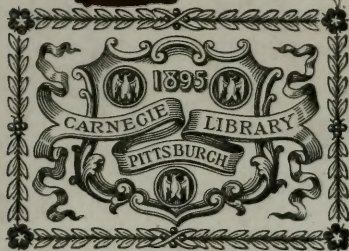




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THE  
STREET RAILWAY  
REVIEW

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1901

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SUPPLEMENT 10th ANNIVERSARY NUMBER STREET RAILWAY REVIEW, JANUARY, 1901.

GRANITE REEF, COAST OF MAINE.





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JANUARY 15, 1901.

NO. 1

With this issue the "Street Railway Review" celebrates its tenth birthday, and takes occasion to briefly review some of the more important changes which have taken place in its field during the decade. Ten years seems but a short time, but the past ten have been filled with events and inventions of a vital character to street railways.

\* \* \*

When the first issue of the "Review" appeared in January, 1891, the trolley had been firmly established, but was yet in the decided minority. The track mileage given by Pres. H. M. Watson at the Pittsburg meeting of the A. S. R. A. in 1891 was as follows: horse cars, 5,443; electric, 3,009 miles; steam dummy, 1,918 miles; and cable, 660 miles. Of cars there were then 25,424 horse; 6,732 electric; 3,317 cable; and 1,044 steam dummies and trailers. Horses and mules were still an important factor, and of these there were 100,116—28,681 having been discarded the year preceding.

\* \* \*

The amount of investment at that time, according to the best estimates were: in horse lines, \$8,000,000; in electric lines, \$50,000,000. This total of \$108,000,000 has been increased during 10 years to an amount little if any less than \$1,500,000,000. Perhaps the story of progress and advancement can be told in so few words in no other way.

\* \* \*

In 1891 electric traction had made a satisfactory beginning in Great Britain, although the conservative Englishmen did not begin to electify on a large scale until five years later. Ten years ago there were in Britain 29 miles electrically operated, of which 15½ miles were third-rail system; 4¼ miles storage battery; 2 miles open conduit and 7¼ miles overhead trolley. At the present time there are 70 roads using electricity, and a large number about to be transformed from animal to electric power.

The horse was by no means a nonentity in 1891, as something like \$15,000,000 was then invested in horses and mules belonging to street railways. It is not surprising therefore that the first two volumes of the "Review" devoted several pages each month to a veterinary department, in which the various ills to which the horse is heir, were discussed. Diet received as prominent attention as the hospital department, and while these articles would occasion a smile if reprinted now, the horse and his diseases were lively subjects in those days. In fact it was not until 1894 that the "horse men" in our annual conventions gave up the ghost and ceased to be jealous that the subject of electricity practically monopolized the program. The prediction of President Lowry, at the Buffalo meeting of 1890 that "this is the last convention at which animal motive power will be seriously considered," came true.

\* \* \*

Elsewhere in this issue will be found a series of articles by writers engaged in the practical work of which they treat, and who concisely review the state of the art during the past 10 years, each in his own special field. It is interesting to note how many of the now essential features of operation were then unthought of, or in an experimental stage which gave little promise of immediate success. Direct connected units; long distance transmission; high speed motors; the arc headlight; air brakes; the cast and electric welding of rails; trolley express, mail and funeral cars; trolley party specials; the electric locomotive; high voltage insulators and transformers; the aluminum feeder and storage batteries for power and sub-station work—all these and many more may be credited to the development of the 10 years just passed. What the coming decade has in store for us is quite as difficult to predict, as was the task 10 years ago. That the coming decade will give a good account of itself and write important history along the lines of street railway interests, we may feel sure.

\* \* \*

That the "Street Railway Review" which has ever endeavored to keep in the very front of new ideas, may retain its present prestige and earn new places of deserved honor, will be the untiring effort of its entire staff.

Chicago is debating the question of municipal control of street railways. An Indiana contemporary appropriately suggests that Chicago should first secure municipal control of her common council and city authorities.

A Kansas City police judge last month made an eminently sensible ruling to the effect that a conductor who goes ahead of a car as it approaches a crossing and signals the motorman when to proceed, is a flagman within the meaning of the law. Kansas City has an ordinance requiring the street railway company to employ watchmen or flagmen at certain crossings to flag the cars across and to warn persons of the car's approach. "But," says the judge, "certainly no watchman is needed if no car is there. The spirit of the ordinance and the reason why it was enacted should be considered. It is a matter of expediency with the company whether to station a watchman there all the time or to require the train men to act as such."

It is interesting to note that the subject of tramway accounting is now a live one in Great Britain, and that the particular need most crying is for a better classification of working expenses. The Tramway and Railway World describes the present situation as one of chaos, and says the practice is so divergent that one never knows what working expenses in any given case really means. Persons who are not sufficiently informed get erroneous ideas as to the economy of electric traction which in the end will injure tramway industry. The fact the demand at present is for a standard classification of operating expenses and not for an academic exposition of the ethics of accounting, will doubtless encourage our own Street Railway Accountants' Association, which has been accused of devoting too much time to mere details of bookkeeping.

The Chicago City Railway Co. last month secured the arrest and punishment of two teamsters, who persisted in delaying cars by driving upon the tracks in violation of a city ordinance providing that traffic teams shall not stop transit on surface lines. We believe street railway companies are fully justified in asserting their rights in this way, and if stubborn drivers were more frequently

impressed with the seriousness of blocking travel, by appealing to the police, there would be fewer delays and many less accidents through collisions. In this connection it is to be commended the action of an eastern company, which has decided to bring suit against owners in all cases where cars are damaged by colliding with wagons as the result of negligence on the part of drivers. Owners of vehicles struck by cars seldom fail to put in claims for damages, but when the courts have decided the drivers were guilty of negligence, the railway company has usually been content to drop the matter.

Of course it is good management to keep the good will of the entire community even at the cost of annoyance, but the interests of the traveling public would be better served if the company's right to use its tracks were more frequently insisted upon.

A large industrial corporation in New England employs a young woman, part of whose duty it is to read the trade journals devoted to the industry, and each month call the attention of the various heads of departments to such articles as she believes will be of special interest to them. Sometimes she tears the article out and at others she places the paper itself with the article marked, upon the official's desk. This clerk also makes clippings from the technical journals and from the local press and files these in indexed scrap books.

While visiting cities in different parts of the country, among others New York, Philadelphia, Kansas City and Chicago, we have noticed this idea carried out by street railway companies with results fully commensurate with the labor and expense involved. Aside from the immense value of bringing to the attention of subordinate officials, articles dealing in particular with their departments, the convenience and advantages of having a scrap book containing all reference in the technical or daily press to the railway company or its officers are many. Cases are on record where such clippings have been used with good results as evidence in legal suits brought against the road. Moreover the scheme enables the manager to keep track of the attitude of the local press on street railway affairs and puts him in a better position to do educational work and, if occasion arise, to point out inconsistencies in the policy of the editor. He is also better able to judge how a proposed measure will probably be treated by the press.

At this time there is no portion of the electrical field that gives greater promise of rapid development in the near future than does long distance transmission. Experience at Niagara Falls and with the numerous transmission plants in the West has been very satisfactory, one 80-mile line in California reporting a line loss of only 8 per cent. The successful transmission of large quantities of electrical energy over distances of 800 miles today presents less serious problems than did the plan to transmit 80 miles ten years ago.

There are two sources of power requiring long lines for distribution—water falls and the low grade fuels in mining regions. Considerable progress has been made recently and waterfalls formerly considered entirely unavailable because of their remoteness or inaccessibility are now being harnessed and their energy put to useful account at distant points. Projects for utilizing culm and other fuel which is now not worth shipping have been discussed for years, but we believe that it is only a matter of a short time until some of these plans will be carried out. The low cost of power house operation in mining regions with cheap land, cheap fuel, and cheap labor is apparent.

There are also two great fields for utilizing the electricity thus generated—manufacturing and transportation. There are manifold advantages in using electric motors in mills and shops, and the experience already had should make it easy to extend the applications. Electricity for main railways is a question that is attracting more attention now than ever before; engineers everywhere are considering it. At the Railroad Congress in Paris last summer, Colonel Heft had a paper on this subject; more recently Mr. W. Langdon discussed it before the British Institute of Electrical Engineers, and in this issue we present a paper read by Mr. E. P. Burch, before the Northwest Railway Club at Minneapolis.

Even if we are too sanguine concerning the development of electrical transmission lines, there is yet another chance for the steam railroads to use electricity. A plan has been suggested for saving two-thirds of the fuel now burned in locomotives. This scheme is to make gas out of coal at points near the mines and

transmit the gas by pipe lines to small electric power stations which are equipped with gas engines, and located at such intervals that direct current distributing systems could be used.

Five years ago railroad engineers were quite convinced of the feasibility of electric traction superseding steam locomotives in suburban and relatively frequent passenger service, but the outlook was not considered favorable for electricity on main lines. The principal difficulty has been how to satisfactorily dispose of the existing equipment for operation by steam. The old equipment represents too large an investment to be discarded while still serviceable, even though it be admitted that electrical operation would be cheaper, and that it might have been chosen had the road been a new one. This is doubtless the reason that the Illinois Central did not equip its suburban tracks for electricity prior to the World's Fair at Chicago. It is interesting to cite the estimates prepared in January, 1892, for the Illinois Central, by Mr. H. W. Parkhurst, on the relative cost of electric and steam traction; these estimates were presented in discussing a paper read before the Western Society of Engineers by Mr. Edward Barrington in December, 1896. According to Mr. Parkhurst's figures the total daily expense, including depreciation and interest, would be \$1,814 for electricity and \$2,032 for steam; without interest the daily expense was placed at \$1,516 for electricity and \$1,774 for steam. The estimates on capital investment were \$1,847,500 for electricity and \$1,584,000 for steam. The figures are quite remarkable when the character of electric apparatus obtainable at that time is remembered.

In Mr. Burch's paper, already mentioned, the author gives a very interesting resume of the progress in electric traction for heavy service, and then discusses the relative economy of electric and steam locomotives, presenting an imposing list of items in which substantial savings can be effected. The saving in coal is placed at 53 per cent, considering all the losses in electric transmission lines, transformer stations, controllers and motors. The other items wherein a reduction of operating expenses may be expected are repairs of roadbed, repairs and removals of locomotives, water supply for locomotives, and engine and round house labor. These four together with fuel constitute about three-eighths of the total operating expenses of steam railroads.

Steam locomotives for passenger service require great boiler capacity and are therefore heavier than is necessary for traction merely, and also haul a heavy tender; an electric locomotive need be no heavier than is needed to give the desired tractive effort, and it requires no tender. Also the locomotive itself may be utilized for carrying passengers. For freight service the electric locomotive would dispense with the tender and could be made lighter by putting all the weight on the driving wheels.

How important a consideration this question of weight really is, will be apparent from the recent development in locomotives. Five years ago the heaviest freight engine yet built weighed 160,000 lb., without tender; today the heaviest engine weighs 250,000 lb., an increase of 56 per cent. This means that tracks must have heavier rails and be better ballasted, and that bridges must be rebuilt, involving capital outlays that should be offset against the expense of equipping electrically. Thus the Manhattan Elevated, New York, found it could not increase the capacity of its road and retain steam as a motive power; because the structure would not bear the wheel loads of heavier locomotives. Equally serious in many instances are the limitations on the design of steam locomotives imposed by the standard track gage, 4 ft. 8½ in., and the clearance at tunnels and bridges.

Most of what Mr. Burch calls the "principal last-century arguments" against electric power for heavy railroads, such as inability to do the heavy work required, unreliability during snow and lightning storms, danger from third rail and trolley, have been pretty effectually exploded.

The first applications to main railways outside of switching in cities—such an application as that of the Baltimore & Ohio in Baltimore—will doubtless be on heavy grades. In fact the Canadian Pacific is already well advanced with plans to use electricity for a mountain division in British Columbia, and the Great Northern has engineers at work on plans for a similar service to get over the Cascade Mountains. In both of these cases waterfalls will furnish the power, but the "coal roads" are favorably located for having recourse to the culm piles.



## CONSOLIDATIONS OF STREET RAILWAYS.

By H. H. Vreeland, President Metropolitan Street Ry., New York.

I suppose that, in any discussion concerning the virtues of consolidation, whatever arguments are to be made should be addressed to the public at large who use public service facilities furnished by transportation corporations. It goes without saying, that a tendency like this, now universally recognized as a feature of our development, would not continue to grow in daily favor among the corporations unless its results were beneficent. The facility with which combinations are made by the willing surrender of stock in old concerns for that in new corporations with enlarged capital and facilities, shows the growing recognition among investors of consolidation as a progressive and profitable development. And so any discussion of this question to be of general interest must be approached from a standpoint of the public which desires improved facilities and cheapened rates.

The most influential argument made on the popular side of this question and against consolidation has been based on the assertion that the combination of railroads meant for the public increased rates and deteriorated accommodation, and in view of this fact perhaps nothing could be of more general interest than a momentary glance at what has occurred in the steam railroad field in the thirty years between '65 and '95, during which time, owing quite as much to combination and consolidation which made the application of improved methods possible as to new machinery, there has been a cheapening of service, the like of which no other industry can show. In no development of business has consolidation been so active as in the railroad field.

A glance at the history of the cost of moving one ton of freight one mile on thirteen of the most important roads which performed during the last year named one-third of the whole transportation of the country, will show a steady and gradual decrease. The record shows the cost to move one ton one mile to have been as follows:

1865.....	3.08 cents
1870.....	1.81 cents
1875.....	1.36 cents
1880.....	1.01 cents
1885.....	0.83 cent
1890.....	0.77 cent
1893.....	0.76 cent
1894.....	0.746 cent
1895.....	0.72 cent

In other words, the public was furnished in 1895 for .72 cent the same ton mileage facilities which thirty years before cost 3.08 cents.

The most impatient shipper will surely not contend in the light of what is common knowledge that the character of the service furnished in 1865 for this high price was comparable to that of today, either in speed or security.

I notice, by the way, that Mr. Rice, when examined by the Industrial Commission at Washington, quotes me as saying that in the decade since 1890, 446 railroads, aggregating 63,000 miles, had been consolidated. There having arisen some question as to the correctness of these figures, I may as well state, that they are subject to slight modification by way of increase; that, as a matter of fact, subsequent investigation shows that when I made that statement, I slightly underestimated the number of roads and the mileage. As these 63,000 miles only represent about one-third of the total mileage of the steam railroads of the United States, it would seem that there remains much to be done in the direction of consolidation.

As street railway consolidation is of comparatively recent development, statistics so abundant in connection with steam railroad expansion are as yet too scarce to be very valuable; but with the successful example of the steam railroads to guide them, it is not strange that the owners of street railway properties soon began a system of consolidation which has resulted in the formation and the operation under a single management of systems of such magnitude, as were believed a few years since to be beyond the grasp of any individual to control.

Since we began to keep reliable records of the street railway business, more than 1,030 corporate names have disappeared from

the records, all of them being lost in the names of merging or controlling companies.

Outside of the investor there are two other classes of persons deeply interested in the subject of consolidation—the traveling public and the employees.

From a public point of view, the change that has taken place in the matter of comfort and facility in street car travel is even greater than the history of steam railroads shows. It has been one long history of lengthening the ride, improving speed, and increasing the comfort of the passenger. The fare, it is true, has apparently remained fixed, whereas in truth and in fact, by the consolidation of various lines, it has been reduced more than 80 per cent. My experience on the Metropolitan is, that with the universal system of transfers, the fare during the maximum travel hours of the day has been reduced to 1.83 cents, while for the whole period of 24 hours, owing to the transfers again, the individual fare is reduced to about 3.25 cents.

During the year 1900, more than 179,000,000 transfers were given away by the Metropolitan system. Under the old regime of separate management each one of these transfers would have represented a 5-cent fare, involving a total output on the part of the public of about \$8,000,000. Along with the reduction in the cost of individual fares, has gone on a yearly increasing mileage privilege, and various other accommodations, such as rapid transit, perfect lighting and heating, and cleanliness, so that the individual citizen has been benefited as much as the capitalist as the result of consolidation.

As to the employees, one of the most significant features of street railway consolidation that has come under my observation is the effect upon the class of men employed. The character of the employes has been improved in a noticeable manner. The drivers and the conductors of the old-time horse cars have been rescued from a field of miscellaneous labor and elevated to a semi-expert class of laborers. The increased demands made on brain and muscle have tended to attract the more intelligent class of employes. With this increased demand upon the intelligence has come an increase of wages which prompts closer application. Consolidation has strengthened their tenure of employment and given them hope of advancement impossible under the old system.

As an evidence of the improved status of the employe, let me say, that during the past year fewer men were discharged, per month, on the Metropolitan Street Ry., with a personnel of 9,000, than in former times when the personnel numbered 3,000; and the average term of service, since we began to consolidate, has risen from 9 months to 35 months.

The employe of the Metropolitan Street Railway Co. has not been slow in seeing the benefits of consolidation, and he has been doing some consolidating on his own account. In this connection a most interesting industrial development has been brought about. The employes of the Metropolitan Street Railway Co. have formed the Metropolitan Street Railway Association, which is a co-operative concern, by means of which the members secure, without the patronage of the owners, one-half of their regular pay when ill, free medical attendance, medicines at reduced fixed rates, and a fixed death benefit of \$150. They have a circulating library of 2,000 volumes, club rooms, furnished with four billiard tables and other means of amusement.

The Metropolitan Street Railway Association has also by a system of easy taxation, collected a surplus, which, by its own motion, has been invested in the securities of the property on which the members are employed.

It is impossible to speculate with certainty as to the future of street railway consolidation. Experience in every center of population in the United States during the last ten years has been toward a union of interests, and one naturally looks forward to still greater expansion. This outlook brings to mind the question that has been frequently asked concerning the limit of human capacity in the matter of street railway management. It was universally the opinion ten years ago that the chief danger in consolidation was the impossibility of finding men to manage the assembled lines, but as I look about me today, there seems to be no lack of either men or efficiency, and I can see no reason why a man who has organized and managed 500 miles of road should not be able to manage 1,000 miles. The essential requirements are, first, to plan the work, and, second, to select competent subordinates to execute the details.



# Electric Tramways—Progress in the United Kingdom, 1891-1900.

BY J. CLIFTON ROBINSON.

[Mr. Robinson is an Associate of the Institute of Civil Engineers, a Member of the Institute of Electrical Engineers, Managing Director and Engineer of the London United Tramway and the Imperial Tramways Co., and Engineer to the Bristol Tramways & Carriage Co. He built the first cable road in England; afterward coming to the United States, he completed, and when finished managed the cable lines at Los Angeles. He was among the first to recognize the future of electricity and spent a year studying the best roads in this country. He then returned to England, and built the first electric lines in Dublin which proved a startling success. He became at once in great demand, and for the past few years has been constantly occupied with the work of securing Parliamentary Bills and constructing new electric roads. He has unquestionably done more than any other individual to introduce and popularize the trolley in Great Britain, where he is acknowledged as the leading exponent and authority on electric traction.—Editor.]

It gives me great pleasure to respond to the editor's request that I should, on the auspicious occasion of the completion of the first ten years of his editorship of the "Street Railway Review," furnish a resume of the story of Tramways in Great Britain and Ireland during these ten years. I comply the more readily because the end of the century makes a convenient landmark in the story, and even more because we are certainly at a parting of the ways, when horse haulage on our tramways is virtually abandoned, and when, in my opinion, of all substitutes proposed, electric traction "holds the field."

The story between 1860—when tramways were born in Great Britain, and I began my active life in helping to make and work tramways—and the year 1890 scarcely needs to be retold. It may suffice to say that long before 1890 tramways had come to stay in



J. CLIFTON ROBINSON.

this country, as elsewhere. Roughly speaking—for I do not propose to do other than use round numbers—there were at the end of 1890 about 160 tramway undertakings in operation in Great Britain and Ireland. The great majority of these were the property of companies, but about one-fifth of the total belonged to corporations. The greater part were still using that good old-fashioned motor, the horse, although a few here and there had steam locomotives—wonderful structures, some of them!—as at South Staffordshire, Birmingham, Leeds, Stockton-on-Tees, Dundee, Huddersfield, etc. There were also two cable tramways in existence in 1890, one at Birmingham, the other at Highgate, the first fairly successful, the other struggling along under the disadvantages of isolation, meager traffic and an effete administration. Of tramways in operation, there were 120 miles in the Metropolitan area, about 640 miles in England, 85 miles in Scotland and about 110 miles in Ireland—approaching 1,000 route miles in all and carrying nearly a million and a half passengers per day. Of the latter number about one-third—or 188 millions per annum—belonged to London and its suburbs. The entire capital expenditure to that date amounted to £14,162,650 sterling—say, 70 millions of dollars.

While horse traction generally prevailed, there was a strong spirit of unrest observable. Horse traction was found to be costly—very costly indeed where traffic was sparse—and the lines were therefore necessarily confined principally to the busier parts of our towns, and on gradients readily surmounted. About two years before there arose rumors of electric traction. "What are these new-fangled notions about electricity?" was the remark I heard at the Minneapolis meeting of the American Street Railway Association in 1889. This was the first cool and discouraging reception of a power which today dominates the world of traction in both hemispheres.

In the beginning of 1891, the only electric tramways in this country were not tramways. (I may be pardoned this hibernicism as the new power got its first foothold in Ireland). The Portrush line in 1883, the Bessbrook and Newry line in 1895, and that pioneer "Tube," the City & South London Ry. in 1886 (in the parliamentary promotion of which I was concerned), mark the first stages of the story. But it was not till 1892 that a real, practical beginning in electric traction on urban tramways was made, the first converted line being in the suburbs of Leeds, where the electric trolley was brought into operation in January, 1893. In that year, also, the South Staffordshire system, serving a more widely spread district, was opened, the latter anticipating, it may be said, the introduction of the Light Railways Act, of which something is said in a later paragraph. At the time these lines were constructed the line work and the electrical installation and equipment were but imperfectly understood. And in this connection I may say that, although the advent of electric traction in this country was delayed by the public agitation and inquiry, which resulted in the standard rules of the Board of Trade being promulgated in 1894, I have never concealed my opinion that these rules have been beneficial in causing necessary attention to every detail of electric tramway construction, equipment and operation.

The first line governed by these rules was established in Bristol, where, in October, 1895, I had the honor to inaugurate for the directors the first electric trolley tramway embodying every scientific improvement and provision then known. This tramway—the St. George & Kingswood line—worked like a charm on public opinion, not only in Bristol, but over the whole country. In the ancient western city the effect was, indeed, almost magical, and the result is seen in the gratifying circumstance that even as I write the engines of the new great central power station at Bristol have begun their work, and 30 miles of tramway route have been put into electric operation. In this power house the plant installed is designed for an output of 3,000 kw., providing for 300 cars, traversing the whole converted and extended tramway system of the city and suburbs of Bristol.

Dublin was the scene of the next step in the triumphal march of electric traction. There, on the 16th of May, 1896, the Lord Mayor of Dublin inaugurated the Dublin Southern Electric Tramway, extending from the southern suburb of the Irish capital to Kingstown and Dalkey. After a long and violent opposition, we had obtained statutory powers to convert these lines to electricity, and in this, the second "object lesson" which it was my privilege to present to the British public the effect was again marvelous. The line was acquired by our great rivals and opponents, who paid us the flattering compliment of immediate imitation, so that today the tramways of the Dublin United Co. are being wholly operated on the overhead trolley system.

The next demonstration in electric traction upon a large scale I was also able to supply. The Imperial Tramways Co., owning the Middlesborough horse line, acquired the Stockton-on-Tees steam line, and in 1896 projected a system of electric tramways to join these two large towns, passing through and serving en route the younger borough of Thornaby. We lodged our plans in Parlia-

ment in November, 1890, obtained the royal assent to our bill in August, 1897, broke ground on Sept. 1, 1897, and the entire system was put into full operation July, 1898. We had to negotiate with and reconcile the sometimes conflicting interests of, amongst others, three borough and two county councils, but two years served to complete the whole work, while as a contrast I may mention that the municipality of Glasgow only succeeded after four years in opening (in October, 1898) its first experimental electric line of three miles. The importance of this contrast in view of some present-day controversies will appear in a subsequent part of this article.

Before considering the general progress of electric tramway traction in Great Britain, I may here refer to the extensive system of electric tramways in the western suburbs of London, on which I have been and am still engaged. From Hammersmith to Chiswick and Kew Bridge, with two branch lines to Richmond and Shepherd's Bush, there existed lines of horse tramway, which the London United Tramways, Limited, rescued in 1894 from the last stage of mismanagement and decay. Following the lines of our equally successful efforts elsewhere, we in 1898 applied to Parliament for electric powers, thus taking the initial step in introducing the electric tramway in London. From the Light Railway Commissioners, in the same year, we obtained powers to construct a line connecting our Shepherd's Bush terminus (and the terminus of the Central London Electric Railway) through Ealing, with Uxbridge, 13 miles distant. In 1899 and in the present year, we succeeded in making agreements with the local authorities of a number of the most picturesque towns in the Thames Valley, such as Twickenham, Teddington and Hampton Court, and Parliament conferred the necessary powers enabling us to extend our system over these wide, populous, and classic districts. On the original lines the electric installation and equipment is complete and in the central power station at Chiswick, the engines are now as I write running. Our motor cars, of which a preliminary equipment of 100 stands idle in our depots, are, however, not running. We await the fiat of the Board of Trade as to what precautions must be taken to protect certain recording instruments at Kew Observatory. The progress of real science is being retarded in the name of science "falsely so-called," and magnetic observations, which could as conveniently be made anywhere, are held by the scientists as of more importance than the inauguration of electric tramways for London. After a year's inquiry, a committee of savants have pronounced simply a non possumus, and handed back the problem for the Board of Trade to determine. Meantime, we have proved that before we had begun to generate electricity in our power house at all there were in our rails and wires electric currents sufficient (according to these observers) to ruin the value of the records at Kew! Capital to the extent of about £750,000 sterling—or 3¼ million dollars—will be standing idle till a definite decision has been arrived at by those responsible for the slow-grinding official mill.

Returning to the general progress of electric tramways in the United Kingdom, we have seen that Bristol and Dublin and the Tees-side towns occupy the premier position, and it is needless to go over the names of all the cities where their example has been followed. Liverpool is of course a notable instance, and many other cities could be named—Glasgow, Birmingham, Manchester, Sheffield, Cork, Newcastle-on-Tyne, etc.

One notable exception to the rule of the "trolley" is furnished by Edinburgh, the metropolis of Scotland. Some few years ago, dominated by the prejudices of a wrong-headed chief magistrate, the corporation of Edinburgh decided that electric overhead traction should not be permitted to desecrate its sacred streets, and cable traction was resolved upon. About four years, and about a million sterling have been spent, and even yet the process of conversion is far from complete; and it is not beyond likelihood that after all an early change to overhead electric traction may yet be resolved upon by the citizens of that beautiful, though belated city.

At the close of the decennium and of the century, we find the actual number of tramway undertakings in this country only slightly increased. The principal change has been in the proportion belonging now to corporations, which is now more than one-third in place of less than one-third as in 1891. The mileage of line has increased by about 20 per cent, showing in England 880 miles, in Scotland 106, and in Ireland 135 miles. The number of cars has more largely increased, 6,500 in place of 3,800—and the passengers carried, reckoned as 526,000,000 in 1890, now exceed 1,000 millions,

of which again, about one-third are found in the Metropolitan area. The traffic receipts have increased approximately 50 per cent from 3¼ to 4¼ millions sterling, whilst the capital invested in established undertakings and the formation of new ones not yet in actual operation has advanced from 14 millions to no less than 86 millions sterling.

In the second half of the decennium (1896) the Light Railways Act has been brought into operation, but the four years' work of the Commissioners can be only briefly referred to. The primary intention of the act was to extend rapid communication to outlying places, giving connection with existing railways. But it has also served largely to build up and extend urban, and especially inter-urban tramways. Up to the end of 1900, the projects submitted have been 298 in number, covering a total length of 2,955 miles—or an average of about 10 miles in each case. Of this mileage, 2,118 miles were on the ordinary (4 ft. 8½ in.) gage, and 637 on the lesser gage of 3 ft. 6 inches. At first, proposals to use steam locomotion were numerous and as regards total mileage that motive power still predominates. But it is of interest to note that as the years have passed electric traction has grown more in favor. Thus in the first 18 months—ending December, 1897—the projects included 53 for steam, 626 miles, and 32 for electricity, 244 miles; while in the 18 months now ending the number of plans submitted has been 21 for steam, 298 miles, and 63 for electricity, 474 miles. In the concluding six months of the century the contrast is even more marked, the new projects embracing 2 of 17¼ miles for steam and 16 of 125 miles for electric traction.

To attempt a forecast, as suggested by the editor, of what the next ten years or the next century may bring forth as regards tramways in this country is a somewhat bold undertaking, when the rapid strides in other branches of scientific discovery are kept in view. But there are certain broad lines of development which one may forecast with safety in spite of the adage about the danger of prophesying "unless you know." Although the mileage of line, as we have seen, has only increased 20 per cent, in the 10 years dealt with, the receipts from passengers have increased 50 per cent, and the total number of passengers carried has very nearly doubled. This indicates that improvement of the service rather than the opening of new lines, has increased the traffic. Let me take a concrete case. The old Tramways of Stockton and Middlesbrough carried in 1890 about 1,500,000 passengers. When they were joined up in one system and worked by electric traction, as already described, their extent was increased by not more than a third. But by 1900 the passengers carried had grown to 9,000,000, or an increase of 500 per cent.

The introduction of electric traction began when the decennium was half through, and in the first five years the construction only added 34 miles to the lines, and the number of passengers grew from 55 to 65 millions only. In the second half, an addition of 140 miles was made, and the passengers rose to 100 millions. The latter increase was far in excess of the mileage ratio, thus again demonstrating the influence of more rapid transit and superior accommodation in developing traffic.

If we apply the principle suggested by these figures, it would be safe to predict that if the work of improving and extending tramways in this country proceeds for the next five years as rapidly as since 1895, the passengers carried will again be doubled in number and will reach 2,000 millions. A high authority, Engineering, agrees with this forecast, and anticipates that in these five years 2,500 miles of electric line will be equipped, demanding 200,000 kilowatts of electric power.

The problem at the end of the century and for the next few years mainly centers in London. In the metropolis two stupid principles have ruled, one referring to the area within which tramways have been admissible, and the other as to the kind of tramways to be allowed. Both of these have at length been broken in upon, and the results in ten years may be marvelous. Even if all the "tuppenny tubes" existing and projected should be brought into use, the clamant necessity of London traffic would be only partly met. The London United Tramways, Limited, is in the coming session raising the question in a very pertinent form, for, although the range of that company does not extend to "the city" proper, we are firmly established in the West End, and the proposal to run electric tramways within sight of the Marble Arch, and round the quiet groves of Regent's Park should "awaken up" the Rip Van Winkles of the chief city of



the empire. In this connection I hail with delight the potent words of his royal highness the Prince of Wales, who, in welcoming the new mayors of the 28 boroughs now created in London, reiterated his words spoken two years ago to the London County Council, and impressed on the new authorities that in the improvement of existing traveling facilities lies the only hope of relieving the congestion of London.

This brings me to one aspect of the question of street congestion to which little or no attention has yet been paid by public authorities, though I have from time to time pointed it out. This is that by eliminating horses the lineal space occupied by each electric car is reduced by one-half! In the case of crowded thoroughfares, this is so striking an advantage that in time it will be recognized as cogent argument in favor of electric traction. If electric tramways were constructed and operated through many of those wide streets and avenues from which they have till now been needlessly excluded, London would only be the poorer by the removal of two silly prejudices, while it would be the richer in having its congestion very materially relieved, and in thus solving the problem of travel, redeem its character as being the most backward in the civilized world.

Heretofore I have written on the assumption that the electric trolley system will prevail for the next ten years as it does now, and I see no reason to expect otherwise. Certainly horse haulage is bound to disappear. The cable, in spite of its recent adoption in Edinburgh, has nothing to recommend it, either from the practical or the financial side, in the contest with electricity. Steam tramway locomotives exhibit a wonderful vitality, but they make no headway in new undertakings or extensions, and they will in time become as extinct as the dodo.

Is there any other adaptation of electricity that will probably out-ride the overhead trolley for general use under all conditions within the next ten years? I confess I have seen nothing as yet that would suggest this. Every point of view must be looked at before one system can be pitted against another. Is it cheaper in construction, more efficient in operation, as convenient in daily use, as trustworthy in all weathers and as reliable under all conditions; can it cope with all and every development of the public demand; is it as free from danger to the passengers and the public? Thus examined, I see nothing in any of the existing conduit or surface contact systems to commend them either to the practical tramway man or to the engineer. The esthetic objection? Is that a sufficient reason—Edinburgh, or at least its lord provost, thought so—for refusing the electric overhead wire, so economical in cost of construction and working, so universally applicable, so pliant in meeting all circumstances, and so beneficial in giving tramway communication to outlying districts? I think not, and shall probably continue to think so ten years hence.

But for two possibilities I should strike "probably" out of my last sentence. One is that a discovery in the construction of accumulators may make their use financially and practically possible for general adoption. The other is that some startling discovery in electricity may upset all calculations and commit motors, generators, street standards and trolley alike to the scrap heap. These things are possible, but they are not now "within the range of practical politics." Besides, even were accumulators to come in, electric trolley tramways could adopt them with less capital sacrifice than tramways operated by any other system.

Another important point affecting the future of tramways must be dwelt upon—I refer to the question of "corporation" or "company" ownership. As regards the monopoly of working in very large cities, with well-defined boundaries, ownership by the corporation may probably prevail, if once it be granted that such "municipal trading" is wise, inasmuch as the town rates are pledged for any loss that may arise. In the event of such a revolution as is above hinted at, how would a corporation face its loss except by a levy on the ratepayers, many of whom never required or desired to use the tramway? A company, on the other hand, is a commercial venture, and, should loss ensue on its operations, it has to be borne as a risk of trade, and it can be provided for by competent administration and management and the establishment of a substantial reserve for contingencies. But this is one of the least of the questions to be considered in discussing the real merits of municipal and mercantile activity, though what has just been said may throw doubt on the wisdom of corporation ownership, even in a large and well-defined city area.

The vacillation and delay of Glasgow Corporation has already been described. The London County Council, after some of its most prominent members had railed at us and our overhead wires, "obscuring the blue vault of heaven," and suggesting a universal washing-day from the rags with which their imagination saw caught on the wires, has come to a sober mind on the facts of the case, and with the zeal of the convert, "now preaches the faith which once it destroyed." We shall yet see plenty of electric trolley lines running through the main arteries of London, even in those sacred streets where tramways of any kind have been heretofore tabooed. The Middlesex County Council would fain have constructed electric tramways, but it has lost its chance through want of decision. First it would and then it wouldn't, and the fates and the Legislature have been alike unkind. So with the Surrey County Council, whose schemes have changed like the chameleon and faded away like the rainbow.

In these circumstances it is a satisfaction to belong to an organization that "knows its own mind" and can attend to its own business. Just as I write I have lodged with the proper statutory authority, and also submitted in detail to every local body interested, a bill seeking powers to largely extend the system of the London United Tramways. The 45 route miles of line which, in the main, supplement the 40 route miles of tramway for which we already hold powers (and have now largely completed), will, if sanctioned, give direct communication from the heart of London, touching the northeastern extremity of the Zoological Gardens and Regent's Park, and the Marble Arch on one hand, and connecting without change of car with such diverse bounds as Uxbridge on the northwest, Hounslow and Staines Road on the west, and Surbiton and Kingston-upon-Thames on the south. Our cars would then convey the myriads of London not only to many populous and busy centers but to such historic resorts as Richmond Park, Hampton Court, and the famous house-boating sections of the River Thames. Our scheme entails negotiations with and agreement with 24 borough, urban and district councils and three county councils—those of London, Middlesex and Surrey. As reasons for hoping that success may crown this important effort, we have had much experience in such negotiations, and as recorded, we have had many successes in uprooting prejudices and breaking down interested or ignorant opposition. London is at the time I write profoundly ignorant on the subject of electric traction, and equally ignorant of the powerful "object-lesson" we are waiting to show whenever the "powers that be" will assent. With these first 16 miles of our system in operation, with our power house equipped with every recent scientific improvement, with our cars, each carrying 70 passengers, running (frequently at one cent per mile) in these busy suburbs, ignorance will be dissipated, prejudice will be overcome and the first fruits of the new century will, I anticipate, be a wide development of electric tramways in London.

But this story of British tramways will have been written in vain if it does not indicate another powerful reason why the services of a company should be preferred. Let us here also take a concrete case. In Dublin we had to negotiate with the city of Dublin and seven townships, including Pembroke, Blackrock, Dalkey and Kingstown. In the promotion of the Tees-side line agreements had also to be entered into with the various county and borough authorities, including Durham County, Stockton-on-Tees, Thornaby, Yorkshire, North Riding and Middlesbrough. In West London, as regards existing and authorized lines, we have fought with and agreed with county, urban and district councils without number, and we have 29 such bodies to meet in connection with our parliamentary plans above described. In each and every instance the strength of our case was that we could offer open through communication regardless of boundaries (which exist only on the map), while not one of the several local authorities could, under the existing statutes, own one furlong of tramway outside its own district. It may be urged that each authority could have made its own lines, and then leased them jointly for through working. Yes, this might be done; but does any person conversant with affairs believe such a solution of the enigma to be desirable? Every local authority, with its own little parliamentary bill, would have its own staff of parliamentary agents and engineers, its own experts and contractors! There would be endless disputes on routes, street improvements, equipment, everything! And then an elaborate accounting from year's end to year's

end to find out which mile of line it was that did not pay, and how much credit redounded to each little Pedlington! In the interest of the community at large I maintain that private enterprise is the best for dealing with tramway problems, and my forecast is that it will and must prevail where large populations are adjacent and yet distant and require daily business intercommunication with each other. Such a plan as is now put forward to join up Manchester and Liverpool by an electric tramway, passing through that remarkable cluster of wide-spreading yet populous "townships" that lie between and around, could not be carried out by any one of the local authorities, nor by all the local authorities combined. No; in the development of the vast tramway enterprises which this country still stands in need of, I predict that success will lie with the company that knows its own mind, understands its business, and is least hampered by local or municipal interference. A long step in this direction has been made in the readiness shown by Parliament to vary the terms and period of purchase as laid down in the act of 1870, when a case for such concession is made out in heavy capital outlay and great public advantage. This should stimulate tramway development in many directions. Still more will our case be improved should the efforts now being made prove successful in inducing Parliament to suspend the standing orders requiring tramways bills to receive the "assent" of every little local authority affected. Tramway proposals would thus be judged on their merits by the parliamentary committees, as railway, gas and water, and other bills now are. Of course were this granted, private enterprise would find itself on exactly the same footing as the municipalities, and thus the task of promoting better means of travel within a town would be lightened of that appalling and unjustifiable system of blackmail to which companies are now exposed by the public bodies representing the very communities that are benefited.

Although railway and tramway working are so distinct, I cannot, in a forecast of the future of electric traction, altogether omit

mention of some important railway developments now being contemplated in this country. The scheme for the transformation of the London Metropolitan and Metropolitan District Railways is so far advanced that parliamentary powers for carrying out the works are now being sought for. A wider proposal, dealing with ordinary trunk line railways, is dealt with in a paper read on November 29th before the Institution of Electrical Engineers in London by Mr. W. Langdon, vice-president. Taking 50 miles of the Midland Railway main line (London to Bedford), Mr. Langdon works out a capital outlay of about £10,000 sterling (\$50,000) per mile for equipment of central power house, sub-stations, "conductor rails" and cables, accompanied by a saving of two-fifths or thereabouts in fuel, a great economy in water supply, the abolition of "water pillars" for the supply of locomotives, economy of space in the abolition of turn-tables and the handling of engine coal at various depots, a reduction of engine shed space by one-half owing to the smaller space demanded by electric locomotives, etc. For new lines the prospect is a most alluring one, and even for our older railways it reads promisingly. But it is seen how far the proposal is outside my subject, that the effective transmission and distribution of power is suggested by methods quite inadmissible in tramway practice.

In conclusion, we may certainly look for a very remarkable development of tramways in the next ten years. The many glaring defects of the act of 1870 have been largely remedied, the Light Railways Act of 1896 has introduced an excellent machinery for building up smaller and more rural schemes, the primitive and costly horse is no longer possible, and the ignorance and prejudice of the public as regards other methods of traction have been practically dispelled. This latter change is owing mainly to the advent of electricity, which has helped so signally to enlighten the people, but thanks are due also for the influence in this good work of such well-informed journals as the "Street Railway Review."

London, Dec. 19, 1900.

## THE RAILWAY POWER STATION.

The essential features of an electric railway power plant are now no different from what they always have been and may be enumerated reliability, stability, economy of operation, economy of maintenance, compactness, convenience in location, capability of enlargement, moderate cost. The aim of the engineer has always been to secure these qualities insofar as was possible with the facilities at his command. Within ten years several of the limitations on power house design have been removed and the result has been a complete change of type, large direct connected units superseding the small generators driven by belts from a counter-shaft; also this newer type, what we have for five years known as the "railway power plant," has to all appearances reached its utmost development as to capacity, and the 20th century opens with a new type which we may call the "large railway power plant."

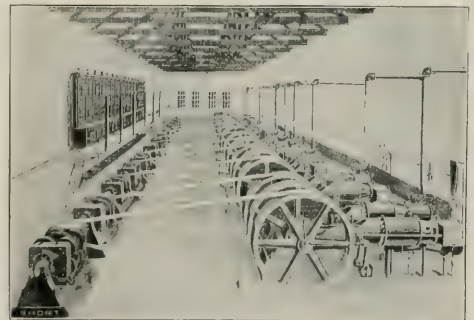
January, 1888, the 13 electric railways then in operation, had in the aggregate only 48½ miles of track and 95 motor cars; one company had 7 miles of track and 12 motor cars, another had 4 miles of track and 78 motor cars. A year later the first electric car was started in Boston. July 1, 1891, the number of electric roads in operation was placed at 354, with 2,893 miles of track and 4,513 motor cars; this was an average of about 8 miles of track and 13 motor cars for each road. Such lines needed only small power stations, but electric traction made larger street railway systems possible and the rapid growth that followed made larger power houses a necessity; this cycle has been repeated again and again until the present time.

It seemed fairly easy to fix upon the capacity for the first stations, but in almost every case the size chosen was too small. Now the probable total demand on a railway power station is considered more difficult to determine and in most cases the choice as to capacity depends largely upon the cost of real estate and convenience to fuel and water.

The cost per kilowatt-hour of generating electrical energy decreases rapidly as the station capacity rises to 500 kw., then decreases slowly up to a total capacity of 1,500 kw., somewhat more slowly for larger plants up to 2,500 kw. beyond which the cost per unit is nearly constant. The economy of having one large station

or a number of smaller ones, of say 2,500 kw. each depends upon whether the cost of land, coal, water and labor at each of the smaller plants would be such as to more than offset the increased cost of distributing the current from the large central station.

In 1892 "the large roads were equipping their entire systems for electricity" and building power plants of from 1,000 to 1,500 h. p. In 1895 the Metropolitan Elevated, Chicago, completed its power station, having a total rated capacity of 6,000 h. p.; the Western Ave. station of what is now the Chicago Union Traction Co.



ROCHESTER (N. Y.) RY. POWER STATION, 1891.

was supplying 7,000 h. p. in 1895, but the plans provided for additions bringing the capacity up to 12,000 h. p., making it the largest station of its kind ever designed. The large stations of the present time completely dwarf the earlier ones; the new central station of the Metropolitan Street Railway Co., New York, decided upon in 1897, and now in partial operation, was designed for 49,500 h. p.—the station of the Third Avenue Railroad Co., New York, for which contracts were awarded in January, 1899, is to have 72,000 h. p.



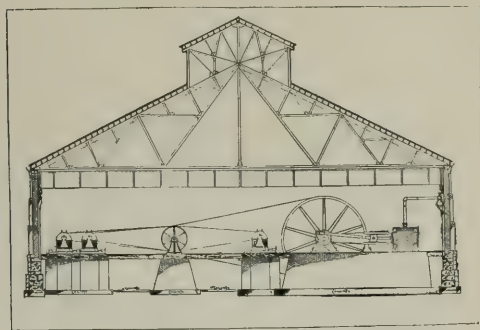
capacity—the plant of the Manhattan (Elevated) Railway Co., New York, now building, is rated at 53,000 h. p.

Having decided upon the capacity of the station, the first and most important element to determine is the size of the engine unit. While the earlier stations were often designed with too small engine units, the reasons were the great uncertainty as to the future of the enterprise and the inability to secure generators of the desired capacity.

Messrs. E. G. Connette, L. H. McIntire and F. S. Pearson, in their report on "Power House Engines," presented at the Milwaukee meeting of the American Street Railway Association in 1893, recommended the sizes for engine units as given in the table up to 2,000-h. p. stations. These are considered good practice today. Mr. Philip Dawson published the sizes for larger stations some years ago and these are pretty closely followed in the latest stations.

Capacity of Station.	No. of Engines.	Size of Engines.
200	2	200
400	3	300
600	3	300
1,000	3	500
1,500	4	500
2,000	4	750
5,000	6	1,000
10,000	6	2,000
20,000	6	4,000
40,000	9	5,000
60,000	11	6,000
90,000	10	10,000

Save in very exceptional cases, the distribution of current from a station of more than 10,000 kw. is not practicable by direct current, and three-phase transmission and rotary converter sub-stations are used. This gives a very flexible system and enables unexpected expansion in a given territory to be easily and cheaply cared for. The limitations on the location of a sub-station are much fewer than in the case of a generating station, and there is no temptation towards what might be called "overdesigning" in trying to plan for the future. Very early in railway power station work the engineers expressed a preference for direct-connected units, but could not use them because the generators available were not larger than 50 to 80 kw. In all but the smallest stations it was quite out of the question



STATION WITH BELTS AND COUNTER SHAFT, 1891.

to dispense with counter shafts, because of the large number of small engines that would be required.

While European makers had been building direct connected generators in small sizes since 1880, and had some in successful operation as large as 1,000 h. p., and Mr. Edison had built some 300-h. p. machines direct connected to engines running at 250 r. p. m., these were all used in lighting or power plants, other than street railway. The design and manufacture of direct driven railway generators was commenced by the Thomson-Houston, Edison and Westinghouse companies in 1890, and a little later the Siemens & Halske Co., of America, entered the field.

The countershaft was accepted as a necessity, but there was a choice of prime movers between high speed automatic engines and the corliss type. The high-speed engines received some setbacks because of the failure of the makers to realize that the severe con-

ditions of the service required that the engines have stronger parts, larger bearing surfaces and heavier flywheels than were needed in lighting work, but once these facts were understood the faults were quickly remedied.

Slow-running engines of the corliss type, by reason of their economy in operation and maintenance, attracted the attention of railway men and were widely used. Experience showed that these engines did not govern quickly enough, but this fault was also soon obviated by the makers.

Power station design had for years vibrated between two extremes, cheap, wasteful engines on the one side, and expensive, multi-cylinder engines with high ratios of expansion on the other. Because of the greater number of hours per day that a traction station is active, compared with lighting plants, and therefore the greater importance of economy, the more wasteful types were abandoned for larger stations. On the other hand, the many and rapid variations in the load on traction engines required a wide range in the cut-off, and experience soon showed that triple-expansion engines were unsuited for the work. The general type recognized as most suited to the conditions was the compound engine.

Further, to secure the highest degree of reliability, it was considered better to have each generating unit separate from all others, and this foreshadowed the abandonment of the countershaft, so soon as generators of larger capacity made it possible.

Perhaps there is no better way of illustrating the difficulties that beset the engineer ten years ago than by referring to the central station of the West End Street Railway Co. This station was designed and built in 1889-90-91, and the accompanying illustration is reproduced from Power-Steam, which described the plant at that time. The plans provided for 13 Reynolds-Corliss engines of 1,000 h.-p. each, arranged as shown. The driving pulleys of the engines were 28 ft. in diameter and 10 ft. 7 in. face, with two 5-ft. belts running to pairs of receiving pulleys on the countershaft, 7 ft. in diameter and 5 ft. 2 in. wide; on either side of each pair of receiving pulleys were two 10-ft. pulleys of 32 in. face, each with a 30-in. belt leading to the generator pulley, which was 4 ft. 8 in. in diameter. The generators ran at 400 r. p. m. Each engine would thus drive four generators of 250 h. p. each. The various sections of the countershaft were connected by clutches so that when all were connected there were two lines of shafting, each 250 ft. long. It was the intention of the company to duplicate this plant as soon as it should be in successful operation, but before the station was finished the manufacturers had agreed to furnish larger generators, and 18 generators of 500 kw. each were substituted for the 52 smaller ones. New apparatus, cross-compound 1,600-h. p. and 2,000-h. p. Reynolds-Corliss engines and direct connected generators, were installed in 1895-6. In 1899 another unit, 2,700 kw., was added.

Nothing can detract from the credit due the directors and management of the West End company for the pioneer work done in the field of electric railroading, and it was singularly unfortunate that the decision concerning the Central station had to be made just when it was made. The design was not what it would have been had there been other apparatus in the market, and two years later a direct connected plant would have been installed. Yet had the West End not shown its belief in electric traction at that time, perhaps better apparatus would have been longer in coming.

Responding to the demand for railway generators, the electrical companies put larger machines on the market. In the early 90's the old Edison company had a number of direct driver generators in street railway plants; these were in sizes not much larger than 200 kw. and ran at about 120 r. p. m. The Westinghouse company at this time was building its direct-connected flexible clutch units in sizes up to 375 kw. for railway work and up to 1,000 kw. for power work. The engine and generator were separate, but mounted on the same bed-plate, and the two shafts joined by a clutch in which springs were interposed to give flexibility and avoid a rigid connection. The speed of operation was from 200 to 250 r. p. m.

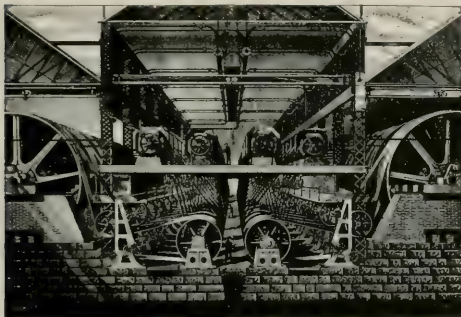
The Lake Erie Engineering Works, of Buffalo, was also a pioneer in the building of direct-connected units; this company's engines were of the marine type, compound or triple expansion.

The first electric railway station in this country to be equipped entirely with slow-speed direct coupled engine-generator units was the New Haven & West Haven Street Ry., at New Haven, Conn. This station was started July 1, 1892. There were three 150-h. p. Manning boilers with mechanical draft, and three compound Westinghouse engines, each connected by a flexible insulated coupling to

a 125-kw. Westinghouse so-called slow-speed generator. In the latter part of 1892 the Brooklyn & Newtown Street Ry. installed Westinghouse compound engines direct coupled by flexible clutches to Westinghouse 260-h. p. generators.

What is thought to be the first rope drive used in an electric railway power plant was that of the Los Angeles (Cal.) Consolidated Electric Ry. put in in 1891. Rope drives were also installed at Portland, Ore., and by the Chicago City Ry. in 1893. In the new combined lighting and power station of the Toledo Traction Co., built in 1896, engines with the armatures of railway generators mounted on the shaft were also connected by rope drives with countershafts from which the lighting machinery was driven. This was probably done in order to utilize old generating apparatus and standard arc lighting machines available at that time. What in all probability is the last large rope driven railway station ever built is the power house of the Chicago City Ry., at 49th St. and Oakley Ave., completed in 1897.

Sept. 2, 1892, the Cass Avenue & Fair Grounds Railway Co. placed an order with the General Electric Co. for one 200-kw. and three 800-kw. generators, and it was the first company to completely equip its power station with direct-connected apparatus of the now common type, with the generator armature built up on



CENTRAL STATION, WEST END STREET RY., BOSTON, 1891.

the engine shaft. The engines were of the simple Reynolds-Corliss type made by the Allis company.

The power plant of the Intramural railway at the World's Fair in 1893, which was designed by Mr. B. J. Arnold, was particularly interesting to railway engineers because it contained apparatus selected for the express purpose of showing the best types obtainable at that time. The generators were all made by the General Electric Co. One of 800 kw. capacity was direct connected to a vertical compound automatic marine engine built by the Lake Erie Engineering Works, and one of 1,500 kw. direct connected to an Allis horizontal cross-compound condensing engine. The other units were an Allis tandem compound engine, direct connected to one 400-kw. generator with overhanging armature, a McIntosh & Seymour tandem compound engine belted to a 200-kw. generator, and a Greene tandem compound engine belted to a 500-kw. generator.

Early in 1893 Mr. F. S. Pearson, chief engineer for the West End road, of Boston, prepared plans for a station for the Brooklyn City Ry., which provided for a double decked boiler house, containing forty 250-h. p. B. & W. boilers, arranged in batteries of two each, and provided with complete coal and ash handling apparatus. The engines were let to the E. P. Allis Co., and were tandem compound, with cylinders 32 and 62 by 60 in. The generators were built by the General Electric Co. and were to be 1,500 kw. machines of the same type as those installed at St. Louis, with 12 poles and running at 75 r. p. m.

The 1,500-kw. generator became one of the standards and was installed in nearly all of the larger stations built subsequent to 1893, and but few direct current generators of greater capacity have been built. We recall two large ones, one of 1,650 kw., built by the General Electric Co. for the Louisville Ry., and installed in 1899, and one of 2,700 kw. begun by the Waller Co. and completed by the Westinghouse company, for the Boston Elevated Ry., and installed

in 1899. Both of these units are direct connected to vertical engines.

For the reasons before mentioned, railway generators of greater capacity that have been designed are of the three-phase type. The Metropolitan and the Third Avenue stations were designed for 3,500kw. units, and the Manhattan Elevated station, for which contracts were let in 1899, and which is now approaching completion, will have eight units of 5,000 kw. each, generating current at 11,000 volts, so that step-up transformers will not be required. Among the large units supplying current for street railways should be mentioned the 5,000-h. p. generators at Niagara Falls, which station has furnished power for the Buffalo Ry. Co. for five years.

Belted generators of more than 150-kw. capacity are now seldom installed in railway plants, but there are a good many of them in the small plants recently built.

The Arnold system of power station construction is also one of the developments of the last ten years and has been used in the plants of the Ft. Dodge (Ia.) Light & Power Co. (1894), the Englewood & Chicago Electric Ry. (1895), and the Chicago & Milwaukee Electric Ry. (designed in 1897). In this system the generator armatures are mounted on hollow shafts supported in bearings and through the hollow shafts, but not touching them, extends an auxiliary shaft; the engines have shafts terminating in flanges by which they may be connected to the adjacent generator shafts or to the auxiliary shaft, which may be connected at its further end to another generator. At the station of the Chicago Electric Traction Co. (Englewood & Chicago) the arrangement is as follows, beginning at one end: One 250-h. p. engine, two 175-kw. generators, one 500-h. p. engine, two 175-kw. generators; one 250-h. p. engine. The center engine is normally direct connected to the two adjacent generators, and each of the end engines to the generator adjacent to it, the auxiliary shafts being idle. The center engine, being capable of carrying an overload of 50 per cent, may, through an auxiliary shaft, be connected to a third generator in case one of the smaller engines must be thrown out of service. Also by making the end engines strong enough to carry a 100 per cent overload the two small engines can drive the four generators should the center engine be disabled. By using the auxiliary shafts either or both generators may be driven by either of the engines between which they lie.

A late modification of the Arnold system dispenses with the quill shafts. The engines and generators have on each end of their shafts halves of magnetic clutches, the weight of the clutches being sufficient to make them serve as fly-wheels. The machines, being placed side by side, a generator may be driven from either of the engines between which it is placed. Normally, the equipment is run as a number of independent direct-connected units, but in case of accident to an engine, the generator need not be kept idle.

The changes in the general plan of power house buildings have been very few. Except in the case of some of the largest plants built where real estate was very costly, as the New York stations, the Union Loop station in Chicago, and a few others, which are double or triple-decked, the railway power station is a single story building. The boiler room floor is at about the street level, the boilers arranged at right angles to the wall separating the boiler room from the engine and generator room. The engines are located on a floor 10 or 12 ft. above that of the engine room, the cylinders next to the dividing wall so as to economize the steam piping, and the engine room basement is utilized for piping and condensers.

There is now less tendency to experiment with novel forms of boilers, and modern stations of large size have water-tube boilers of one of the standard types; in smaller stations cheap fuel may permit fire-tube boilers to be used.

A sensible increase in the working steam pressure has taken place in the last decade. The power plant of the West End road of Boston, previously mentioned, was designed for 160-lb. steam pressure, but this was with triple-expansion engines. The working boiler pressures in later stations have been as follows: Intramural road, World's Fair, 1893, 125 lb.; Metropolitan Elevated, Chicago, built in 1895, 125 lb.; California Ave. plant, Chicago Union Traction Co. (1895), 150 lb.; Western Ave. plant, Chicago Union Traction Co. (1895), 150 lb.; the Northwestern Elevated, Chicago (1900), 150 lb.; the new Metropolitan station in New York (1900), 200 lb.; the Third Avenue station, New York (1900), 200 lb. The increase in boiler pressures has resulted in improvements in valves, piping and accessories.



Ten years ago it was usually considered necessary that the high-pressure steam piping be in duplicate but experience has shown that this precaution is not necessary nor worth the excessive cost that it entails. The steam headers are now somewhat smaller in size than those installed a few years ago. Auxiliary headers are generally provided for supplying the auxiliary apparatus, leaving only the main engines to draw upon the large header.

Economizers are to be strongly recommended where the draft is sufficient to permit of the flue gases being cooled to the extent necessary to heat the feed water. In case natural draft is used and is barely sufficient for the work, economizers in connection with auxiliary mechanical draft will effect a saving of from 7 to 10 per cent of fuel in most cases. A number of railway power stations have been built wherein mechanical draft was relied upon to furnish all the draft, the stacks being only high enough to carry the gases above the neighboring buildings. The use of mechanical draft cannot yet be said to be the general practice, however, though it affords cheap and efficient method of regulating the rate of combustion in accordance with the load, and thus does away with the necessity of putting extra boilers in service.

Coal and ash handling machinery and mechanical stokers or improved grates or furnaces are recognized as a necessity if economy of operation is to be attained, and almost without exception the larger stations are so equipped.

The present tendency appears to be towards self-supporting steel stacks rather than brick.

Needless to say, power stations are located near an ample supply of condensing water if possible, and where this cannot be done, it has become nearly the universal practice to install cooling towers or tables, so that the engines may be operated condensing.

The practice in the matter of driving auxiliary apparatus is divided between steam engines and electric motors, with the leaning toward the former in smaller stations and the latter in larger ones. A very considerable advantage in using electric motors has been pointed out by Mr. B. J. Arnold; this is the absence of loss due to radiation from the steam pipes.

If we except the disappearance of the belts and countershafts, there is probably no change in the engine room of a modern station as compared with one of ten years ago, that is greater than

the switchboard has undergone. The following sentence is taken from a technical paper published in 1891 and describes "A Beautiful Electric Railway Switchboard," then recently installed in the power house of the Rochester (N. Y.) Railway Co.: "The upper portion of the switchboard is built of solid mahogany, and the workmanship of the pillars and cornices is of the most delicate character. The lower portion is made of marbleized slate, which takes a high ebony polish, and upon this slate are mounted the rheostats, dynamo protectors and heavy switches."

In 1893 we began to hear of switchboards with iron frames, and the General Electric Co. shortly thereafter brought out its standard slate or marble panels. After 1894 there developed the modern fire-proof switchboards, which are intended strictly for use; they are none the less pleasing for this reason, however.

The use of storage batteries in power stations is another feature where European practice has been in advance of our own. In 1893 there were but two power stations in this country where storage batteries were used to equalize the load, though there were numerous such installations in Europe. The two stations in the United States were the 53d St. station of the Edison Illuminating Co. of New York, and the Edison station at Germantown, Pa. A storage battery was being installed at the Central Edison station in Boston.

What is believed to be the first installation of a storage battery for regulating purposes in a railway station in this country was made at Easton, Pa., in 1896. In 1898 the South Side Elevated began operating by electricity and during the first year installed two storage batteries of 535 kw. h. capacity, one hour discharge rating, to care for the increasing load. The first long distance electric railway operated from steam plants to install storage batteries for regulating was the Chicago & Milwaukee road; although this station was designed in 1897, the batteries were not put in until the spring of 1899. Since then the Electric Storage Battery Co. has made a number of other installations of which that of the International Traction Co., at Buffalo, is perhaps the best known. It is probably not too much to say that the storage battery will be an essential feature of railway stations built in the future. The battery assists in carrying the peak load, acts as a regulator, and can furnish the whole output of the station during the "inverted peak."

## DEVELOPMENT OF THE MODERN RAILWAY GENERATOR.

(CONTRIBUTED)

The first link in the chain of electro-magnetic evolution may be said to have been formed by Arago's discovery in 1820 of the fact that a wire carrying a current of electricity exerted a magnetic effect upon iron filings placed near it, and the subsequent discovery by Arago and Ampere that this wire exerted a more powerful effect when wound into a helix.

In 1825 Sturgeon announced the discovery of the electro-magnet, which he made in much the same form as that which is familiar to us today, and from this date the new electro-magnetic science progressed rapidly. It was not until the early '30's, however, that practical electro-magnetic machines were built. Some of these early machines were designed to give out currents of electricity in return for mechanical energy expended upon them, while others gave an output of mechanical power when supplied with a current. By 1835 numerous forms of both types had made their appearance, though their essential identity seems to have dawned but slowly upon the scientists of that day.

It was not until 1858 that patents were asked for covering the use of the current generated by an electric machine to energize its own field magnets, and nine years later the principle of self-excitation was practically applied by the Siemens Brothers and by Wheatstone. Thus were made the first dynamo-electric machines, while the use of permanent magnets was by degrees abandoned.

It was now recognized that as thus constructed, motor and generator differed from each other in no essential particular.

From these early machines the modern railway generator has been gradually evolved, but so far as the railway industry per se is concerned, we do not need to carry our review farther back than 1870, in which year Siemens & Halske exhibited at Berlin an electric railway in practical operation.

It is true that small experimental carriages had been run by electro-magnetic apparatus at as early a date as 1835, but they were operated by primary cells, and were crude and of no commercial importance.

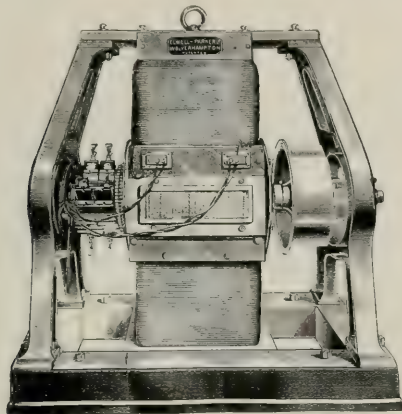
If, therefore, we accept the approximate date of 1879 as the inaugural year of dynamo-electric locomotive machinery, we see that our history of electric railway apparatus starts at a period when other forms of electric machinery had reached a considerable degree of development. Long prior to this date the electric arc light had been quite generally introduced in many parts of the world, and the demand for dynamo-electric apparatus thus created called forth many forms of electric lighting generators. These machines, by the time electric railway apparatus began to be seriously considered, had been brought onto a basis of sound mechanical design and had reached a fair degree of electrical efficiency. Thus it is that the railway generator as such dates properly from a period subsequent to the crude and early types of apparatus, and starts when the major part of the many problems involved had begun to be very generally understood and provided for.

It is singular the electric motor had been in operation for a number of years before the possibility of supplying it with current by means of a conducting wire from a generator placed at a distance seems to have been suspected. It was in 1873 that one of the French engineers at the Vienna Exhibition hit upon the expedient in an emergency when part of the machinery was out of order, of operating one electric machine as a motor, by means of a generator situated at a short distance, connection being established through a cable over a mile in length.

While the actual distance between machines was insignificant, this length of cable was used as a resistance to regulate the cur-

rent. The possibility of the transmission of electricity for power purposes to a distance thus seems to have been established in a purely accidental manner. The Siemens & Halske third-rail electric tramway line of six years later was the logical result.

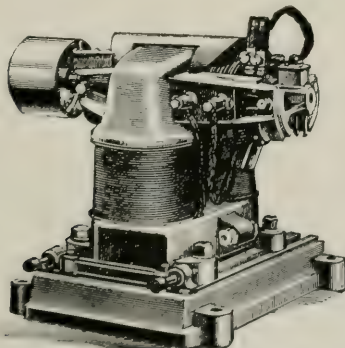
Since this road of 1879 the growth of electric traction systems has been so rapid that it would be difficult to find a parallel case in history. Other methods of traction for town and city lines had been and continued to be tried with varying success, but the first electric street lines of 1880-85 established the supremacy of



ELWELL PARKER BELTED DYNAMO OF 1890.  
Used on the Blackpool Electric Tramway. 180 amperes, 200 volts.

the electric generator so firmly that the gradual abandonment of other systems, whether horse, cable, steam or air, has been merely the natural outcome of the situation.

The railway generator, starting with the fairly developed forms of 1880, has undergone a process of growth in which, until recently, the changes have been rather of detail than of principle. The early machines were not required to supply a large output, and they were accordingly of small dimensions. To attain the requisite voltage with the old bipolar fields, two factors were essential:



SMALL LAWRENCE, PARIS & SCOTT DYNAMO—1890.  
Double horseshoe field magnets—Pacinotti ring armature.

The use of heavy armature windings and a high rate of revolution. To reach this high rate of revolution without prohibitory peripheral speeds, the armature diameter was usually small, and hence the armature windings were crowded.

The necessity of high speeds led, with the engines then in use, to belt driving, which was continued as the standard method up to within the last decade. The former consideration (the neces-

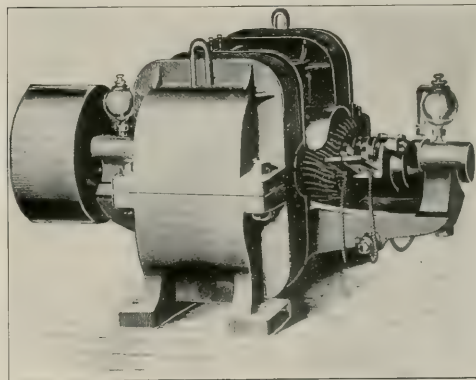
sary crowding of the armature windings) led to successive efforts at armature ventilation, in spite of which hot and easily burned-out armatures for many years constituted one of the larger difficulties in central station work.

These conditions also led to excessive iron and copper losses and consequently to low efficiencies. A generator of 1885-86-87 was considered good if it gave out in electric energy 50 per cent of the mechanical input. But such efficiency was, under existing conditions, satisfactory, just as much lower efficiencies are even today tolerated in factories operated by steam engines the power from which is transmitted through long systems of belts and shafting.

Bipolar and occasional four-pole machines were continued as the standard form up to about 1893. The older machines had armatures with surface coils, which were wound on by hand. The coils, being merely bound to the surface by layers of wire, rope or canvas, had very little strength to resist torsional strains. It was, moreover, difficult to secure insulation between coils and over the surface of the core, and good ventilation was impossible.

It was a distinct step in advance when the Westinghouse company placed the armature coils of its railway generators in partially closed slots on the periphery of the core. A tube of insulation was slipped over each conductor, giving perfect insulation, but not diminishing the difficulty of winding. In 1892 the company used bar windings, the bars being pushed through the core slots and soldered to end connections.

Strap-wound coils, prepared separately from the machine, and placed in open slots on the armature surface, were a further distinct



LARGE SIZE LAWRENCE, PARIS & SCOTT DYNAMO—1890.  
Double horseshoe field magnets of cast iron—Pacinotti drum armature.

advance. These coils were held in place by wedges, driven into grooves in the core. This gave perfect insulation, the coil as a whole being wound with insulating material; and the coil was furthermore well ventilated; also wires having a high potential difference were well separated. This is considered to give much better insulation than the so-called trough construction which gives short distances from core to coil at ends, while the upper and lower parts of the coils are not in separate wrappings of insulation, as is customary in the former method.

In 1894 the Westinghouse company also began to use bar windings in which a complete coil of forged copper bar, formed by machinery and wrapped with insulation, was laid in slots in the armature core and held by wedges.

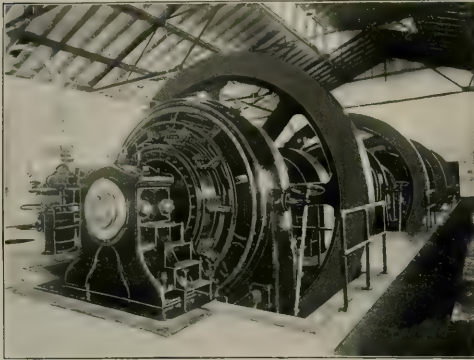
During the first decade of the electric railroads, we have seen that the problems involved in the supply of electric power were relatively simple. The generators were small, were driven by belting from engines of any existing type, and were designed to supply current to a very small number of cars. Thus the problems involved in meeting hours of heavy, congested traffic were as yet of little weight.

Precisely analogous conditions held in regard to railway motor work. The cars had relatively short runs and frequent stops.



Long, high speed, interurban lines and the greater power of subsequent motor equipments were to bring into the field difficulties as yet unknown.

To overcome the objections inseparable from overcrowded and overloaded armatures running at high speeds, several radical departures in design were resorted to, and at the World's Fair of 1893 the larger electric manufacturing companies showed machines in which, to a very great degree, the imperfections of the old belt driven type were overcome. One of these expedients was to spread the armature windings over a core of larger diameter, giv-



500-KW. DIRECT CURRENT WESTINGHOUSE GENERATOR—UNION TRACTION CO., PITTSBURG.

ing one or at most two layers of wire radially, and allowing ample interstices for air currents. Such an armature, running at a much lower rate of speed, could still give the requisite electro-motive force, (first) if it were run in a field of great magnetic intensity, and (second) if that field, instead of being bipolar, were made multipolar; so that a given armature coil, instead of receiving but one complete reversal per revolution, should receive double or quadruple that number, or even—as in the case of some of the more recent direct current machines—ten or twelve complete reversals per revolution.

Such a machine, running at a relatively low rate of revolution, was adapted for direct coupling to steam engines. Thus the armature, from a crowded, high-speeded and hot-running type, was gradually developed into a low speed, well-ventilated and cool-running type, capable of sustaining severe and prolonged overloads, mechanically sound, and not liable to breakdowns of insulation.

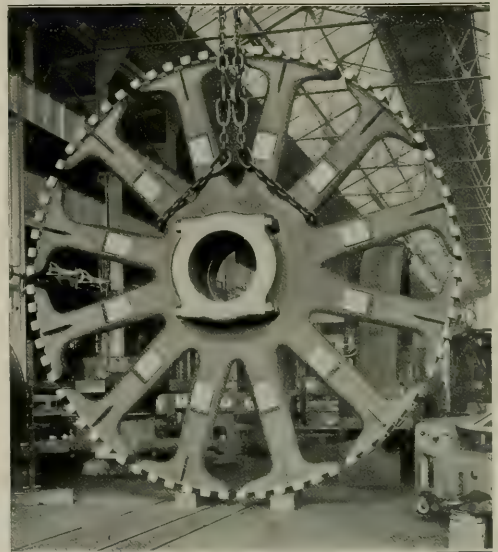
In addition to the necessity of securing adequate ventilation for the armature coils, there was a second consideration of scarcely less weight in developing the modern type of armature. As machines of larger capacity but small armature diameter were developed, difficulty was found in providing satisfactory commutation. While the commutator was of small diameter and with consequently narrow segments, these latter, in order to be given proper capacity, had to be made abnormally long. Even then, since the commutator was of small diameter, its ventilation was insufficient—its radiating capacity was small. Also in these bipolar machines all the armature current flowed from brush to brush through only two parallel circuits. The current in any given commutator segment was consequently very heavy. The obvious expedient was to use a field of four or more poles with an armature having accordingly two or more sets of brushes, all the sets being in parallel and the armature coils so wound as to carry the current in a corresponding number of parallel circuits. Thus the total output, distributed over numerous sections of the commutator circumference, gave less current intensity at a given commutator contact, and the commutator ran cool, this result being further advanced by the large radiating surfaces provided, and the facilities for interior ventilation afforded by the large diameter of the commutator.

Such engine-driven generators were exhibited at the World's Fair of 1893 by both the Westinghouse Electric and the General

Electric companies. It is not to be inferred, however, that at that time the direct connected generator had entirely superseded the belted type. Indeed, it has not done so up to the present time. But many of the essential features of the new engine-driven multipolar generators were incorporated in belt-driven machines of moderate size, and these continue in use today as recognized standards for small units. The Westinghouse and the General Electric companies, in fact, make them in sizes up to 500-kw. capacity. They are six-pole machines, with large, well-ventilated armatures, and the larger sizes rotate at the relative low speed (for belt-driven machines) of 320 r. p. m. The 100-kw. size rotates usually at about 650 r. p. m.

This Exposition (of 1893) made possible a careful comparison between belt and direct driven generators. The Westinghouse company exhibited a 400-kw. multipolar railway generator, and a similar 500-kw. machine, both driven by steam engines, the former belt-driven and the latter direct connected. This latter machine ran at 90 r. p. m. and was of massive construction. Both machines were at that time of noteworthy size, and in them were incorporated various new features, many of which have since become general standards.

The electrical design was such that the brushes required no change of position with variations of load; each brush was in a separate holder and could be separately removed; all brushes could be simultaneously adjusted, however, by a rocker arm, of rigid construction; the bearings were self-oiling, equipped with oil rings, and the shaft was automatically kept in alignment by ball-bearings. The armature core was built up of thin punched disks of special iron, pressed onto the shaft and keyed. Tubes of insulating material, through which the conductors were subsequently threaded, were pushed into grooves in the armature core. The windings, unlike the excessively complicated armature circuits of some of the early machines, were very simple, open, and well ventilated, especially over the end faces of the armature. No adjacent wires had a high potential difference, and the armature windings were not made up of a great number of turns between brushes, the necessary voltage being obtained by a strong magnetic field rather



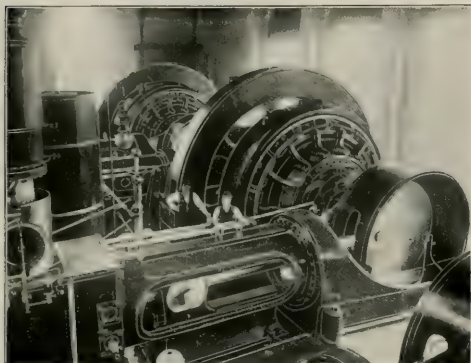
SPIDER CASTING FOR 2,700-KW. GENERAL ELECTRIC RAILWAY GENERATOR.

than by congesting the armature coils. This feature has ever since been typical of the best practice.

The relatively small amount of wire on the armature accounted for the freedom from sparking; the field was powerful enough to nullify the effect of armature cross-magnetism; and the commu-

tators were large and of very heavy design, built of the best copper and mica. There were no binding wires or bands on the armature, as the conductors were threaded through grooves punched in the armature core disks in accordance with the standard practice of that period. In this way a really well ventilated armature became possible.

The field was a circular yoke or ring of high grade cast iron. The inwardly projecting pole pieces were built up of sheet metal stampings of special composition, secured together by iron rods. These pole pieces were held in position in the mold while the fluid metal for the field was poured around them. In this way a good mechanical and magnetic joint was made. This practice is



1,500-KW. DIRECT CURRENT, DIRECT CONNECTED WESTINGHOUSE GENERATORS—SOUTH SIDE ELEVATED R. R., CHICAGO.

continued with modifications which still further increase the mechanical strength of the union.

The exciting coils were compound wound on metal bobbins; the windings, being placed side by side, could be separately repaired, and they had large radiating surfaces as compared with bipolar machines. The completed bobbin, wound on a special lathe, was slipped on over the pole piece and held by bolts.

This practice was subsequently modified. The coil, being surrounded on three sides by metal, required extra insulation, and it was furthermore difficult of construction. Ventilation was also difficult. Westinghouse coils are now wound without shells, and heavy insulation is applied only where it is required; that is, where the coil is in contact with metal parts. The coils, thoroughly protected from mechanical injury by rope, are now practically open to the air on all sides, and perfect ventilation is assured.

In the later field bobbins, furthermore, as in those at the World's Fair, the series and shunt coils are separately wound and insulated, with open air spaces between. In the seven years during which field coils so wound have been in use, we believe no case has arisen in which they have given trouble.

It is interesting to note that the improved methods of insulation developed by the Westinghouse company have been widely adopted by other companies as standard. It is also a notable fact that this company's standard railway apparatus of today has undergone fewer radical changes of design than that of other makers. Its original designs were correct and were put into use only after careful, rigorous preliminary experiment, so that relatively few changes have been called for, even up to the present day.

Further characteristics of the railway generators at the World's Fair were rigidity of field frames, secured by careful distribution of metal in the cast iron yoke or ring, and massive commutator construction, the commutator segments having a radial depth of four inches, and ample areas of contact between commutator segments. In addition to the Westinghouse exhibit, a direct-driven 45-kw. machine and several larger belt-driven machines were shown by the General Electric Company, while other exhibitors—whether of power or light apparatus—such as the Thompson-Houston, Fort Wayne and Mather companies, had on exhibit, we believe, mainly belt-driven apparatus. Siemen Bros. exhibited

their characteristic compact bipolar machines, direct connected to high-speed vertical tandem engines of a type that is widely used abroad.

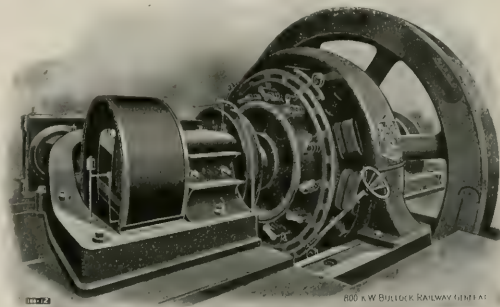
There is no sharp line of demarcation as to size between the direct driven and belted types of generator. As a general thing, one may say that the majority of railway generators of 200 kilowatt capacity and below that are now in use are belt driven, while practically all of 500 kilowatt capacity and upwards are direct connected. Between these limits of 200 and 500 kilowatts capacity, both types are in use, choice between the two being determined by a variety of conditions, such as the character of the existing engine plant, and the considerations of cost, floor space and individual preference. But the tendency is unmistakably towards the use of direct connected generators in all but the smaller sizes.

These changes in railway generator design followed as the result of changes in the conditions of street traffic. In 1885 Mr. Kapp states that there were approximately seven miles of electric road in operation in this country, controlled by three lines, which operated in all 13 cars. In 1886 the figures were 28 miles, five lines and 39 cars. In 1887 there were respectively 30 miles, seven lines and 81 cars. From these figures we see that the average number of cars operated by one company during these three years was only eight. The load thrown on the generators was not, therefore, great, and almost any type of generator and any method of generator driving sufficed.

In 1888 the figures had jumped to 130 miles of road, 33 lines and 265 cars. In 1889 there were 267 miles, 42 lines and 538 cars. Even here the average number of cars operated from a central station was not large, and was therefore well within the limits of satisfactory belt driving. Up to 1890, in fact, the 60-kw. machine was about the largest size of railway generator in general use. It was belt driven and ran at high speeds.

Since 1890, however, the conditions have changed so rapidly that today railway generators are built in sizes of 3,600 h. p. each, machines of this size being in use by the Boston Elevated Ry. The most generally used types (particularly of Westinghouse and General Electric apparatus) range from 500 to 1,500 kw., while a constant tendency toward the choice of the larger sizes is evident.

In these machines great care is given to the quality of iron and other materials used, and the distribution and amount of the various losses is accurately gaged. Cores are laminated; the pole pieces, also laminated, are ingeniously built up in the Westinghouse machines, some of the laminae being cut away at the polar horns, thus producing a magnetic saturation at those points which helps greatly in preventing the distortion of the field. This feat-



BULLOCK TYPE "T" 800-KW. GENERATOR AT ALEXANDRIA, EGYPT.

ure, controlled by patents, constitutes one of the important Westinghouse characteristics.

As a result of these and similar improvements of detail the modern generator gives practically its maximum efficiency at overloads, full load and down to and below half load. It is not uncommon now for a first-class railway generator to carry 75 per



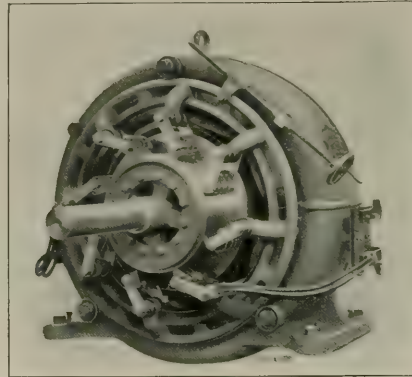
cent overload for short periods of time at high efficiency, while 50 per cent overloads are often carried for several hours continuously. Machines which can do this are of great value in reducing the initial cost of a street railway power plant which is called upon to meet daily periods of heavy traffic, but in which the average load through the day is relatively light.

Many of the early machines, prior to 1890 let us say, had no overload capacity, had even fair efficiency only at their precise rated power, and would not carry even that continuously. While these early machines rarely showed a better efficiency than 50 per cent, by 1891 improvements in design had brought the usual generator efficiency up to 80 per cent, while a little later on claims of as high as 95 per cent were made. This latter figure represents a degree of efficiency which in the nature of things can never be much exceeded. Compared to present steam efficiencies of 10 and 15 per cent, it is wonderfully high. Yet in the larger sizes of certain forms of generators an efficiency of 98 per cent has recently been reached. Of course this efficiency is somewhat lowered by the losses incident to transmission and use in motors, but the net efficiency of the system as a whole is now ordinarily very high.

Confusion occasionally arises as to the accepted names of modern railway apparatus. The so-called engine-type of power generator is not provided with shaft or bearings, the revolving armature being designed for mounting directly upon the engine shaft, and occasionally bolted to the flywheel; while the stationary field rests either upon the engine foundations or upon a separate base. The direct-driven type differs from the engine type mainly in the

built by the different companies. Thus the Westinghouse machines have a vertically divided field which rests on a guide plate, so that one-half of the field may be moved laterally away from the armature; the pole pieces are laminated and are cast solidly into the yoke. In the General Electric machines the field is not divided, the pole pieces are of solid metal bolted to the yoke and may be separately removed in a lateral direction. In the larger General Electric machines, however, laminated polar faces are used. In both makes of machines the fields are over-compounded, series and shunt coils are separately wound and may be removed for repairs if such should be necessary. Armature coils are wound separately of copper strip or forged copper bar, and are retained in the armature slots by wedges of wood or fiber.

In all these machines also the method of balancing the armature magnetically by means of equalizer rings, as previously referred to,



BULLOCK TYPE "I" 200-KW. GENERATOR.

is in use. The armatures run on self-oiling ball-bearings and have ample provision for ventilation both through armature windings and commutator.

The belt-driven types are now made ranging from 100 kw. to 500 kw., the smaller running at from 600 to 700 r. p. m. and the larger at from 300 to 350. They are usually six-pole machines, with circular cast steel yokes divided horizontally so that the top half may be removed for repairs, while the lower half and the two bearings are cast in one piece. The fundamental characteristics of the direct-driven and engine types are embodied in the belt-driven machines, which consequently show very high efficiency and running qualities. The armature circuits are balanced as in the larger machines, sparking is practically overcome, and the lead is constant. In the larger sizes the shaft is relieved from bending strains due to the pulley by the use of a third or outboard bearing. The machines are ironclad and there is little if any stray field.

Further modifications in the design and sizes of generators for railway service have been occasioned by the development of the perfected water turbine and its application to electric power stations. The United States and Switzerland have been especially prominent in this work.

As early as 1885 a short electric tramway was in practical operation in Great Britain, deriving its power from two Edison-Hopkinson generators driven by a 65-h. p. water wheel. Current at 250 volts, conveyed along a primitive "third rail," was here used on a tram line three miles long. There was, we believe, one car equipped with a 25-h. p. Edison-Hopkinson machine operating as a motor, and capable of a speed of fifteen miles per hour. This motor car hauled "trailers."

Such plants gradually multiplied and at the World's Fair of 1893 the Westinghouse company exhibited a 600-h. p. generator driven by a Pelton wheel. The enormous Westinghouse generators now in use at Snoqualmie, Niagara and elsewhere are the outgrowth of this phase of electrical engineering. Such generators, however, are not ordinarily direct-current machines, and



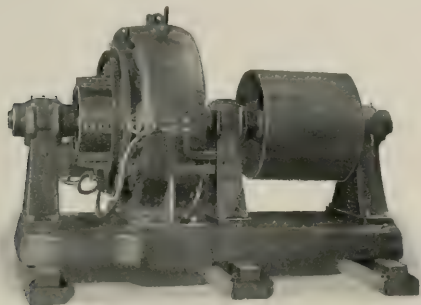
FIELD RING OF 1,800-KW. GENERAL ELECTRIC GENERATOR.

addition of shaft and bearings. It is built for use generally in connection with horizontal engines and the design of which as a rule necessitates the use of separate bed-plates and bearings. Both types are made by the leading manufacturing companies in sizes that range from 100 kw. up to 2,400 kw., and in exceptional cases 2,700 kw. They have from six to twenty-eight poles operating at speeds of from 275 r. p. m. in the smaller sizes to 75 in the larger units.

Many characteristic differences of design occur in the machines

do not come into the regular railway class of apparatus, although their output is commonly used for railway purposes.

The discussion of these types of apparatus is outside of our present limits, but this review would be incomplete without brief reference to them. Polyphase plants are in successful operation on both two and three-phase systems, at from 3,000 to 7,200 alternations per minute and with line pressures of from 3,500 to 15,000 volts. The generator, direct driven by either water turbine or steam engine, operates at either low or high voltage, an electro-motive force of as high as 10,000 volts having been used; but high voltages entail great difficulties in the matter of insulation and of general



200-KW. GENERATOR—TRIUMPH ELECTRIC CO.

design, and ordinarily the machines run at a relatively low voltage, which is raised by step-up transformers to the voltage used in the transmission lines.

The voltage of the direct current generator is of course limited by the allowable voltage on the trolley lines, and as this is usually fixed at a maximum of 500 volts, the usefulness of the railway generator is limited to transmission over areas which can be economically supplied at that voltage. Transmission by direct current for distances greater than about ten miles is ordinarily very wasteful, if not directly in current then in the cost of the heavy copper transmission lines employed. This difficulty is met with entire success by the alternating current system, introduced into this country by the Westinghouse company. The most conspicuous example is the familiar one at Niagara where eight 5,000-h. p. alternating current Westinghouse generators, driven by turbines, supply current to a wide variety of power service. Current from the generators is carried to step-up transformers, by which it

is raised to 11,000 volts. It is then transmitted to various distributing centers over two-phase and three-phase transmission systems. Over 2,000 h. p. of the output goes over a three-phase transmission line at 11,000 volts to Buffalo, 26 miles distant, where, by means of transformers and rotary converters, it is transformed into direct current at 550 volts and is used on the street railways.

Notable among the later applications of the alternating system to street railway service is the electrical equipment installed by the Westinghouse company last year at the Paris Exhibition. At the Molineux Station were installed nine three-phase generators of 800 kw. each, which are to be used ultimately by the electric system of the Western Railway of France. During the Exposition three-phase current of 5,000 volts was transmitted to the Exposition grounds and there lowered to 340 volts, at which it was led to rotary converters. These gave out direct current at 550 volts, and supplied power to the 120 5-h. p. motors of the moving sidewalk and the cars of the third-rail surface electric road.

These recent developments in polyphase apparatus for street railway work indicate that the railway generator, valuable as it is for local power stations, is likely to be very largely superseded by the more flexible polyphase system in all cases where power has to be transmitted over considerable distances. The two systems, direct and alternating, will in fact be likely to advance shoulder to shoulder. Where power is required over very large areas, or for a variety of purposes, the extreme flexibility and adaptability of the polyphase system is the governing factor, in making a choice. For power service over large municipal areas the two systems at present divide honors, with the polyphase method gaining the ascendancy over its rival; while for railway use within the limits of small cities and towns the direct current system leads. Whichever type ultimately predominates it is safe to say that the modern direct current railway generator is not likely to have an immediate successor in its own legitimate sphere of purely local service. It possesses practically the highest possible efficiency, is almost indestructible, and minor injuries may be more readily repaired than in the case of other forms of power apparatus. Relatively crude as the railway apparatus of ten years ago undoubtedly was, some of these pioneer machines are still in regular and satisfactory operation. Considering the great improvements embodied in the modern machines it is fair to suppose that these will show even better results in respect to long life. The modern generator is in fact a more standard form of machine than the majority of other forms of apparatus, more so perhaps than any other except a few prominent types of stationary engines.

The accompanying illustrations show how strong a contrast exists between the old and new system of electric power supply.

## THE MODERN HIGH PRESSURE VALVE.

BY JOHN B. BERRYMAN, MANAGER ENGINEERING DEPT., CRANE CO.

The conditions met with in large modern steam plants are entirely different from those encountered ten years ago. At the present time a working steam pressure of 150 to 175 lb. is the rule, while in the last decade it was the notable exception. Valves and fittings have of course been designed to sustain the tremendous stress incidental to the increased pressures and temperatures. These valves are the same in principle as those made for working pressures of 100 lb. per sq. in., in fact, there has not been a really new basic idea in valves for twenty-five years, but the weight of metal has been increased three times, the seats made stronger, the stems larger, the bronze mountings made of special composition to resist erosion and more care exercised in the workmanship. For a great many years the ordinary steam pressures ran from 80 to 100 lb. per sq. in., and all valves were designed for that service. These valves were known as "Standard." The demands of the present, however, have forced us to multiply our patterns and make a series of valves designed for different conditions. We now make:

Standard valves for steam pressures of 100 lb. or less, tested from 120 lb. to 200 lb.

Medium valves for steam pressures of 150 lb. or less, tested to 500 lb.

Extra heavy valves for steam pressures of 250 lb. or less, tested to 800 lb.

Hydraulic valves for water pressures of 800 lb. water or less, tested to 2,000 lb.

The weight of fittings has naturally increased with the increasing steam pressures. Ten years ago nearly every power plant was fitted with screwed fittings, standard weight, designed for 100 lb. working pressure. At present all large plants are put up with flanged fittings designated as standard (100 lb.), extra heavy (250 lb.) or hydraulic (500 lb. and upward.) The pipe flanges are also, in weight, design and method of attachment made to conform to modern rigid requirements.

It was formerly the custom to leave the question of pipe fitting almost entirely to the contractor. The greater part of the pipe was cut on the job, measurements being taken as the work progressed and the lines run according to the judgment of the person in charge. This answered fairly well while the units were small and steam pressures low, provided an intelligent contractor was employed, but except on very small plants the method is now obsolete. It is now recognized that upon the piping depends the life and to a great extent the economy of a plant. On all important work an expert mechanical engineer lays down the piping plans,



paying fully as much attention to the detail, as to any other part of the installation. All necessary measurements being marked upon the plans, the piping can be cut and flanged accurately in the shop ready for erection, the cutting labor on the job being confined to the small screwed lines smaller than 2 1-2 or 3 in.

In our shops especial attention is paid to this branch of the business, particularly toward turning out work which will go together without strain. It is well known that pipe, as it comes from the mill, is not absolutely straight and there is also a chance of the thread in the flange or upon the pipe not being perfectly true, it follows that two flanges when screwed on, may, or may not, be parallel. If they are not parallel, the piece when bolted up will

throw out of a straight line and if forced into place an undue strain will be thrown upon the flanges. To avoid this we originated the system of screwing the pipe through flush with the flange faces and refacing after the flanges are in place. This ensures parallel faces and makes a bearing upon the end of the pipe for the gasket. This method is the only one adapted to modern requirements. After refacing and testing under hydraulic pressure each piece of pipe is given a number corresponding to a similar number on the plan and the erecting engineer has only to hoist the different sections into their designated places and bolt together. This development is the practice of the ship or bridge builder applied to steam fitting.

## PROGRESS IN THE USE OF FUEL ECONOMIZERS IN STREET RAILWAY POWER STATIONS.

BY A. H. BLACKBURN, GENERAL MANAGER FUEL ECONOMIZER CO.

The engineers designing electrical power stations have realized from the first that it is most important to cut down the cost at the coal pile and one of the largest savings they can make has been in the utilization of waste heat leaving the boilers, by means of fuel economizers.

The first use of economizers in street railway power stations was in that of one of the first roads of any important city to move its cars electrically, namely, the West End Street Ry., of Boston. The machines first placed in the plant were imported from England, and the beneficial results were so marked and highly commended by all connected with the operation from the manager to the foreman, that in all its plants built since that time Green's economizers have been installed including the new Boston Elevated station.

The next large roads to install economizers were the Brooklyn City R. R., which equipped ten power plants in 1893, and the Union R. R., of Providence. Soon after economizer plants were put in at Springfield, Mass.; Newark, N. J.; Terre Haute, Ind.; Montreal, Philadelphia, Toronto, Detroit, Holyoke, Cincinnati, Columbus, New Orleans, Troy, N. Y.; Chicago, Milwaukee, Atlanta, Oakland, Cal., and other cities. The mammoth stations of the Manhattan and Third Avenue roads in New York are to be equipped with economizers. The first economizer to be installed in Chicago was

for the South Chicago City Railway Co. in 1893; later plants were for the Englewood & Chicago, the South Side Elevated, the Chicago & Milwaukee and the Metropolitan Elevated.

The coal economy of an economizer is not disputed, but for electric traction another very desirable feature of its use is the more regular steam pressure; it is to the boiler what the storage battery is to the generator, and uniformity of operation is a great factor of economy.

By taking advantage of the low water rate of the main engines and driving the auxiliary engines by electric motors, and utilizing the waste heat in the flue gases to heat the feed water in an economizer the greatest possible economy is obtained.

Ten years ago the economizer was opposed by many of the boiler manufacturers, but today all the leading manufacturers consider it as a very desirable adjunct to the economical working, saving of repairs and prolonging the life of their boilers. Apropos of the disfavor the economizer was met with at first, the story is told of a chief engineer who ordered the apparatus put out of service soon after its installation. The firemen, however, at once noticed a sudden increase in their work and complained of it. A comparison of coal records was then made and the economizers again put in service; they have been in use ever since at that plant.

## STORAGE BATTERIES.

BY FRANK H. CLARK, MGR. CHICAGO OFFICE, ELECTRIC STORAGE BATTERY CO.

During the past ten years there has been no remarkable development in storage battery design. As with the dynamo, however, there have been many improvements in detail of manufacture. These improvements, with perfected methods of installation, have brought the storage battery from an obscure and almost ignominious position to one of prominence and respect in electric engineering.

At the present time, one of the widest fields for storage battery application is in connection with electric railways. Considerably less than ten years ago the only place for a battery in connection with electric railways was supposed to be on the car to furnish energy for its propulsion. Today many of the largest electric railways operated by overhead, or underground trolleys, or third-rail systems, employ storage batteries of very large proportions as regulators, and incidentally to take a portion of the heavy peaks occurring during morning and evening traffic.

A regulating battery must be capable of charging and discharging at excessively high rates with but little change in voltage. Such a battery must have a highly developed plate surface, very low internal resistance, great uniformity of output in its various cells and structural strength. These requisites of a regulating battery, impossible in the lead-lead battery of a few years ago, have been secured by a judicious combination of the Faure and Plante principles, and in the introduction of an alloy for stiffening the plates without increasing their size or weight. By welding the plates together throughout the battery, instead of bolting or soldering them, the internal resistance has been reduced to a minimum, with greater durability of structure.

For batteries of any considerable proportions heavy wooden containing tanks, lined with sheet lead, are used. The individual

plates of the battery are uniformly separated by glass tubes suspended in hard rubber supports, and the entire element is supported on thick sheets of plate glass resting on the bottom of the tanks, thereby securing almost perfect insulation from the containing cell.

Improved methods of formation insuring greater uniformity of product, and the determination of proper specific gravity and purity of electrolyte to be used, have played no small part in bringing the modern storage battery to its high standard of excellence.

The experience gained in the care and operation of batteries in the past few years justifies the assertion that the inferior batteries of ten years ago could today be so operated as to greatly increase their efficiency and practically double their life.

## PROMINENT INVENTORS WHO HAVE DIED.

The passing decade did not close without taking from us some of the pillars in the Temple of Invention.

Charles J. Van Depoele, the father of the trolley and one of the most earnest workers in early electric traction, died at Chicago in April, 1892, from overwork.

Dr. E. W. Von Siemens, founder of the Siemens-Halske concern died in Berlin, in December, 1892.

John Stephenson, inventor and builder of the first street car, and a car builder during the remainder of his life, died July 31, 1893, at New Rochelle, N. Y., at the age of 84 years. He built his first car in 1831.

A. S. Hallidie, inventor of the cable system died in San Francisco, April 25, 1900, at the age of 73. He ran the first cable car, Aug. 1, 1873, and within 20 years 700 miles had been constructed.

# PROGRESS IN LEADING CITIES

## NEW YORK.

In the year of our Lord 1800 if a person wished to go from one end of Manhattan Island to the other, he traveled on the elevated road; if he desired to go only part way he rode on a horse car, and if he was in a hurry he walked. It is interesting to record that while the end of the century finds New York building a road that is to make "15 minutes to Harlem" a possibility, the problem 10 years ago was often how to get there the same day.

In 1890 the term New York City designated a municipality of 1,515,301 souls living on the island of Manhattan and a small strip of the mainland to the north. The railway system of the city comprised 275 miles of horse lines, operated by some 20 independent companies; and 100 miles of elevated steam dummy lines, operated by two separate companies. Many of the roads were substantially parallel lines, connected at frequent intervals by cross lines, and were in fact but divisions of one great system, although up to this time the idea of consolidating had not been suggested. The Manhattan Railway Co., however, the following year, started the ball rolling by absorbing the Suburban (Elevated) Rapid Transit Co., and thus putting all the elevated roads under one management. The surface companies were not long in catching the spirit, and on April 4, 1892, the Metropolitan Traction Co. was incorporated with the avowed object of controlling, through ownership of stock, various street railway properties in the city of New York. This was purely a stock ownership company, and was not to operate the roads it purchased. During 1892 and 1893 a partial or full interest was secured in 12 of the horse surface lines. It was then seen that by consolidating the various properties controlled many economies in operation and management could be introduced. Accordingly in November, 1893, the Metropolitan Street Railway Co. was organized, and in that and the following year, by merger and lease, began operating 112 miles of track, this being the entire street railway system in New York controlled by the Metropolitan Traction Co. In the spring of 1893 the first cable line in the city was opened on Broadway from the Battery to 59th St., a distance of 10 miles. In 1894 the Third Avenue Railroad Co. began operating its main line (28 miles of track) with the cable system, and it is of interest to note that this is probably the most expensively built piece of track in the world. The Railroad Commissioners' Report for 1896 giving the cost of road and equipment as \$995,000 per mile of road owned, or \$497,500 per mile of single track. In 1895 the Columbus, Ninth and Lexington Ave. division (about 15 miles of track) of the Metropolitan system were opened with cable traction. The following year saw the beginning of electric construction. The limitations of both horse and cable in a city with the population and commercial life of New York had become painfully evident, but as the city fathers had strenuously refused to permit the overhead trolley, it was hard to see how the situation was to be relieved. Compressed air, hot air and gas were tried, but these failed at that time to make any impression on the councilmen or to prove satisfactory to the stockholders. Finally as a last resort the conduit electric system was given a trial, and proving an entire success was accepted as the best solution of the difficulty. The work of converting the north and south trunk lines and the main cross-town lines to the conduit system was commenced in 1896, has been carried on with all possible rapidity and at the present writing is still in progress.

During this period of mechanical transformation the process of welding together the integral parts of the present united organization was going steadily on. Each year additional properties were purchased or leased, the final link being added on May 24, 1900, when the Metropolitan company acquired ownership of the Third Avenue Railroad Co., with its allied interests. In 1897 the Metropolitan Traction Co. having served the purpose for which it was created, was dissolved as a corporation, and was succeeded by the Metropolitan Street Railway Co., which now owns, controls or leases and operates the entire surface street railway system on the

island of Manhattan, and the lines of the Union Railway Co. in the borough of the Bronx. Not the least interesting phase of street railway development in New York is the fact that this \$52,000,000 "monopolistic" corporation has been organized, financed and placed in control with hardly a word of criticism or disapproval from public or press, and this perhaps is the greatest compliment that can be paid to the fairness, good judgment and integrity of the gentlemen who have guided its affairs.

The surface system comprises nearly 340 miles of track, divided roughly into 114 miles operated by horse power, 25 by cable and 200 by electricity; but this division will be altered materially within the next few months by the substitution of electricity for horse and cable on many of the lines. Two of the cross-town lines are at present operated by compressed air, a power which now gives promise of being a most valuable auxiliary. Electric power for the system is taken for the most part from a 50,000 h. p. station now nearing completion at 66th St.

In 1892 the surface lines in New York had total receipts of \$11,742,963; in 1900 the total passenger receipts of all lines aggregated practically \$19,000,000. In 1892 the elevated roads carried 56,000,000 passengers and reported gross receipts of \$2,824,000; in 1900 they carried 184,000,000 passengers and reported receipts of practically \$10,000,000. Contracts are pending or have been let for equipping all of the elevated roads for electrical operation.

The last year of the decade sees New York's underground rapid transit road actually commenced. The first rapid transit commission was appointed in 1875, and a complete history of this movement would include the names and actions of more public men, and the citation of more court decisions than probably any other single public enterprise of modern times. However, the last legal obstacle was removed in 1899, and on Jan. 16, 1900, contracts were awarded for building a 21-mile underground electric road running to Bronx Park on the east, and 135th St. on the west. The contractors promise that the main portion of the route will be in operation within three years.

The question of forming a Greater New York by consolidating New York, Brooklyn and several smaller contiguous cities and towns first took tangible shape in 1890, when the Legislature created the Commission of Municipal Consolidation Inquiry. After some delay, as the result of this Commission's report the question of consolidation was submitted to popular vote in 1894, and all the districts affected, with the exception of two or three small municipalities, declared in favor of the movement, although the vote was very close. After a two years' struggle in the Legislature, an "Act to Consolidate" was passed in 1896, and on Jan. 1, 1898, the greater city came into existence. The population, according to the 1900 census, is as follows: Boroughs of Manhattan and the Bronx, 2,050,600; Borough of Brooklyn, 1,166,582; Borough of Queens, 153,000; Borough of Richmond, 67,020; total, 3,437,202.

## BOROUGH OF BROOKLYN.

On June 30, 1892, there were in operation in the city of Brooklyn nine separate companies, operating 221 miles of horse surface lines, and two companies operating about 50 miles of elevated steam lines. In 1892 and 1893 contracts were awarded for equipping nearly all the surface roads in the city with the overhead trolley, and during these years the number of operating companies was reduced through mergers to five. For the next three years the work of consolidating went on by the organizing of stock ownership companies, and by purchase and lease, until in 1896 there were but practically two great independent systems—the Brooklyn Rapid Transit Co., controlling the Brooklyn Heights, the Brooklyn City, and the Brooklyn, Queens Co. & Suburban; and the Nassau Electric Railroad Co., controlling the Atlantic Avenue R. R., and the Brooklyn, Bath & West End. In 1899 the Brooklyn Rapid Transit



Co. became the owner of the entire surface and elevated railway system in the city by acquiring a controlling interest in the stock of the Nassau Electric Railroad Co., the Brooklyn Elevated Railroad Co. and the Kings County Elevated Railway Co. The system comprises 480 miles of track, 413 surface and 67 elevated. The entire surface mileage is operated by the overhead electric system, and the elevated roads have within the past few months been equipped with a third-rail electric system.

Late in 1897 the transportation companies of Brooklyn, both surface and elevated, applied to the trustees of the Brooklyn Bridge for permission to run their cars across the bridge to Manhattan.

## WASHINGTON.

BY D. S. CARLL, GENERAL MANAGER CAPITAL TRACTION CO.

One bright, crisp afternoon in the latter part of November, 1890, the writer arrived in the City of Washington, D. C., having been engaged under Daniel Bontecou, consulting engineer, for the installation of the cable system on the Pennsylvania Ave. and 14th St. lines of the Washington & Georgetown Railroad Co.

At this time its Seventh St. Division (about three miles of double track) was operated by cable, while the Eckington & Soldiers' Home Ry., and also the Georgetown & Tennytown Ry., were operated by the overhead trolley. The remainder of the 78 miles of single track street railway within the District of Columbia was operated by what have since been styled "hair motors." While speaking of them, it might be mentioned that even these motors moved at no snail's pace. Lying before the writer is one of the old time-cards, which shows that the distance (nearly six miles) from Georgetown to the Navy Yard gate was made in 50 minutes.

By a wise provision of Congress, overhead trolleys have been prohibited within what is known as the city limits of Washington. While this has been to the disadvantage of the street railway lines in some respects, and kept rapid transit back, it has led up to the installation of the best modern system of street railway operation in existence—the open conduit electric system.

As intimated, one of the two principal companies of Washington had in 1890 a cable line in operation, and by September, 1892, its entire system of 21.6 miles was operated by that method. The other principal company's lines had so many curves that it was not deemed suitable for a cable system; consequently, not being allowed to install overhead trolley, it experimented with storage batteries, to its sorrow. About that same time the Eckington & Soldiers' Home Ry. was also experimenting with storage battery cars on the G St. Division, but met with no more success than the Metropolitan company.

While these experiments were going on, the Brightwood Railway Co., had put down a short stretch of track, installed engines and compressors and was experimenting with the Judson pneumatic system, but in its report to Congress, dated Jan. 10, 1893, it said: "The company contracted with the Judson Pneumatic Street Railway Co. for a compressed air system and issued stock to the amount of \$48,500 in addition to the \$60,000 issued in part payment. The said system proved a failure." So under an amendment to the charter, granted by Congress July 26th previous, it proceeded to install the overhead trolley.

The Rock Creek Railway Co., under an Act of Congress, approved May 28, 1890, and extended Apr. 30, 1892, was authorized to construct a road from 18th and U Sts., N. W., along U St. and Florida Ave. to North Capitol St., but was forbidden to use the overhead trolley. The company was the first to take up the subject and put in operation, the open conduit electric system. It adopted the Love system from 18th St. and Florida Ave. to 7th St., W., a distance of about one mile. This was put in operation Mar. 4, 1893. On Sept. 22, 1895, this piece of road came under the management of the writer, and while it gave some trouble from frequent "grounds," was kept in successful operation until Apr. 11, 1899, when the tracks were turned over to the contractor for installing the General Electric open conduit electric system. While the Love system ran cars for 365 days in the year, it was far from perfect, in the writer's opinion.

I have already referred to the failure of storage battery cars on the Metropolitan Railroad Co's. line. It was not only competing

Receiving the necessary consent, they at once made the required alterations on the structure, and over 3,500 cars now cross the bridge daily, for which service no extra fare is collected. For this privilege the companies pay the sum of \$170,000 per annum, and in addition save the 300,000 persons who daily use the bridge, 2½ cents each, or over \$2,700,000 every year.

For the year 1892 the surface lines then in operation in Brooklyn reported aggregate receipts of \$6,012,314; the elevated lines reported \$2,824,555. In 1900 the Brooklyn Rapid Transit Co., owning the entire transportation system of the city, had gross receipts of \$11,768,550.

with horses against a first-class cable road but was also failing to carry out an Act of Congress, approved Aug. 6, 1890, and extended July 22, 1892, requiring it to do away with horse power. Congress passed an act, approved Aug. 2, 1894, authorizing the company to equip and operate its lines with an underground electric system.

In September, 1894, Mr. S. L. Phillips was chosen president of the company and he soon selected Mr. A. N. Connett, Mem. Am. Soc. C. E., as chief engineer. They together went thoroughly into the matter of conduit electric railways and soon made arrangements with the General Electric Co., to secure various patents controlled by it, and work was pushed so that in August, 1895, cars were run on the Ninth St. Division, and about one year later on the entire system.

The Columbia Railway Co. in the meantime, had adopted and installed the cable system. The cable system up to this time had given entire satisfaction and was very popular in Washington, but the electric conduit system with independent motive power for each car, worked so smoothly, doing away with the swaying motion from the cable and the rough starting of the cars, that the public soon began criticising the cable lines.

The cable companies watched and studied the electric system and were giving some thought to the proposition of changing, when on the night of Sept. 29, 1897, the power house of the Capital Traction Co. (formerly the Washington & Georgetown Railroad Co.), was entirely destroyed by fire. It was at once decided to install the electric system in the cable conduits, and work was promptly begun and pushed, even during the winter months, so that by Feb. 22, 1898, the 14th St. Division was operated to the Treasury Department, and on Apr. 20, 1898, the Pennsylvania Ave. and 14th St. lines were in full operation by conduit electric system. In the meantime the company had decided to install the same on its 7th St. Division, which was operated by cable. The operation of the cars was not interfered with during the installation, and on the night of May 25, 1898, the last grip car was pulled to the barn on the tail end of the cable and the next morning, without a hitch, the first electric cars were started over the division. The Columbia Railway Co. soon followed suit, yet Washington still had horse cars running through the heart of the city. The Anacostia & Potomac River Railroad Co., the Belt Railway Co. and the City & Suburban Railway Co. had not yet given them up. The City & Suburban Railway Co. soon followed in the use of the conduit electric railway, having done some experimenting with compressed air motors, without satisfactory results.

The Anacostia & Potomac River R. R., together with the Belt Ry. were financially in bad shape but in 1899 they were consolidated and soon came under the control of the Washington Traction & Electric Co., which had secured the control of all street railways within the District of Columbia, other than the Capital Traction Co. and the Washington, Alexandria & Mount Vernon Line. The Washington Traction & Electric Co., proceeded to equip these lines with the conduit electric system, and on May 27, 1900, started the last division, and the day previous, May 26th, the last horse car, for regular business, was run in Washington, so that today all cars within the city are operated by the open conduit electric system, and any car could run on any line, while the suburban lines are all operated by the overhead trolley, and a large number of the cars are so equipped that they can be run on either system.

There have been other systems experimented with in Wash-

mington, among them being the Wheelless system, and the Brown system of electric surface contact, but none of them have proved efficient and practicable.

Just a few remarks in closing, relative to the street railway business of the District of Columbia. In 1890 there were 78 miles of single track road, 400 cars, 1,718 horses, probably 10 or 12 motor cars. The passenger receipts for that year were about \$1,347,000.

## PHILADELPHIA.

BY JOHN B. PARSONS, PRESIDENT UNION TRACTION CO.

When the "Street Railway Review" made its initial bow, a decade ago, Philadelphia citizens were seemingly content with the existing method of street railway transportation. They lumbered over uneven rails, in stuffy old cars, drawn by horses, and upon one line at least by fractious, antiquated mules, that made the lives of drivers and passengers alike burdensome; with the probability of arriving at any desired point within any given time a matter of great uncertainty. Today the facilities are improved to a degree that no percentage of comparison can adequately explain.

Just about 10 years ago there was some agitation among progressive ones for some improved system, and a more rapid transit. Several elevated railway bills were passed, but none ever put into effect. The one that came nearest consummation was stopped by an injunction of the Supreme Court. The electric trolley system was proposed by the Philadelphia Traction Co., and after vigorous opposition, which took the shape of a monster town meeting, secured a franchise from the councils, in March, 1892, permitting the use of electric trolley cars. It failed to meet the approval of the mayor, but was finally passed over his veto. Within a few months thereafter, the Catharine and Bainbridge St. line was in operation, and the people gave hearty welcome to what they had been told would prove a modern Juggernaut. Rapidly company after company secured franchises, and within three years trolleys were universal in the city—even the old cable lines giving way to the improved method.

From cars of contracted dimensions, the change has been to handsomely constructed vehicles, nearly as commodious as the ordinary day coach of steam railroads. The change in street railway methods in Philadelphia within to years has simply been complete revolution. Nothing is done now as it was then. Originally the street railways were all separate corporations. The People's company was the first attempt at concentration of interests. It absorbed four lines. The Philadelphia Traction Co. was next to amalgamate a number of lines; then the Electric Traction Co. absorbed the rest with the exception of a single line. Later these three joined interests as the Union Traction Co., and in 1897 the Hestonville, Mantua & Fairmount company was added, putting the entire system of street railway traffic under one governing body. The result has been a vastly improved system that embraces every modern method known to railroading.

There are today 500 miles of rails that provide access to nearly every point within the 129½ square miles of the city's territory.

The population, according to census report, was 230,292 in 1890.

In 1900 the population is 278,718, an increase of 21 per cent, and there are about 170 miles of single track, over 1,000 cars, no horses, and the receipts from passengers will be about \$2,500,000, showing that the public appreciate good accommodations, and yet the increase in miles of track, cars and capital spent on the railways has been greater than the gain in passenger receipts.

There will be added within six months to additional miles, at an approximate cost of one million dollars. The new line is designed to afford a connection between Frankford, Germantown and Manayunk, rapidly growing manufacturing, business and residence sections. During 1900 there were carried in the 3,195 cars of the company, 292,327,924 passengers. Ten years ago the longest ride for a single fare was 7.6 miles. Today a run of 12¼ miles can be made for a nickel.

Material changes in track construction have taken place within the decade. Formerly 50-lb. rails were used, with light cast switches and frogs. Now 90-lb. girder rails are laid, with heavy manganese special work. In 1891 transfers were general at connecting points of roads controlled by the same company. An 8-cent exchange ticket is sold good north or south, east or west as the line runs, at the junctions of all lateral roads. By a system of trading tickets in vogue among daily riders they practically reduce their fare to four cents.

There were a few small repair shops to years ago. Now there are two large, thoroughly equipped repair shops, a rail shop, seven large power houses, two sub-power houses and five storage battery stations. There are 6,656 electric motors in use of 25, 30 and 50-h. p. The power station units aggregate 28,000 kw. All feed wires and cables are under ground with the exception of a few miles in the suburbs. The overhead trolley is used entirely. There are 7,222 employees. Drivers and conductors 10 years ago received \$2.00 for a day covering 15 to 18 hours. Under the new regime motormen and conductors receive \$2.18 for a uniform day of 12 hours.

The effect of the introduction of the trolley system has been very marked. Wherever a track extension has been made improvement immediately followed. There have been no difficult engineering problems to be met. The work has been simply of bridge and bank construction order. But one serious fire has occurred—the burning of a large power house which was destroyed nearly three years ago. It has been completely rebuilt, installed with the latest type of machinery and the capacity increased. Modern safety appliances have been adopted for the protection of passengers, employes and pedestrians, and all cars are vestibuled for the protection of the employees.

The officers of the company are: President, John B. Parsons; first vice-president, George D. Widener; second vice-president, Charles O. Kruger; and secretary and treasurer, R. B. Selridge.

## CINCINNATI.

BY H. M. MILLAR.

The development and progress of the passenger street omnibus, stage and street car service in Cincinnati is an interesting study. Along in the 50's the people were dependent upon stage coaches and omnibuses, the first omnibus line having been established in Cincinnati in 1850. The late Seneca W. Ely, in 1859, got the first franchise for the first street car lines built in the city. The first record of street railway legislation by the Cincinnati authorities shows that on July 1, 1859, a general ordinance prescribing the terms and conditions upon which street railroads were to be operated was passed. The rates of fare were originally, and are now, 5 cents each and ticket, 25 for \$1, 12 for .75, 6 for .40, and 3 for .25 cents. The rates were not increased when after extensions were made. The circuit length of the first established route was about five miles, and cars were run on a 5 minute schedule, 6, 10 and 15 minutes.

Now, there is one route known as the East End line, electric,

which with its extensions, is said to be the longest street railway circuit in operation in this country, and is possibly the longest street railway in the world. For a single cash fare of 5 cents and a transfer ticket, a passenger can travel 18 1-2 miles one way, or for 10 cents can make a round trip of 37 miles.

The street car passenger today gets five times as much accommodation as he had under the old time system. Up to Jan. 1, 1894, the Cincinnati Street Railway Co., together with the Kentucky lines, paid Cincinnati, for car licenses, \$104,302.77, and from the gross earnings at the rate of 2 1-2 per cent, the sum of \$316,355.16, or a total of \$420,657.93.

All the consolidated lines now are under a contract to pay 5 per cent, or an increase of 100 per cent on the gross earnings, and a car license of \$4 per lineal foot on all cars owned by them.

Ten years ago there were two lines where horses and mules were



employed, and two cable lines; now, all but one line is electric. There were about 450 cars used then, and now, 1,200; then there were about 85 miles of track, now, 200 miles. Ten years ago the longest ride for one fare was 5 miles; now, about 20. Then, a 42-lb. rail was used; now, 76-lb., 95-lb. and 106-lb. on different routes.

Ten years ago no transfers were given; now, there are transfers to and from all of the 38 lines. Old sheds then were used as stables and there were few car barns. Now, the buildings include immense and architecturally attractive power-houses on several of the routes, stone and brick car barns, receiver's stations, shelter stations, and club houses for conductors and motormen with baths, library, and gymnasiums.

Since 1896 the Roger's law, giving the company a 50-year franchise has been in force.

The company in 1891 had about 1,500 employees; now, the number is nearly 3,000; wages have increased since then about 12 per cent.

There has been but one serious fire during the past 10 years, and

that was the total destruction of the Avondale barn with a fire loss of about \$20,000.

The city is very proud of the street railway system, and under the extension grants has a more favorable contract with the company than any other city in the country, Baltimore excepted. The company claims to have the best uniform rates of fare, the largest urban electric line in the world, and the longest run for a 5-cent fare.

Besides the routes mentioned the connecting lines extend to many places in Ohio, Kentucky and Indiana. The officers of the Cincinnati Street Railway Co. are: John Kilgour, president and general manager; James A. Collins, secretary and assistant general manager; R. A. Dunlap, treasurer; William R. Avery, auditor; John Harris, superintendent; A. G. Starr, purchasing agent; H. C. Foscula, paymaster; Patrick Leen, superintendent car shops; C. S. Muscroft, M. D., surgeon; F. R. Weizenecker, track engineer; B. L. Kilgour, electrical engineer; H. C. Rolf, superintendent steam machinery.

## PITTSBURG.

BY C. E. LOCKE, JR.

There is probably no city in the country in which the growth of rapid transit lines, or to be more exact, the electric street railway systems, has been so marked within the past ten years as in Pittsburgh. The opening of the present decade saw the start of the present systems, although two years before the cable had been introduced, and just at the end of the year 1889, electric power came into use in Allegheny on the Pleasant Valley line.

The peculiar topography of the city had seemed to present insurmountable difficulties in the way of the operation of the electric cars, and those who had given the subject careful consideration, were of the opinion that like San Francisco, cable cars must be the main reliance for rapid transit in Pittsburgh. The growth of the electric lines in the past ten years has shown that the conclusions reached by those interested in the cable roads were erroneous. In every direction, extending for many miles out of the city, electric lines are in operation, and the steep grades which it was supposed could only be ascended by means of the cable or inclined planes, are climbed with perfect ease. All the lines operating in and about Pittsburgh at the present time use electricity as a motive power.

The present rapid transit systems of Pittsburgh and vicinity have been built up and developed since the beginning of 1890, so that a statement of the conditions at the present time will show what progress has been made in this direction during the past decade.

At the end of the year 1890, there were in Pittsburgh and Allegheny 89.78 miles of street railways or a total length of track of 130 miles, including sidings. Of this amount, 34.51 miles were operated by animal power, 20.3 miles by electricity, and 12.97 miles by cable. There were nine separate companies; the Pittsburgh Traction, Citizens' Traction, and Central Traction, all cable lines; the Second Avenue and Pleasant Valley, electric lines; and the Pittsburgh, Allegheny & Manchester, Pittsburgh & Birmingham, and the West End operated by animal power. In addition to this the Duquesne Traction Co. was in existence and most of the line had been constructed but was not in operation. The combined stock of these companies amounted to \$17,800,000, with bonds to the amount of \$6,800,000, making a total of \$24,600,000.

Although the Pleasant Valley company in Allegheny had begun the use of electricity two or three months before, the Second Avenue was the first electric line in the city proper. The operation of this line was begun early in the year 1890 with 10 cars and 10 miles of track, extending from the heart of the city to Glenwood, a distance of five miles. One-half of this line was laid with the 48-lb. Johnson rails, and the other half with the old style flat or strap rail. The cars were equipped with 15-h. p. double reduction T. H. motors, one motor to the car. The company had one power house situated about two miles from the city terminus of the road. It was equipped with three 60-kw. generators built by the Thomson-Houston company.

Following closely upon the successful operation of this line came the opening of the Duquesne Traction Co.'s lines with 28 miles of track. In 1892, the Pittsburgh, Allegheny & Manchester and the

Pittsburg & Birmingham changed from animal power to electricity, and the next eight years saw a remarkable development until at the present time there are electric railway connections between nearly every town in the county with even more extensive projects under contemplation that may be realized at an early date. The longest line now in operation is a belt branch of the United Traction Co., on which passengers can ride 30 miles without change of cars.

During the four years following 1892, the most important movements were in the direction of the consolidation of the lines. The Duquesne line was absorbed by the Pittsburgh Traction Co., and in 1896 the Consolidated Traction Co. was formed, which absorbed all the lines running to the eastern part of the city. Following this all the lines forming a part of the Consolidated were practically reconstructed and laid with 9-in. 100-lb. girder rails. A new power house of 12,000 h. p. capacity situated at 20th street and the Allegheny Valley R. R., was built, and supplies the power for the whole system known as the Consolidated. The next step toward consolidation was the absorption of the Second Avenue and all the lines in Allegheny by the United Traction Co., which was in turn purchased by the Philadelphia company last year. The United company, however, still maintains its organization.

The rapid transit systems of this city are now controlled by five companies, the Consolidated, the United, the Monongahela, the Pittsburgh & Birmingham, and the West End or Southern. The capital stock of these companies is about \$60,000,000 with bonds amounting to \$15,000,000 more, making a total of \$75,000,000.

The Consolidated Traction Co. has the largest system. It operates 126 miles of track, and owns 500 cars, inclusive of summer cars, of which about 250 are now in operation. The company employs 2,000 men.

The United Traction operates 127 miles of track with 322 cars, and employs 1,500 men. The cars are equipped with two No. 38 Westinghouse motors of 50 h. p. each. The company has two power houses; the equipment of which comprises six direct connected 600-kw. and one belted and two direct connected 300-kw. generators.

The officials of the company are: J. D. Callery, president; J. H. Reed, vice-president; Joseph F. Guffey, secretary; C. J. Braun, treasurer; and John Murphy, general superintendent.

The Monongahela Traction Co., which is the newest of the systems, operates 48 miles of track with 10 miles now under construction. The company owns 160 cars, each equipped with two 50-h. p. Westinghouse motors, and employs 350 men. All the power is developed at one plant, which is situated about the center of the line. This station has an engine capacity of 3,000-h. p. The officials of the company are: W. A. Mellon, president; A. W. Mellon, vice-president; R. B. Mellon, treasurer, and George L. Davidson, secretary and general manager.

The Pittsburgh & Birmingham has 17 miles of tracks, and operates 78 cars. On account of the low grades on this line, the cars are the heaviest operated in the city, the largest weighing 25,000 lb. The officers are: Henry Moore, president; Charles Wettingill, vice-

president; A. S. Petrie, secretary and treasurer; and Frank McCoy, superintendent.

The West End Traction Co., which has recently been absorbed by the Southern, a new corporation, operates about 112 miles of track with 175 cars. All the cars are equipped with the most improved electric motors, and are of the latest design.

For a comparison between the construction of the roads and the equipment used at the present time and in 1890, it is only necessary to note the differences as stated in the description of the Second Avenue line when the road was started, and that of the United Traction company, of which it is a part and which represents the other lines in a fairly accurate manner.

Perhaps the most important engineering feat connected with the development of these lines is the surmounting of the steep hills which surround the city on every side, and the developing of a motor to stand the strain of propelling the cars up such grades. The motor now in use has been perfected through much study, and has been found perfectly satisfactory.

The most important development that is promised in the near future in connection with the traction systems is the consolidation of all the lines within the county of Allegheny under the name of the Union Traction Co. The negotiations for this have been pending for some time, but have been delayed because of the suit against the Consolidated Traction Co. in regard to the ownership of a

large amount of its stock. This suit has just been amicably settled, and there is every reason to believe that the consolidation will become a fact within the next sixty days.

Another development in traction circles that will materialize at an early date is the forming of a company to operate a line between Pittsburg and Uniontown, 60 miles southeast. This line which will be formed by the merging of a number of small lines in this section of the state and the building of the connecting links will unite more than 100 towns in western Pennsylvania and will be extended to nearly every town of any considerable importance in the coke and coal regions. Already negotiations have progressed so far that there is no chance of a failure, and the public announcement of the plans of the new company will be made in a short time. The extension of the trolley roads has given a wonderful impetus to the opening of new territory for residence purposes. The wonderful growth in manufacturing in the Pittsburg district has attracted thousands of people for whom homes have been made possible by the enterprise exhibited in the construction of trolley roads, both urban and suburban.

Thus far, the transfer system has been kept in abeyance, and only on a few lines, including those of Allegheny, have transfers been granted. The public demand is growing in this direction, and it is not improbable that by the time the general consolidation is effected a complete system of transfers will be arranged.

### ST. LOUIS.

At the beginning of the year 1890 there were in St. Louis, a city of some 450,000 population, 20 independent roads, principally operated by horse power. In that year, however, the city began to take on a new life and, catching the spirit of change and improvement that was then beginning to be felt throughout the street railway world, the owners of the lines in St. Louis commenced preparations for converting their properties for mechanical traction. The first road to be changed was a narrow-gauge line running from St. Louis to Florissant, over what is now the route taken by the St. Louis & Suburban Ry. This was rebuilt as a cable road, but after two or three years the owners having become entangled in legal difficulties, the property was sold and converted into an overhead trolley road.

About 15 months later several of the St. Louis companies—afterward included in the National system—were purchased by a Chicago syndicate and their lines changed to either cable or electricity. The movement spread throughout the city rapidly, and within a few months plans were in progress for doing away with animal traction on every line in the city. In 1891 there were eight electric, six cable and seven horse roads. During the previous year the 17 leading companies had carried 68,105,561 passengers.

Since the early years of the decade the processes of extension, and conversion to more improved motive systems, have gone on rapidly, this work proceeding more and more systematically and satisfactorily as the various independent companies have been brought by purchase and merger under the management of a smaller number of executive officials.

As St. Louis was one of the pioneer cities to try electric traction, it has naturally been the ground for a large amount of experimental work, and several of the theories now accepted as fundamental principles were given their first practical demonstration on the St. Louis roads. Capt. Robert McCulloch, whose name is inseparably associated with the development of St. Louis and her transportation lines, assures us that, among other things, his company let the contract for the first slow-speed direct connected unit, with armature mounted on the engine shaft, for the first 60-ft. girder rail and for the first cast-welded joint in this country.

In a recent interview, Capt. McCulloch told in his characteristic way how some of these contracts were given. "Yes," said he, meditatively, "in 1892 we succeeded in getting a representative of the General Electric Co. to accept a contract for three 750-kw. direct connected machines, but when the agent turned the order into the

home office there was lots of trouble. The president of the company immediately called an emergency meeting of the directors to decide how they were going to build direct connected machines, and they went so far as to send one of their head men down to see if we wouldn't cancel the order. But we didn't see any reason why we should, and we told them to go ahead and erect the generators and we would share the responsibility. Those were the first direct connected machines ever installed here, and they worked well, too."

Asked how he happened to order 60-ft. rails, Capt. McCulloch continued: "That was an amusing incident. Mr. Coolidge of the Johnson Co. was in my office one day in 1894, and I ventured the remark, 'Coolidge, why don't you roll 60-ft. girder rails?' The longest length that had then been attempted was 32 ft., but he half-jokingly replied, 'Well, I guess we will.' I was at that time just ready to build 10 miles of new track and was very anxious to try longer rails, so I said: 'Will you sign an agreement right now to furnish us 10 miles of 60-ft. girder rails at a good price?' 'Yes,' Mr. Coolidge replied, and we drew up a contract then and there; and it was a good, strong one," added the captain with a twinkle in his eye.

"Mr. Coolidge took the agreement to Johnstown," continued Mr. McCulloch, "but in about a week he was back again and wanted to know 'if I wouldn't cancel that order.' 'Why, what is the matter?' I said. 'I am afraid it isn't possible to roll such long rails,' he replied. 'But go ahead and try,' I returned. 'But the railroads won't handle such lengths for you,' he said. 'I'll tend to that,' I answered. 'And you won't be able to handle them yourself, after you get them here,' he continued. 'I'll tend to that, too,' I returned. 'But you will have to wait until we get our new plant at Lorain ready,' he kept on. 'All right, I'll wait,' I said. He left the office with a dubious expression on his face, but in the course of several months the 60-ft. rails arrived, and are probably still in service."

The final result of the various combinations and mergers in St. Louis has been to reduce the number of operating companies to two; the St. Louis & Suburban, owning about 92 miles of track, and the St. Louis Transit Co., which on Sept. 1, 1899, began operating all other lines in the city, comprising 330 miles of track, all of which have either been changed or are now in process of change for overhead electric operation. The two companies carried during the year just closed approximately 120,000,000 passengers. The first street railway mail car, and the first street railway ambulance car were run on electric lines in St. Louis during the past ten years; funeral cars have also been used.

### CHICAGO.

In the directory of the street railways published in the first issue of the "Review," Chicago was credited with six operating companies. The Chicago City Ry., chartered in 1859, had 148

miles of track all operated by horse except 35¼ miles which were cable, and 1,048 cars; Mr. C. B. Holmes was president and superintendent of the company. The North Chicago Street R. R., suc-



cessor to the North Chicago City Ry., organized in 1850, had 50 miles of track, 15 of which were cable, and 400 cars. The West Chicago Street R. R., successor to the Chicago West Division Ry., organized in 1861, and lessee of the Chicago Passenger Ry., operated 150 miles of track, of which 18 were cable, and 1,150 cars. Mr. C. T. Yerkes was president of the North and West Side companies, he and his associates having become interested in the properties in 1886 and 1887. All of these lines were operated by horses except the mileage mentioned as cable. The other three companies in the city were operating electric roads. The Cicero & Proviso Street Ry. was chartered in 1889, and its first power house built in 1890. The Calumet Electric Street Ry. had three miles of track and three cars. The South Chicago City Ry. had 1½ miles of track and nine cars.

The Chicago City Ry. in 1892 decided to equip its cross-town lines for electric operation; its power house at Wabash Ave. and 52d St. was completed early in 1893, and the cross-town lines on 63d, 61st, 47th, and 35th Sts. were equipped in time to care for a large share of the World's Fair traffic. The Yerkes lines did not secure permission from the city to equip electrically until April, 1894. In the meantime numerous experiments had been carried out in the attempt to find a satisfactory substitute for the overhead trolley; the Love electric conduit and various steam and gas motors were given a trial.

By 1894 the Chicago City Ry. had 26 miles operated by electricity, the North Chicago 1¾ miles, the Cicero & Proviso 27 miles, the Calumet 53 miles and the South Chicago City 32 miles, while two new electric roads were in operation, the Chicago North Shore with 17 miles and the Chicago General Street Ry. with 11½ miles of track. Within 16 months of April, 1894, the Yerkes' interests had completed 210 miles of electric road.

In February, 1899, eight of the subsidiary companies organized by Mr. Yerkes were consolidated as the Chicago Consolidated Traction Co., the property of which was leased to the Chicago Union Traction Co. (itself a consolidation of the West Chicago and the North Chicago Street Railroad Cos. effected July 1, 1899), April, 1900.

The Englewood & Chicago Electric Railway Co. was incorporated Jan. 11, 1893, and control was soon acquired by the Electric Storage Battery Co., of Philadelphia, and accumulator cars were used. By reason of the sparsely settled territory through which the road ran, the road became insolvent, and after being operated by a receiver for nearly a year was reorganized as the Chicago Electric Traction Co. Operation by storage batteries proved mechanically successful, but it being desired to extend the system, the company was confronted with the alternative of

building several small power stations or changing the motive power. The latter course was chosen, and trolley wires were erected in 1900, thus bringing to an end the most thorough trial ever given storage battery traction in this country.

At the present time there are a few horse cars, or rather electric cars drawn by horses to be seen in the downtown district, where the overhead trolley is not yet permitted; the cables are being operated in the hope that municipal consent to a change in motive power can be obtained in a few years; compressed air cars are used as a night auxiliary on the North Side lines, and are giving excellent satisfaction; all else is the overhead trolley.

The surface lines in 1901 are as follows: Chicago City Ry., 169 miles electric, 34¾ miles cable, 1¾ miles horse; Chicago Union Traction (including the Consolidated Traction), 453¾ miles electric, 47½ miles cable, 6½ miles horse; Calumet Electric Street Ry., 90 miles; Chicago Electric Traction, 35 miles; South Chicago City Ry., 57½ miles; Chicago General Ry., 30 miles; Suburban R. R., 56 miles; total, 981¼ miles, of which 82¼ are cable and 8¼ horse.

In addition to these there should be included in the Chicago roads three interurban companies. The Chicago & Milwaukee Electric Ry., operating 27 miles between Evanston and Waukegan, Ill.; the prospect is that a through line between Milwaukee and Chicago will be in operation in a short time. The Joliet Railroad Co., of Joliet, Ill., is building extensions to connect with Chicago lines and give a 30-mile interurban. The Aurora, Wheaton & Chicago Electric Ry. is building a 32-mile line from Aurora, Ill., to Chicago.

The last ten years has also seen the development of the elevated railway system of the city. The South Side Elevated (then the Chicago & South Side Rapid Transit) was opened for regular traffic to 39th St., June 6, 1892, and the entire line, May 12, 1893. In 1897 the road was equipped for electricity and the first regular electric train operated May 15, 1898. Total track, 18.62 miles.

The Metropolitan West Side Elevated Railway (formerly Railroad Co.) opened its first branch for traffic May 6, 1895, and the last one August, 1896. Extensions have recently been decided upon. Total track, 37.28 miles.

The Lake Street Elevated R. R. was opened for traffic (with steam locomotives) Oct. 28, 1893; in 1895 the motive power was changed to electricity. Total track, 15 miles.

The Northwestern Elevated R. R. began running regular trains May 30, 1900, although the company had run 30 trains around the loop beginning Dec. 29, 1899. Total track, 25.45 miles.

The Union Elevated R. R. (downtown loop) was completed in 1897, and the three roads began using it in October of that year. Total track, 3.96 miles.

The total of the elevated roads is 100.31 miles.

## MINNEAPOLIS-ST. PAUL.

The largest electric railway system in 1891 was that of the Minneapolis-St. Paul lines on which no horse cars remained. Minneapolis had 120 miles electric, and St. Paul 75 electric and 15 cable. President Lowry had completed all arrangements in 1889 for an extensive cable system in Minneapolis, the power house was under roof and thousands of tons of iron yokes and slot rails were on the ground. He was one of the earliest to put his faith and money into the trolley, and his sagacity in making the radical change he did, is plain now, but considered very doubtful then. People knew what the cable was but none could then guarantee electrical equipment.

The Twin City Rapid Transit Co. was chartered in June 1891 to effect a consolidation of the two systems. During 1899 the Twin City company acquired the entire capital stock of the Minneapolis & St. Paul Suburban Ry. (the successor of the St. Paul & Suburban) which owned an electrically equipped line running from St. Paul to Stillwater; this line with 26 miles of track has since

July 1, 1899, been operated as a part of the Twin City system. The first interurban line between Minneapolis and St. Paul was operated by electricity in 1891; in 1898 a second interurban between these cities, passing the State Fair Grounds and the State Agricultural College, was completed. The last of the cable lines, that on Selby Ave., St. Paul, was changed for electricity in the same year, the Bronsdon counterweight cable system being installed on the hill as an auxiliary.

In 1900 the system comprised 250 miles of track with 800 cars. Gross receipts for the year 1899 were \$2,522,794, or over \$350,000 in excess of the receipts for the preceding year; in August, 1899, the first dividend on common stock was declared.

The plant of the St. Anthony Falls Water Power Co., Minneapolis, was put in operation in January and February, 1898, and now furnishes the greater part of the current for the entire Twin City system; small stations are operated in St. Paul, White Bear and Stillwater.

## DENVER.

BY JOHN A. BEELER, CHIEF CONSTRUCTING ENGINEER, THE DENVER CITY TRAMWAY CO.

The growth of trusts and combines, both "good and bad," is one of the distinguishing features of the decade closing the nineteenth century. This tendency to combination and consolidation has been well exemplified by the present Denver City Tramway Co.,

which embraces practically all the street railways of Denver and vicinity. By combination, great economy in the management was possible, in the saving of power, in preventing unjust competition, and in many other ways familiar to all.

If the advantages of consolidation simply benefited the company, some would class it among the "bad" trusts mentioned, but such is not the case in this instance. The public has been benefited by the universal transfer system now in force between all lines whereas ten years ago, transfers were issued to a very limited extent and only between the lines of the separate companies; now, all are included. Where formerly a five mile ride was possible for one fare, now 15 miles for 5 cents is to be had. Many other benefits are noted later on.

Ten years ago the lines now comprising the Denver City Tramway Co. were as follows: The Denver Tramway Co. operated 17.5 miles of cable and 35 miles of electric line; the Denver City Cable Railroad Co. operated about 24 miles of cable line, which was afterwards increased to some 30 miles of cable; the West End Street Railroad Co. and the Colfax Electric Railway Co. operated some 17 miles of electric railway. These, together with the lines of the Metropolitan Railway Co., a later organization, embracing 42 miles of electric railway, now constitute the lines of the Denver City Tramway Co.

The entire system is now operated by means of the overhead trolley; the lines of the City Cable Railway Co. being the last to be electrified, which work occurred during the year 1900. The 16th St. viaduct was reconstructed, new steel I-beams being placed under the rails the entire length of the structure, and the old flat rails being replaced with new 65-lb. steel. The Larimer St. viaduct was similarly reconstructed, as well as a number of bridges; all during the present year. The various systems have been connected by means of curves and switches in the down-town district at many different points, and a partial re-routing of the lines has taken place.

Wages have been increased since the consolidation of the lines, as follows: Trainmen, formerly paid 17½ to 22 cents per hour, now receive 18½ to 23½ cents per hour. Trainmen who have been in the employ of the company for a period of 10 years, or over, receive one uniform per annum from the company, gratis. Laborers, formerly 15 cents per hour, now 17½ cents. Trackmen, formerly 17½ cents, now 20 cents. Other labor in proportion. In any division, where a majority of the trainmen by vote desire it, each man is given one day off in eight. This rule is in force in all divisions, with one exception.

Additional changes that have occurred during the ten years past, may be enumerated as follows:

Large, well lighted, commodious, easy riding double truck combination cars have replaced the old style single truck motor and trailer, and the grip and trailer, cars.

All cars are now provided with fenders, vestibules, bicycle carriers, and electric heaters. On the new cars, G. E. 58 motors, rated at 37½ h. p., have replaced the old F20 Sprague and W. P. 30 motors of 10 and 15 h. p.

The track construction has advanced from the 30-lb. T-rail to the 65-lb. A. S. C. E. standard T-rail in suburban and unpaved streets, while the 48-lb. T-rail on chairs has given place to the

6-in 72-lb. T-rail now adopted for all the paved streets. As far as possible, a standard has been adopted in the construction of rolling stock and track. All the special track work, switches, mates, frogs, crossings, etc., are made by the company at a large saving both in first cost and in maintenance. The shop for the construction of special track work, is one of the most complete and best equipped in the West.

The population of the city has followed closely along the tramway lines. During the past 10 years the city limits have expanded from 17 to 51 square miles. This was due, very largely, to the influence of the transit system in spreading out the increasing population. The assessed valuation of the property along these lines has doubled, trebled, and in some places quadrupled, within a few years of their construction.

The policy of the company has been that the best is none too good for its patrons, and the patrons have responded. The Denver people love to ride on the cars; they have no affinity for long walks or short ones either. The cars are attractive, and run everywhere, so who can blame them?

If the home people cannot resist the temptation to ride, one will readily see that the tourist, for whom Denver is the Rocky Mountain Mecca, is easily beguiled; he puts in his days, and often his nights, whirling along the streets and avenues, viewing Denver's beautiful lawns and residences in the foreground, and scanning the various peaks of the snow-clad range in the distance.

Denver is also the home of many thousands who come to get the benefits of the altitude and the bracing atmosphere for throat, lung and various troubles. These people spend much of their time on the cars; it is a healthful and inexpensive mode of amusement and instruction, and incidentally a source of revenue to the company.

The company has 900 employees, and in 1900 carried 35,258,464 passengers, issued 8,234,910 transfers, operated a daily average of 114 of its 195 motor cars, making 6,257,118 motor car-miles on 143 miles of track. The combined capacity of power station units was 2,470 kw.

The officers and operating staff of the company are as follows: Rodney Curtis, president; Wm. N. Byers, vice-president; George E. Ross-Lewin, treasurer; Wm. G. Evans, secretary; A. M. Stevenson, general attorney; J. B. Hogarth, auditor; S. W. Cantril, superintendent; C. F. Musgrove, purchasing agent; John A. Beeler, constructing engineer; L. T. Durbin, surgeon; Sam C. Dorsey, claim agent; A. M. Ballou, chief electrician.

The company expects to make some decided betterments in track and construction work during the coming year.

One distinguishing feature, for a company as large as this one, is the total lack of all inharmonious in the various departments, and the general good feeling prevailing between the men and the officials. All departments and all employees seem to endeavor to work together for the mutual benefit of the company. There are no petty jealousies, but a general spirit of helpfulness, unity of purpose and good will prevails throughout.

## THE PACIFIC COAST.

BY H. S. ALLEN.

Great progress has been made during the past few years in the district west of the mountains. Already the Far West leads the world in long-distance transmission, while its street railways compare favorably with any in the east.

### SAN FRANCISCO

The Clay Street Railroad built in 1877 was the first cable road in the world. Favorable climatic conditions and the many hills to be traversed led to the general adoption here of this method of propulsion. Since the advent of electricity, with its economy in operation and maintenance, the trolley system has been used in all new construction, but has thus far replaced only a few miles of cable roads. The first electric road was opened in 1892.

The Market St. cable system was built in 1883. Ten years later the Market Street Railroad Co. absorbed 12 other companies and took in 104 miles of trolley, 28 miles of cable, 11 miles of beam and 9 miles of horse car track. The San Francisco & San Mateo

Railroad Co. has 30 miles of trolley and will build during next year 22 miles more, extending the system to San Mateo. It is now constructing a new power house. The Presidio & Ferries Railroad Co. contemplates reconstruction during next year, but has not determined whether to put in a modern cable or trolley system.

### OAKLAND.

Mr. W. F. Kelly, general manager of the Oakland Transit Co., says: "No city in the world of its population, has as many miles of street car tracks as Oakland. This is the more remarkable as the main systems are paralleled by steam lines, there being about 130 miles in the city and suburban routes." Their earnings are satisfactory and indicate the general prosperity of the people. The Oakland Transit Co. is now using oil for fuel, as it is more economical than coal. The Bay Counties Power Co. will within a few months supply this system with power transmitted 138 miles from the Yuba River.



## LONG DISTANCE TRANSMISSIONS.

Long distance transmission of electricity from sources of a continuous flow of water has resulted from the high price of fuel, until today California leads the world, both in the number of installations and the length of transmission lines. Through the courtesy of Mr. George P. Low, an authority on this subject, we append a list of street railway systems supplied by long distance transmission:

Tramway system of Victoria, transmitted 18 miles; Nelson, B. C., 40 miles; from Bonnington Falls Light & Power Co., Ltd., West Kootenay.

Seattle, 42 miles, and Tacoma, 35 miles; from Snoqualmie Falls & Power Co., Snoqualmie.

Portland, 14 miles; from Willamette Falls, Portland General Electric Co.

Sacramento, 22 miles from Folsom; Sacramento Electric Railway & Gas Co.

Santa Cruz, 20 miles; by Big Creek Power Co.

Redlands, Colton and Riverside, between 30 and 40 miles from Mill Creek; by Redlands Electric Light & Power Co.

Los Angeles, 23 miles; from Azusa, by San Gabriel Electric Co.

Los Angeles, 83 miles; from Santa Ana River, by Los Angeles Edison Co.

Butte, Mont., 24 miles; from Big Hole River, by Montana Power Co.

Helena, Mont., 20 miles; by Helena Light & Power Co.

Salt Lake City, 30 miles; from Ogden Canyon, by Pioneer Electric Co.

Salt Lake City, 36 miles; from Big Cottonwood River, by Big Cottonwood Power Co.

Salt Lake City, 30 miles; from Jordan Narrows, River Jordan, Salt Lake City Water & Power Co.

The palm in long distance transmission will go to the Standard Electric Co., which will have some 180 miles of lines, including branches; from Amador County to San Francisco a continuous line of 145 miles; branches to Oakland and San Jose will supply street car systems there and also power for other purposes. The magnitude of this enterprise indicates the great confidence its promoters have in the future of San Francisco.

## PORTLAND.

Along the line of development throughout the Pacific Northwest, the most noticeable is the growth of the street railway system. Within 10 years it has grown from a few miles of poor track, using bobtail cars drawn by horses, to its present size. In Oregon and Washington alone there are between 300 and 400 miles of electric railway with good rolling stock, most of which is fully up-to-date.

The electricity used by the Portland lines is generated by water

power at Oregon City, a distance of 16 miles. Branch lines out of Portland extend 7 or 8 miles, making the power transmission fully 23 or 24 miles.

It is considered by most people who think and look ahead that while the past 10 years has brought about great things in the street railway world, it is yet only in its infancy in so far as the Pacific Northwest is concerned. New fields are opening for settlers who are coming here by the thousands from all parts of the United States, towns and cities are building up in all directions, and the people are clamoring for street railway facilities. Extensions and improvements are being planned by some of the Portland roads for reaching many of the suburbs, which at present are not connected by any line. The Portland East Side R. R. has just been sold for \$499,449. The new company will reorganize and as soon as possible will send a man east to select new rolling stock and will put the road in the best possible shape, so that it will be one of the finest in the Northwest.

One hundred thousand dollars will be spent in improving the street railroad system in Everett, Wash. Five miles of new track will be built, also a new power house and considerable rolling stock purchased.

## LOS ANGELES.

In 1883 there were but three lines of street railways in Los Angeles operated by horse cars. One ran to Agricultural Park, on the south side of town, one to Boyle Heights, and the third to East Los Angeles. In 1887 a syndicate of Chicago capitalists looked over the field and constructed three cable lines. In 1889, trolley lines had been found so successful in the east, that Messrs. M. H. Sherman and E. P. Clark put in an electric system, paralleling the cable system, at an outlay of \$3,000,000. This condition existed up to 1895, when the two systems were consolidated.

On March 24, 1895, the Los Angeles Consolidated Railway Co. was formed, and by April, 1896, the entire system was in full operation under electric power with 12 lines and 74 miles of track.

In 1898 a syndicate was formed in San Francisco headed by C. P. Huntington, which purchased the entire system, and on Jan. 1, 1899, added the Los Angeles & Pasadena Ry., now known as the Pacific Electric Ry.

In 1900 was added the Mount Lowe Ry. The system now operates 94 miles of road in Los Angeles and 39 miles outside under the name of the Pacific Electric Ry., which runs to Pasadena, and also by three separate routes to Santa Monica. It has some 600 employees.

Of late years a competing company was formed, the Los Angeles Traction Co. This is now operating about 12 miles of road in Los Angeles and suburbs. Companies are now organizing to construct electric roads between Los Angeles and Monrovia, Los Angeles and Santa Ana, and Los Angeles and Whittier.

## IN THE SOUTH.

At the time of the breaking out of the Civil War there were more miles of steam railroad built and building in the South, than in the North. The street railway facilities while not advanced in the same proportion, had made a good beginning, and during the past decade have shown commendable activity. In all the larger cities electric traction is in successful operation. Atlanta, Birmingham, Augusta, Mobile, New Orleans, Houston, Dallas, Galveston, and Memphis—all these have equipped with modern appliances and among them may be found several large and interesting stations.

Augusta was among the first to use water power for generator driving, and until the disaster of a few months ago Austin had

an unlimited supply of water power.

The visitor from the North is pleasantly surprised at the excellence of service and the condition of tracks and cars. In the line of pleasure resorts some of the largest and best in the country are to be found here, notably at New Orleans and Birmingham. Not only have the existing physical conditions been almost completely changed during the past few years, but a gratifying number of extensions have been built, giving evidence of the steadily increasing population and business.

Interurbans are already finding a foothold in the South, and the number will increase as their ability to handle express and freight is realized.

## BOSTON.

Owing to the complete review of the Boston Elevated Ry. system, prepared by Mr. C. B. Fairchild and published in our issues for March, April and May, 1900, it is not necessary to give at this time an extended description of the development of Boston's transportation lines. Sufficient it is to say that no set of men deserve greater credit for bringing about the present wide adoption of electric power for traction purposes than the gentlemen forming

the management of the West End Street Railway Co., the predecessor of the Boston Elevated Railway Co., for it was through the foresight, faith and courage of H. M. Whitney, W. A. Bancroft, C. S. Sergeant, Samuel Little and others associated with them that the first practical demonstration of the application of electricity to the transportation conditions of a large and growing municipality was given.

The general consolidation of the street railways of Boston took place Nov. 11, 1887, when the West End Street Railway Co. was formed by the merger of five independent companies owning 224 miles of horse railways, this being the total street-railway system of the city. In 1889 the Boston Common Council passed an ordinance permitting the overhead trolley, and by 1890, 50 miles of horse lines had been re-equipped for electric operation.

During the year ending June 30, 1890, the West End company carried approximately 104,500,000 passengers.

Boston's Rapid Transit Commission, charged with the responsibility of relieving the traffic congestion in the business district of the city, was appointed in 1894, and on March 20th, of the following year, contracts for building the first section of the subway were let. On Sept. 1, 1897, the greater part of the subway was

opened to the public.

The Boston Elevated Railway Co. was incorporated in 1894 with powers to construct an elevated railway, lease the subway for 20 years, and lease and operate the lines of the West End company. On Oct. 1, 1897, the West End property was taken over and in 1899 the erection of the elevated structure was commenced, construction work being still in progress.

During the year just closed the Boston Elevated system carried approximately 192,000,000 revenue passengers. The total mileage comprises 338 miles of track, substantially all of which is operated by electric power. Boston has grown from a city of 448,477 population in 1890, to one of 560,892 in 1900, with a tributary population of over 1,200,000 living within the radius of "Metropolitan" Boston.

### THE STORY OF A STRIKE.

The following account of the inside workings of a street railway strike which occurred some years ago, is vouched for by the superintendent of the road, and is repeated here in the hope that there may be lessons in it for both employer and employee.

The road in question was under the management of men who had the reputation of being broad minded. Conductors and motormen were paid from 16 to 20 cents an hour and worked on the average 10 hours a day, rates comparing favorably with those paid in other cities, and the relations between managers and employes were harmonious.

The company learned with regret that a business agent had taken up his residence in the city with the object of organizing a union, as it was feared that an effort would be made to impair the pleasant relations that had previously existed; the management had confidence, however, that the men would not act hastily.

The business agent was able to convince about 10 per cent of the employes that their interests would be best served by organizing. The greatest secrecy was maintained concerning the whole matter and many of the men themselves did not know who the other members of the union were. They were given to understand, however, that practically every man on the system had applied for membership.

It was at this point that the railway company received offers of assistance from several of the men who voluntarily went to the superintendent and told him all they knew concerning the progress of the movement, and the company then decided to do some detective work on its own account.

The organization having been perfected a committee waited upon the superintendent and submitted the demands of the union. The chief demand was for "recognition of the union" which the company interpreted as giving the men power to dictate who should and who should not be employed to run the company's cars. The committee was shown every attention and courtesy and was assured that all reasonable demands would be given full consideration and wrongs righted where possible, but the company flatly refused to relinquish its right to be the sole judge of who should act as its servants. It was pointed out to the committee that the company and not the union is held responsible by the courts when accidents occur, and therefore must be free to hire and discharge as it sees fit the agents who are to operate its cars.

The company's answer was well received by some of the leaders, but disregarding the advice of cooler heads a strike was called to go into effect the following morning. That night the company discharged a number of the men that had been most active in organizing the association. This action came as a surprise to the men because they had been assured that it was beyond a possibility for the railway officials to know who had joined the union, and yet the company evidently had the names of the leaders at least.

The morning for the strike arrived but not a man left his car. Not discouraged however the business agent called another meeting, told the men that the company had decided to discharge every man on the road, and that they would now have to strike in self defense. Another strike was ordered for the following morning. The company again tried to prevent an outbreak by discharging more of the men but with only partial success. During that night word was passed around that practically every conductor and motorman in the city would refuse to take out his car in the morning. Morning came and just 10 per cent of the men declined to go

to work. This number was increased during the first hour until 30 per cent of the men were out. The other 70 per cent stood by the management and by afternoon all cars were running on schedule time and the strike was seen to have failed.

Then the business agent turned to his last resort and formed what was designated as the "Steel Ring." This was a secret organization of 12 members, none of whom knew who the other members were until called together in an out of the way place for the first and only meeting. Each member was required to take a solemn oath to prevent the operation of the company's cars, agreeing if necessary to use violence; nor was he to let the fear of destroying human life deter him from accomplishing the desired end.

The "Steel Ring" was organized as soon as the results of the attempted strike were evident, and the first meeting was scheduled for that night. An agent of the company was present at the rendezvous and before the men had reached their homes after adjournment, a complete report of the meeting with a list of those present was in the hands of the superintendent. This official was loath to bring the entire 12 members to justice but determined to defeat the object of the "Ring" by making an example of one member, an old conductor, who seemed to be the most violently disposed of them all. The facts having been laid before the chief of police, that official called at the house of the conductor referred to, it then being 2 o'clock in the morning. When the old man came down into his parlor the chief stepped up to him, laid a hand on his shoulder and looking him straight in the eye asked, "Henry, what are you doing in the Steel Ring?" The man was completely taken aback, broke down and confessed everything. The chief then warned him as follows: "Henry, I will not arrest you now but if there is a single bomb exploded in this city tomorrow you go to the penitentiary for 20 years." The conductor did not wait for daylight but lost no time in hunting up the other members and informing them that the game was up. The business agent left town by an early train and before noon of the same day, there were two-thirds of the strikers waiting in line at the company's office to apply for their old positions. As many of these as possible were taken back but many of them had to seek work elsewhere.

An amusing incident and yet in a way a most pathetic one closed this episode. A batch of former employes who had applied to be reinstated had been admitted to the superintendent's room and were being interviewed as to their connection with the union. "Well," remarked the superintendent, "were you boys members of the union?" "Oh no," was the reply, "we wouldn't have anything to do with the union. We just struck because we were forced to and were afraid to resist." "I am glad to hear that," replied the superintendent, stepping to the safe and returning with a bundle of papers, "but perhaps some of you can identify these signatures for me," and he handed to each of the men his own signed application for membership in the union. They could hardly believe their eyes, for these were the papers that the leaders of the movement had assured them could not be procured by any means in the world.

"If that business agent ever comes down here again, he will find this the warmest climate he ever struck," remarked one of the conductors as he passed down stairs.

The Grand Rapids (Mich.) Street Railway Co. has awarded an eastern manufacturing firm a contract for 10 summer cars of a special type, to be delivered in Grand Rapids by April 1st.



## Third-Rail Interurban of the Albany & Hudson Railway & Power Co.

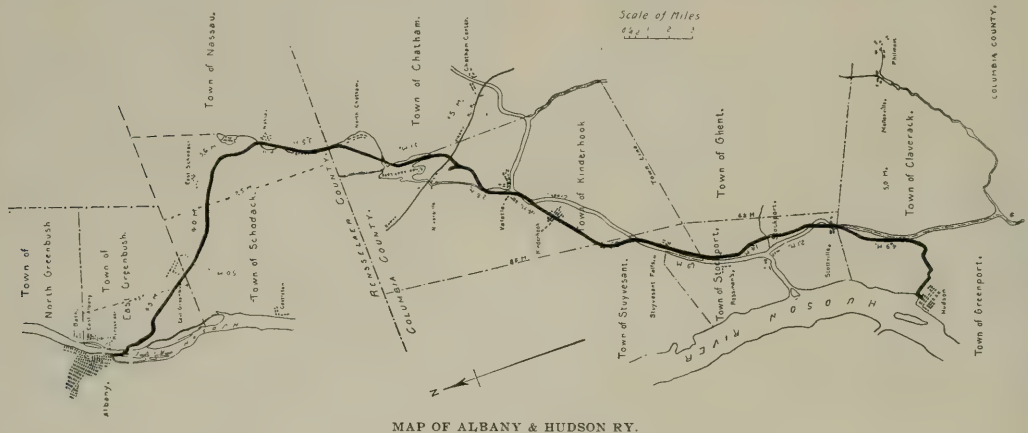
BY C. B. FAIRCHILD.

The most interesting electrical enterprise that has been developed during the year 1900, in this country at least, is that of the Albany & Hudson Railway & Power Co. The experience of the last five years in showing the possibilities of the electric interurban field has given this company a considerable advantage which is sure to enure to the stockholders. The railway was designed for passenger and freight service between Albany and Hudson, a distance of 36 miles. In order to permit high speeds with the greatest degree of safety, a private right of way for the interurban section of the line was secured and the third rail system of distribution was adopted as being best suited for the service. The franchise of the company includes the local lines in Hudson and a traffic agreement has been made for operation over the street railways of Albany, thus securing to the company the superior terminal facilities which, together with the frequent train service practicable with electric cars, have made the electric interurban so serious a competitor of the steam railroads. The interurban section has been built and is operated in all respects as a steam railroad would be, with the exception of the motive power. The cars, however, are fitted with trolley poles for use within the cities.

The functions of the operating company also include supplying

the Hudson Valley and the Catskill Mountains in the distance. The route continues east, passing East Greenbush and East Scho-dack, to Nassau, where it turns south and continues in a line nearly parallel to the Hudson River, but four or five miles east of the river, and traverses a most beautiful and prosperous farming country to within a few miles of Hudson, when it turns east and passes through the city coming back to the banks of the Hudson and near the depot of the New York Central & Hudson River R. R.

The region through which the road passes is known as semi-mountainous, and from the highest points superb views may be had of the Catskill Mountains to the west and the Berkshire Hills to the east. The farm products of the region are chiefly corn and wheat, but there are numerous dairy and grazing farms and here and there extensive truck farms, interspersed with apple orchards, vineyards and a few peach orchards. The line runs near the border of Kinderhook Lake, where a pleasure park is to be developed, and along Kinderhook Creek, from which the water power is derived, and also along Claverack Creek, giving a combination of unsurpassed rural scenery which by its beauty must attract many tourists in addition to the regular travel. The villages in order on the southern trip following those already named are



current for lighting and power purposes in the numerous manufacturing towns and villages on the line of the railway, and the plans adopted for distributing the current, which is all generated at a central water power plant are also of particular interest. The boldness of the design and the successful manner in which the difficult engineering problems have been met reflect great credit on the skill of the management and show that the financial faith of the promoters was not misplaced.

The Albany terminus is at the Post Office at the foot of State St., and thence the route is over the tracks of the United Traction Co., formerly the Albany Railway Co., south along the river to the bridge of the Albany & Greenbush Bridge Co., over this bridge, and then over local tracks for a few blocks to Rensselaer, where the third rail section begins. On leaving Rensselaer the cars ascend a gentle grade on an embankment which forms the approach to a steel viaduct 2,100 ft. long spanning the New York Central and the Boston & Albany tracks; this viaduct was built at a cost of \$125,000. Included in the viaduct is a 200-ft. span of deep steel lattice girder construction immediately over the tracks of the New York Central, and another of 150 ft. over those of the Boston & Albany. On leaving the viaduct the cars continue to ascend a hill from which for quite a distance the passenger has, by looking back, a fine view of the city of Albany, including the new Capitol, and also has an inspiring view to the right of

North Chatham, Niverville, Valatie, Kinderhook, Stuyvesant Falls, Rossman, Stockport, Stottville and finally the city of Hudson.

### POWER PLANT.

The development of the water power is a most interesting feature of the system, from an engineering standpoint. The power house, which is of brick, 82 x 142 ft., is located at the bottom near the mouth of a ravine just below the lower of the two Stuyvesant Falls in Kinderhook Creek, and below the village of the same name, which is 10 miles from Hudson. Here the water of the creek falls a distance of 105 ft., over two abrupt cascades, a few hundred feet apart, having an available flow sufficient to develop 2,500 h. p. The station, however, contains an auxiliary steam equipment to provide against any accident to the hydraulic plant or interference with water supply due to anchor ice. The water is taken from a dam at the Upper Fall and is carried a distance of about 3,000 ft. in a pair of steel penstocks each 7 ft. 6 in. in diameter; these are buried side by side in a channel dug for the purpose, part of the way in solid rock, along the top and at the side of the creek valley, making several bends and descending gradually at the lower end, where the channel turns to the right and terminates at the power house near which are two stand pipes of about the same diameter as the penstocks, and 104 ft. in height. The standpipes are also of steel and rest on a masonry foundation and communicate

with the penstocks by means of steel elbows, as shown in the illustration. The penstocks and standpipes and accessories were furnished by the Riter & Conley Manufacturing Co., of Pittsburg, and were so well made and erected that not a leak is detected in the entire length.

The power station contains three classes of generators in addition to the exciters. First, 12,000-volt, 25-cycle, three-phase machines for use in supplying the long distance transmission system both for railway and power sale purposes. Second, 2,200-volt, 60-cycle, single-phase machines for supplying the lighting service in Hudson and Rensselaer. Third, 600-volt, direct current machines for supplying the third rail at the points nearest the power station, thus avoiding the necessity of the use of rotary transformers in the power station.

The use of these three classes of machines is justified by the demands of the service. If it were attempted to make one class answer for both the power transmission and the lighting system, there would be nothing gained. The necessity for better regulation in the lighting system, than can be obtained on the railway transmission system, calls for the operation of independent units for railway transmission and lighting purposes. This being the case, it was decided best to install separate units, each adapted for its

Bierce & Smith-Vaile Co., of Dayton, O., and are regulated by governors made by the Lombard Water Wheel Governor Co. These governors obtain their operating pressure from the penstocks, and are without oil pumps.

All the electrical equipment was made by the General Electric Co.

The switchboard in the power station is arranged in two galleries, the space underneath the galleries being utilized for water wheels. In the lower gallery are the generator, line and feeder panels, which panels contain all instruments and operating levers. All of the high tension wiring and apparatus is in the upper gallery, the operating rods running from the levers on the panels on the lower gallery through the ceiling to the controlling devices in the upper gallery. This avoids the possibility of a switchboard attendant making contact with any of the high tension apparatus. All high tension switches are of the General Electric oil cell type. The 60-cycle 2,200-volt single-phase current is stepped up to either 11,000 or 22,000 volts and transmitted over the line to the sub-stations in Hudson and Rensselaer. For this purpose, there are duplicate No. 6 copper lines running to Hudson and to Rensselaer.

The sub-stations are located at Hudson, 8 miles south of the power station, and at North Chatham and East Greenbush, 11 and



POWER PLANT AT STUYVESANT FALLS

particular purpose. With this in view, the large, low frequency, three-phase units were selected as most suitable for the railway and power transmission service, and smaller, high frequency, single-phase units as most suitable for the lighting service. The direct current units are cheaper in first cost and in operation than would have been a sub-station in the power station.

There are three 750-kw. units of the first class, each connected to a pair of 33-in. turbines. Each of these pairs of turbines is rated at 1,590 h. p. and is capable of driving its generator to 50 per cent overload. The generators are guaranteed for short time overloads of this amount. These units run at 375 r. p. m.

There are two 250-kw. and one 125-kw. units of the second class, each connected to single 21-in. wheels. The wheels for the larger units are rated at 445 and for the smaller units at 225 h. p. and are intended to care for a 25 per cent overload on the generators. All of these units of the second class run at 600 r. p. m.

For supplying the third rail, there are two M. P. 200, 600-volt machines, connected to single 30-in. wheels of 435 h. p., adapted for driving the units at 50 per cent overload, and running at 450 r. p. m.

There are two exciters, each a M. P. 142-97, 600-volt machine. These are driven with single 12-in. wheels running at 975 r. p. m. All of the wheels are of the Victor type, made by the Stilwell-

23 miles, respectively, north of the power station. To the former sub-station run two No. 1 three phase lines. Running towards the north is a single three-phase line. This line is No. 00 to the North Chatham sub-station and No. 1 from North Chatham to the East Greenbush sub-station. There will eventually be a fourth sub-station at Rensselaer,  $3\frac{1}{2}$  miles north of East Greenbush. This sub-station will contain the apparatus for lighting distribution and for the transformation of current for power sale and will be connected with the East Greenbush sub-station by a No. 2 three phase line.

The Hudson sub-station in addition to the apparatus for lighting control contains two 200-kw. rotary converters with the necessary step down transformers and switchboard apparatus. Each of the North Chatham and the East Greenbush sub-stations contains one 200 and one 400-kw. rotary converter. All of these converters deliver direct current at 600 volts for feeding the third rail. The third rail forms the only direct current conductor between the sub-stations and is continuous from sub-station to sub-station. All of the converters operate in multiple on their direct current sides. The method of starting is to start the direct current machines in the Stuyvesant Falls power station, starting all of the rotaries by direct current obtained from the third rail.

The auxiliary boiler equipment consists of two 200 h. p. water



tube boilers of the Aultman & Taylor make. These are located in a wing of the power station. There is a brick chimney 125 ft. high. There are two engines; the larger is a vertical cross-compound condensing machine of 1,125 h. p. arranged to drive by means of belting the 750-kw. generator. This generator is also directly connected with one of the water wheels, a belt pulley being on an extension of the wheel shaft; the sections of the shaft are connected by jaw couplings. The second engine is of the same description, but of only 750 h. p.; this engine can drive by means of belts the two 250-kw. generators for lighting purposes, arrangements being made for driving these generators by either water or



STANDPIPES.

steam power. With both engines the Bulkley type of condenser is used. The engine and wheel room is spanned by a Shaw electric crane of 30,000 lb. capacity, manufactured at Muskegon, Mich.

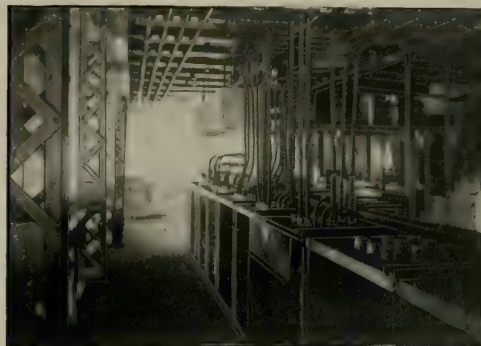
## TRANSMISSION LINE.

The transmission wires are supported along the side of the railway on 35-ft. chestnut poles, which are 8 in. at the top and are set 6 ft. in the ground. The various transmission lines erected have been mentioned in connection with the sub-stations. The 22,000-volt wires are carried on 6-in. porcelain insulators of the petticoat type, guaranteed to a pressure of 70,000 volts, and the 12,000-volt wires on 5-in. insulators of the same type tested to 50,000 volts; all of the insulators were made by the R. Thomas Sons Co., of East Liverpool, O. The single-phase wires are transposed every mile in opposite directions. The three-phase wires are given a one-third transposition every mile. The two single-phase wires are carried on a four pin arm at the top of the pole, being spaced 24 in. apart. The two three-phase lines are on a six pin arm, this being in the second gain, and are spaced 18 in. apart. The telephone wires for the line are 5 ft. below the third gain and consist of two No. 10 copper wires, transposed at each fourth pole, on Lock transposition glass insulators. Telephones are provided at each of the turnouts and 12 of them were furnished by the Couch & Seeley Co. Besides these, 21 ordinary telephones are used at the different stations and houses. The Couch & Seeley telephones are of the iron box type, and have four-bar magneto generators, with sufficient current output to ring a large number of instruments. An advantageous feature of the iron box type of telephone is the arrangement whereby closing the door automatically cuts the instrument out of circuit; thus the instruments along the lines are never in danger of being damaged by electric storms.

The sub-stations are located in brick buildings and in one instance the building is a combined passenger and power station.

At each sub-station are two bus-bars for the two kinds of current. The equipment includes rotary converters and static transformers cooled by electrically driven fans. The rotaries in all the stations aggregate 1,600 kw. in capacity.

The transmission rail is an 80-lb. T bonded through the base with two L-3 protected bonds at each joint; each bond has a section of 425,000 c. m., giving a total of 850,000 c. m. These bonds were furnished by the Mayer & Englund Co., of Philadelphia, and are attached to the base of the rail one on each side of the web, the holes being spaced 8 in. apart. The bond holes were punched



12,000-VOLT SWITCHES AND WIRING ON UPPER GALLERY.

by portable hydraulic punches and the bonds upset by the same means. The potential of the third rail is 600 volts. The track rails are also of 80-lb. section, except the turnouts. These are bonded with the type H-3 protected bonds placed under the fish plate; there are two bonds at each joint with an area of 844,000 c. m. as against 850,000 c. m. in the third rail bonds. For these the holes in the web were drilled, and the lugs upset by a screw press. The cross bonds consist of a heavy iron flat tie rod, having 8-in. bonds at each end to connect with the rail, this to avoid trouble from copper thieves. On side tracks a 56-lb. rail is used and the conductor rails are of only 35-lb. section, old rails having been used.

REAR OF 12,000-VOLT SWITCHBOARD  
Showing rods from switch levers to the oil switches on upper gallery.

At farm road crossings and highway crossings the third rail is omitted, and the sections connected by means of cables of 1,000,000 c. m. cross section. These are lead covered, paper and jute cables made by the General Electric Co. and the various crossings on the line required about 6,000 ft. of cable. At the farm road crossings the ends of the third rails are about 30 ft. apart, and the current is not shut off, as the cars are of sufficient length to bridge this space. At the highway crossings the motorman is required to turn back his controller. To prevent injury to the cables

by the expansion and contraction of the rails, the terminals of the cables are brought up through iron pipes about 18 in. outside the rail, and the connection is made by means of flexible bonds. The iron pipe is first lined with a porcelain tube, having a cap and on top of this is an inverted copper cup from which the bonds lead to the rail.

At all crossings and at the long bridges a notice is posted which reads: "This railroad is operated by an electric rail. Walking on track or other trespassing is forbidden." In each car there is also a cautionary notice: "Passengers must keep their seats until car comes to stop at station. Do not step upon or touch third rail."

The third rail is supported on blocks of treated wood resting on the ends of the ties which are 9 ft. 3 in. in length with malleable iron caps, after the practice recommended by the General Electric Co.

#### CAR HOUSES.

There are two car houses, one at Hudson and the other at Rensselaer, which are of about the same construction. The building at Rensselaer is of brick 286 x 65 ft., with a wing or adjoining building of 170 x 35 ft. The walls are 20 ft. in height and the roof is corrugated steel supported on steel truss construction made by the Berlin Iron Bridge Co. The car house proper contains five tracks laid with 56-lb. rails. The pits are located in the front end of the building and extend back 53 ft. under each track; they have cement walls, making them water tight. Over the pits the tracks are supported on deep steel girders. The wing portion of the building is designed for a machine shop and storeroom, the storeroom being at the rear of the machine shop. The machine tools are operated by an electric motor. At the rear end of this wing there is a second story 35 x 50 ft. which is approached by means of stairs opening outside the building, and which is designed for a reading room for the employees. This room is fitted up for the convenience of the men, and the equipment includes lockers, two closets, wash bowl and bath tub. The entire structure is steam heated. An office building, also of brick, two stories in height with ground dimensions 50 x 34 ft., stands some distance in front of the car house, and between it and the tracks of the road. The general manager's office and clerical offices are on the second floor, also the drafting room and stenographer's department. On the first floor are offices for the superintendent and dispatcher. There is also a lobby and a fireproof vault 9 x 9 ft., for the safe keeping of records and money.

Some distance to the right as one leaves the car barn is a freight house 28 x 80 ft., built of wood with side walls 16 ft. high, the roof being covered with tin. A siding from the approach to the car house leads to the freight house. A second freight house of similar construction is located at Hudson.

The cars which are used on this line were illustrated and described in detail in our October issue. The equipment consists of 10 summer cars, 5 of which have smoking compartments, 3 combined baggage and passenger, and 2 express cars. The summer cars are 53 ft. 6 in. long over all, and are mounted on Brill No. 27 extra heavy trucks and fitted with four G. E. 57 motors and K-14 controllers. The total weight is 57,728 lb., of which 27,763 lb. is in the body, 15,900 lb. in the trucks, 12,600 lb. in the electrical equipment, and 1,465 lb. in the air brake equipment. The winter cars are of the same general dimensions but have four G. E. 51 motors and L-4 controllers, giving 300 h. p. per car. They are also mounted on Brill No. 27 trucks. The cars were made by the Wason Manufacturing Co., of Springfield, Mass. They are all equipped with Christensen air brakes and motor compressors, the compressors being housed in under the floor. The minor equipment includes Perry ventilators, double Stanwood steps, Heywood Bros. & Wakefield Co. seats, Dornier & Dutton track scrapers.

The ordinary maximum speed of the cars is 51 miles an hour, and on some sections it is expected that they will make 60 miles. The schedule time between Albany and Hudson is one hour and a half, but the cars stop only at regular stations the same as on steam railways; at the stations are ticket agents and baggage rooms. The cars are run on written orders.

*The line from Albany to Hudson is 50 miles.*

The company has ordered two 47-ton electric locomotives from the General Electric Co., and these will be used to handle the heavy freight traffic, it being the intention of the company to haul ordinary freight cars over the electric line and transfer them to

steam roads at the terminals and at Niverville. The freight service is designed for the transportation of farm products, and raw materials and finished products to and from the numerous manufacturing establishments located at the different villages along the line.

The officers and operating staff of the company are: President, Charles H. Werner; secretary, L. B. Grant; treasurer, A. M. Young; purchasing agent, M. J. Warner; cashier, Charles M. Hem-inway, all of whom have headquarters at the New York office, No. 100 Broadway, and general manager, Maurice Hoopes; superintendent, M. E. Stark; general freight and passenger agent, Thomas Cochran, jr., auditor, A. P. Deeds, with headquarters at the general offices located in Rensselaer. Ernest Gonzenbach, electrical engineer, is located at Hudson.

#### TRANSMITTING POWER CURRENT 153 MILES.

Two months ago we noted that the Snoqualmie Falls Power Co. had connected its transmission lines from Snoqualmie Falls to Seattle and Tacoma in series, thus obtaining a transmission circuit 153 miles long, and conducted some interesting experiments. The circuit was composed of 58 miles of aluminum wire with an area of 69,696 c. m., 4 miles of No. 1 B. & S. medium hard copper, 51 miles of aluminum wire of 54,756 c. m. area, 36 2-3 miles No. 2 B. & S. aluminum cable, 1 2-3 miles No. 2 B. & S. medium hard-drawn copper, and 1 2-3 miles No. 0 medium hard-drawn copper. The generator and motor were 1,500-kw. three-phase Westinghouse machines.

With the incoming end of the line open, the current to charge the line varied with the voltage, (the alternations being constant at 7,200) being 62-kw. at a line pressure of 22,500 volts, 112-kw. at 30,000 volts, and 180-kw. at 35,000 volts. With lowering transformers cut in, the secondaries being open, the charging current was 76-kw. at 22,500 volts and 123-kw. at 30,000 volts. The charging current also varied with the frequency; the voltage being constant at 30,000, then it took 100 kw. to charge the line at 6,000 alternations, 105 kw. at 6,600, and 115 kw. at 7,800 alternations. With charging current only on the line the pressure at the incoming end of the line was 2,100 volts greater than at the out-going end.

With a non-inductive load, a water-rheostat, at the end of the 153 mile circuit the line voltage out was 33,000 and the drop 8,000 volts; the current per phase at 1,000 volts out was 624 amperes, and 554 incoming; the total generator output was 1,100 kw. and that delivered to the rheostat 723 kw., a loss of 34.2 per cent.

On connecting a second generator to operate as a synchronous motor at the end of the long circuit no difficulty was experienced in synchronizing the machines, but they soon began pumping and were separated. Approximate data for this test are: Outgoing voltage, 26,700 to 27,600; incoming voltage, 24,000 to 26,700; current per phase at 1,000 volts out, 900 amperes; incoming, 650 amperes; output of generator, 432 kw.; input at motor, 374 kw.; loss, 13 1-2 per cent.

With the motor and water rheostat in multiple the operation of the motor was much improved.

#### PROTECTING GRADE CROSSINGS IN INDIANA.

Press reports state that Judge McMasters of the Marion Superior Court (Indianapolis) has held the Indiana grade crossing law to be unconstitutional because it imposes greater burdens on electric than on steam railroads. The law in question was published in the "Review" for February, 1898, page 88, and the section referred to reads:

"In case, however, one railroad company or an electric railroad company, shall hereafter cross at grade with its track or tracks, the track or tracks of another railroad, the railroad company or the electric railroad company seeking to cross at grade shall be compelled to interlock such crossings" to the satisfaction of the auditor of state and pay all cost of installing and maintaining the apparatus. The court held that this requires an electric road crossing a steam road to interlock, but imposes no such duty on a steam road crossing an electric road. The suit was brought by the Pennsylvania road to compel the Indianapolis, Greenwood & Franklin company to install interlocking apparatus. The Superior Court so far as this case is concerned has the same jurisdiction as the Circuit Court would have.



## Development of Street Railways in Canada.

BY W. G. ROSS.

Mr. W. G. Ross was born in Montreal, Aug. 6, 1863. For over 21 years he has been an accountant and auditor, having been associated with his father in that capacity as early as 1880. In the '80's he was successively secretary, treasurer, and assistant manager of the Windsor Hotel Co. In 1892 he became comptroller of the Montreal Street Railway Co. for several years and now occupies that position. He was one of those who attended the organization meeting of the Street Railway Accountants' Association of America in 1897, and was chosen a member of the executive committee; in 1899 he was elected second vice-president of the association.

In view of considerable climatic difficulties, the development of electric street railways in Canada has points of special interest, among which are:

1. The early start and rapid progress.
2. Invincibility to weather.
3. Liberal fares and universal free transfer.
4. Remarkable popular and financial success.

Canadian street railways were among the first roads on the American continent to change from horse to electric traction, and the progressive development of the electric street railways in Canada has been nowhere surpassed in the world; this notwithstanding the exceptional conditions offered in most cities by the severe and prolonged winter. The enterprise and courage required to face the first experiment of a trolley system in Canada were no ordinary qualities. There was a theory, so Canadians have heard tell, in vogue once among some of our neighbors south of line 45, that Canadians were slow. If the theory exists and has reason, the introduction and spread of electric street railways presents an exception to the rule. The Canadian grasp of the electric idea was early, quick and strong, despite uncertainties and difficulties



W. G. ROSS.

which are not easily appreciated save to those who know the winter conditions in a majority of cities on the northern side of the line.

### A Serious Problem.

What the first electric railway promoters in Canada had to face was a problem, popularly considered insolvable, of moving the winter snowfall bodily from the streets as fast as it came. The public laughed at the idea. Investors shied at it. Consider what snow is in most Canadian cities. The average annual fall in many is ten feet on the level or for the streets probably twice or three times that depth, as each street receives finally the snowfall of a large adjoining area. In the month of March, 1900, alone, there fell over four feet on the level in Montreal. To this add severe grades and streets sometimes not any too wide—what a prospect for capital!

### No Timidity.

Notwithstanding this outlook, Canada as already said was in the electric race from almost the first. The first electric railway in America was started, I think, in Richmond, Va., late in 1888. Ottawa, the capital of the Dominion, ran the first electric car in Canada in June, 1891. The following year saw a general change from horse to electric traction. Hamilton began in June, 1892. Toronto on Aug. 17, 1892; Montreal on Sept. 21, 1892, and Winnipeg in the same month. St. John, N. B., started April 6, 1893; Halifax, Feb. 13, 1896, and the ancient city of Quebec on July 3, 1897, running a close race with the comparatively new and progressive coast city of Vancouver.

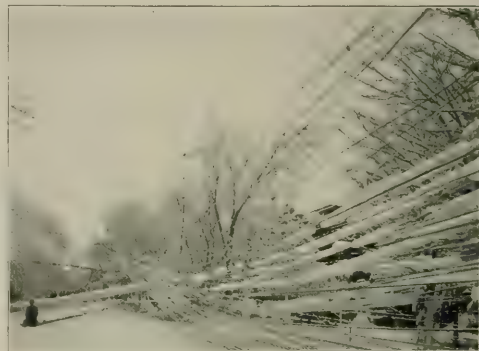
### The Old Style.

Perhaps the very climatic difficulties had much to do with the great financial success and the rapid spread of the electric systems, as nowhere (with the exception of Toronto, where climatic conditions are not so severe as in most cities in the Dominion) did the street railways under the old horse traction afford the traveling public as poor accommodation as in Canada. Use of the cars, sleighs or busses was then confined to the unfortunates who trav-

eled on them only in cases of necessity, especially in winter. The circumstances may be glanced at profitably, perhaps. Horse power could not keep a street car track clear of snow and ice during winter in most Canadian cities, and no attempt was made to do it. Two sets of street railway equipment were thus required in the horse days—horse cars and busses for summer, sleighs for winter. The expense and trouble of this were not the deadly considerations. The winter upset all possibility of cleanliness and comfort; to keep people's feet warm, straw was loaded into the bottom of the cars, where no possible amount of renewal could keep it clean or decent; there it would lie, unkempt and unsightly, dirty and unsanitary, particularly on wet days, contributing dubious odors to the atmosphere of the cars. Such conditions did not tend to make street railway service popular. A street car in winter was decidedly not a drawing card. As the horse car service was in part repellant, so was it slow, and being repellant and slow, it was unpopular, paid poorly, and like other poorly paying things, was half-hearted in every respect and correspondingly ineffective. There came a magic change with electricity.

### The Magicians.

The advent of the electric cars was a transformation indeed. The slow dirty busses or sleighs, disease-breeding vehicles, confined to the condensed portion of the towns, running at intervals anywhere from fifteen minutes to half an hour, were replaced by something infinitely better. People jumped to patronize the improvement, which in turn responded to the patronage, and now are



EFFECT OF A STORM AT HAMILTON, ONT.

seen magnificently appointed cars following closely one after another to all parts of cities and their suburbs at a speed no one just before the change thought possible. The enterprising men who have been chiefly instrumental in revolutionizing the antiquated street railway systems deserve all honor and credit for the successful manner in which they have developed the new systems and made them what they are; such men are James Ross, William Mackenzie, Hon. L. J. Forget, Thomas Ahearn, W. Y. Soper and H. A. Everett, whose names will go down to history as marking a period of the complete and perfect development of electric street railways in the Dominion.

### Up-to-Date Plant and Methods.

The construction and equipment of the Canadian roads were the best at the time, and have been kept up with all modern improvements, Montreal being the first road on the American continent to

lay rails in concrete without ties, a fact that was an education to many United States roads, and favorably commented on at the annual convention of the American Street Railway Association held in that city in 1894. All the roads are equipped with open and closed cars, rendered absolutely necessary by the severe changes in temperature, and carry a full complement of sweepers and other mechanical devices for the handling of snow.

The roads are thoroughly equipped in the way of car sheds, power houses and modern machinery. Almost all generate their electricity by steam, though water-power is used in Ottawa, Quebec and Hamilton, and Montreal will shortly get its electrical energy from that source.

In the matter of street railway accounting, Canada has led the way, the standard system of accounts recently adopted by the Street Railway Accountants' Association of America showing surprisingly little change from the system in practice in the principal Canadian companies since 1893.

#### The Snow.

Steam railway service meets no such problem in snow in winter as street railway service does. In a city street there is more than the natural fall of snow on that area. From the roof tops and the sidewalks, the snow comes on the street, a double accumulation, and as the snow lodges, it is beaten solid by traffic. The street railway cannot shove the snow aside; practically there is no room. The snow must be moved bodily, and not merely the snow from the car tracks, but from the whole street, for otherwise the car tracks would soon be obliterated.

#### Fighting Storms.

Canadian street car companies take no chances with winter storms. The companies keep a keen weather eye both on the "Probs." and on the local weather manifestations, and the moment trouble is sniffed, the enemy is tackled. Any symptom of a heavy snowfall, let alone a storm or a blizzard, calls out the electric sweepers, and promptly if necessary the snow sleighs. As a result it is probably correct to say that winter street car service in Canadian cities has fewer interruptions than in the northern cities in the neighboring states; for the simple reason that not so often subjected to attack, and fearing danger less, the American companies are less effectively equipped.

Fighting the climatic conditions in some Canadian cities is a matter of money of course, as well as brains. Apart from the equipment necessary in the shape of sweeper cars and their crews, the mere cost of removal of snow is a large item. As an instance of what this may cost, the Ottawa Street Railway Co. paid out for merely the removal of snow, about 1½ per cent on its capital, while in Montreal last winter the total cost of handling snow was equal to 3 per cent on the capital of the company; so it is apparent that Canadian companies, or most of them, are pretty heavily taxed by the snow-fighting. Yet in face of this great special expense, the operating expenses per cent of earnings will compare favorably with that of roads south of line 45.

#### Fares and Transfers.

A powerful factor in the popularity of street car service in Canada is the universal system of free transfer. Everywhere one fare carries to any point in a city. This privilege to the passenger has been facilitated by several things—above all by the fact that there is but one company in each city. Yet despite the complete transfer privilege, fares are low. Five cents is the highest fare, but always six tickets are given for 25 cents, making the regular fare practically 4-6 cents. But there are special tickets, all roads issuing workmen's tickets limited to certain hours morning and evening at eight for 25 cents, or ¾ cents per fare. Tickets for children are issued at 2½ cents by most roads, and some roads give Sunday tickets good all day at eight for 25 cents. About 20 per cent of the passenger are workmen's ticket, and 2 per cent the children. Thirty-two per cent of the passenger on Canadian lines—over one-third—used transfers during the past year.

Excellent service, handsome open cars in summer, thoroughly heated ones in winter, liberal concessions in fares and transfers, testify to the conviction of the companies that it pays to be in advance of the requirements of the public. Little is left undone to meet the wishes and comforts of passengers. It is fitting that most of the companies should enjoy, as they unquestionably do, not only great financial success, but popularity.



WINTER SCENE IN MONTREAL.

#### Comparative Statistics.

That demand creates supply is a popular axiom. That supply creates demand is proved by electric car service if by nothing else, and proved particularly in the Dominion. The supply of first-class street car service has brought out a patronage which is unquestionably remarkable.

While it is difficult to give actual statistics of the development of the street railway systems of Canada, so far as the statistics previous to the introduction of electricity go, the following interesting comparison will tend to show the great development that has taken place between the years 1892 and 1899, the statistics being for eight of the principal roads:

	1892.	1899.	Per cent Increase.
Gross earnings.....	\$1,702,685.00	\$3,707,086.00	123
Operating expenses.....	\$1,209,050.00	\$2,088,355.00	61
Net earnings.....	\$493,638.00	\$1,708,731.00	424
Passengers, number.....	37,323,810	90,362,198	142
Track mileage.....	150	335	115
Miles run.....	9,662,363	23,224,592	140
Population served.....	592,000	809,000	37
Gross earnings per capita.....	\$2.88	\$4.69	...
Capitalization per mile of track.....	\$18,305.00	\$50,985.00	...
Expenses, per cent of gross earnings.....	70	55	...

During this period the gross and net earnings of the larger roads have increased as follows, the figures being the per cent of increase:

Montreal—Gross, 195; net, 665. Ottawa—Gross, 208; net, 222.

Toronto—Gross, 63; net, 198. London—Gross, 196; net, 526.

Toronto leads all roads in Canada in earnings per capita of population, \$6.37, and is lowest in operating per cent of earnings, 48.76; but Montreal has increased her gross earnings per capita of population more than any other road, from \$2.56 in 1892 to \$5.53 in 1899, closely followed by Ottawa, \$1.75 in 1892 to \$4.62 in 1899; while Ottawa leads in increased miles run, 557 per cent.

The total number of passengers carried in the Dominion of Canada for the year 1899 approximated 105,000,000, or about 20 rides per capita of the whole population of the Dominion.



## THE STREET RAILWAY REVIEW.

Of all the many important events of 10 years, its publishers naturally think the "Review" the greatest thing that happened during that time. The "Review" was not long "a bornin'," for in exactly 40 days from the time its publication was decided upon it was organized, compiled, the field canvassed and an edition put into the mails. Not a stroke of the pen, or an advertiser communicated with, prior to 40 days before publication. For a magazine of the size of Vol. I, No. 1, from four to six months are usually allowed to the preliminary work. Out came the first number promptly on time, with 32 pages of reading matter, 32 pages of advertising and a complete directory of street railways and their officers.

Eighteen lines were sufficient to convey the inevitable editorial announcement, the essence of which was "an earnest purpose to give our readers a thoroughly live, practical publication, for which we have special facilities." After 10 years we can offer no better promise for another decade; in fact it has ever been the policy of this publication to make few promises, but rather spend its efforts in the doing of things.

The initial number was an innovation in trade journalism of that day, in that it was handsomely printed on a fine quality of paper, and employed a large number of illustrations. Engravings were expensive in those days, costing from three to four times as much as now, and there were not wanting people in abundance who gravely predicted disaster. In fact the chief difference of opinion seemed to rest in the length of time the "Review" could hold out; this ranged from three to twelve months.

In the first issue was an illustrated description, the first published on this side, of the recently constructed City & South London Ry., which was operating electrically by means of a third rail. An account of the cable system of Melbourne, Australia, then as now the largest in the world; and a description of the then new Broadway cable line in St. Louis, were among the principal articles. The new appliances included a description of a new cable system; a car (oil) lamp; a boltless rail chair; a paper car wheel; a bent post for open cars; a new electric motor; another rail chair; a new fare register and a lever brake. These were all illustrated. Eight pages were devoted to news from all parts of the country. Intention to change from horse to trolley constituted much of this news; there were many new electric roads trying to get off of paper onto the ground; and the adoption of transfer tickets and electric heaters were both important items of news. The first year 616 pages of reading matter were printed.

In order to score a "beat"—which it did—the entire account of the New York State convention, which was held September 15th, publication day, was transmitted by telegraph. The account was about 10,000 words long, and this was considered quite a feat in trade journalism at that time. In order to promptly report the A. S. R. A. meeting, at Pittsburg, October 21st-23d, that month's issue was delayed, and all the discussion and most of the papers read were put on the wires. This made a much larger transmission than the first named but won commendation on all sides.

The "Review" was published under the firm name of Windsor & Kenfield until 1895, in which year the business was incorporated under the title Windsor & Kenfield Publishing Co. As is the rule with most trade and class journals, the mechanical work was done under contract by a printing house. This was the arrangement followed by the publishers of the "Review" until 1899. In that year it was found that nearly \$50,000 had been paid to printers exclusive of paper and engraving bills, and in order to secure better and more prompt service it was decided to install a plant of its own for the "Review." This was promptly done, the selection and purchase of presses and other equipment being made with the main idea of securing the very best, regardless of first cost.

This present installation, which will be still further increased in a few months, includes three large cylinder presses, two type-setting machines, a full complement of display type for job and advertisement use, job presses, and bindery outfit. This issue of the "Review" was set, printed and bound in our own establishment. The press and type-setting machine departments run night and day continually. An average of 50 people receive constant employment in the mechanical department alone, and with the editorial and business office force give the company a total list of about 70 persons. In addition to the two monthly publications of

the company, the mechanical work is done on other weekly and monthly papers, the average output being one complete publication, including type setting, make up, printing, binding and delivery to postoffice for each working day in the month. The catalog department has turned out some of the largest and finest specimens of this class of work obtainable in Chicago. During the day all machinery is operated by steam power and at night one 20 and one 5 h. p. electric motor are employed.

## THE PASSING OF THE CABLE.

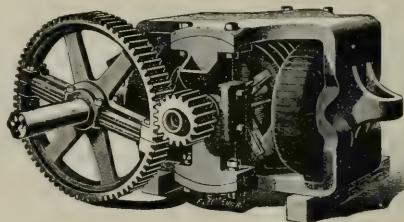
The past 10 years has marked the high water mark of cable operation and has also witnessed its decadence. The cable has literally lost its grip. Ten years ago new cable lines were being planned. Today the few remaining will soon give way to electricity. In Baltimore, Washington, Pittsburg, Cincinnati, St. Louis, Kansas City, Omaha and St. Paul all or nearly all the cable lines have been changed for electric operation. Even in San Francisco, the home of the cable system, some of the cable lines will this year be converted to trolley. From a total track mileage in the United States of 660 miles in 1891, the cable mileage has fallen to less than 400 miles in 1901, and these last figures will certainly be materially reduced in the near future. Except for abnormal grades the cable is a back number.

## WHEN TWO HORSES WERE ONE.

In 1892 a test case was had in New York. The license was \$25 for a one-horse car and \$50 for a two-horse car. One road put two horses drawing the "one-horse car" and the city claimed the double tax. The court said it did not matter how the car was drawn—the car remained the same—a one-horse car.

## MOTOR FOR TWELVE MILES PER HOUR.

In May, 1891, we described a new type of motor known as the "new Edison," which conveys power to the car axle by means of a single reduction gear. "The motor, while rated at 25 h. p., will



EDISON 25-H.P. MOTOR, 1891.

develop fully 30 h. p. \* \* The company also intends building a 15-h. p. motor of the same style for light street railway work. To secure a car speed of 12 miles an hour the armature makes 460 r. p. m. The machine is of the four-pole type."

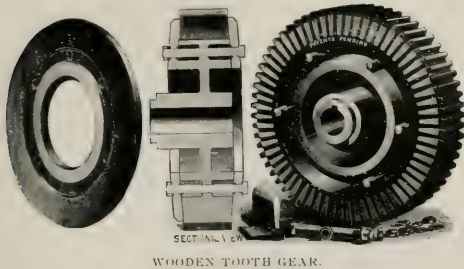
## HAD BAD BOYS THEN.

"A mischievous boy was the cause of the stopping of the cars on the Broadway & Newburg (Cleveland, O.) Street Ry., for nearly an hour the other day. He threw a thin wire over the trolley wire at the power house and then "grounded" it by laying it on one of the rails and holding it there with a short piece of 2-in. plank. When the electric current suddenly failed a force of men were sent along the line to find the supposed break. The power house was not thought of, and it was only when the men found the wires along the line were all connected the trick was discovered."—Review, April, 1891.

The Wheeling (W. Va.) Traction Co. has been organized to take over the railways of the Wheeling, Citizens, Benwood & Southern and Bellaire, Bridgeport & Martins Ferry companies.

### WOODEN TOOTH GEAR.

A wooden tooth gear for street car motors was put on the market in 1891. The body of the wheel was cast iron with receptacles cut in its periphery for insertion of the wooden teeth. "Any ordi-



nary carpenter can insert the teeth without special tools, or removing the gear from the motor." The wooden teeth were expected to last six months and increase the life of the pinion.

The statement as to the pinion proved correct.

### SIDE SEAT CAR.

In March, 1891, Mr. Sessions, a California banker, had constructed at the Pullman works a car for use on a small road in his own city. The height from track rail to deck was only 9 ft.



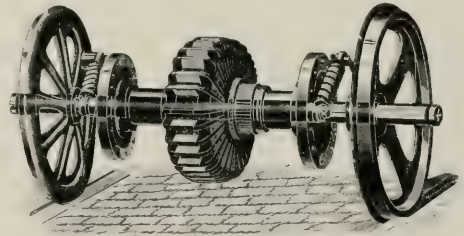
SESSIONS SIDE SEAT CAR.

7 in. or 14 in. less than the ordinary horse car. It was called the "side seat car," and a 14 ft. car seated 26 passengers within and 24 outside.

### SLOW SEED GEARLESS MOTOR.

In the summer of 1891 attention was directed to the new slow seed gearless motor invented by Prof. Sidney H. Short. The illustration is interesting in showing the basic construction of these devices. From our description in April of that year we quote: "Not only are the gears with their consequent wear and noise done away with, but the motor is enabled to do its work with three

shafts less than heretofore. A remarkable feature. \* \* that a speed of 30 miles per hour can be obtained for the car, with no greater speed for the motor than was formerly possible when the car was moving at only 10 miles per hour. The armature shaft is hollow, 6 in. in diameter on the outside. On each end of

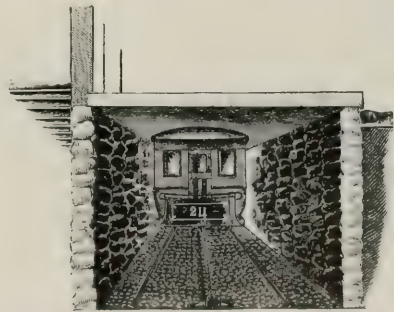


SHORT GEARLESS SLOW SPEED MOTOR.

the armature shaft is keyed a heavy crank disk made with iron hub and rim and wooden web which insulates the armature shaft from the rim of the crank wheel. The crank wheel rim has a crank pin on one side, and the car wheel has a crank pin also, the two being connected by a heavy coil spring capable of pulling under slight extension 2,500 lb. The power of the motor in the turning wheel is transmitted through these springs, and the car wheel turned readily in whichever direction the armature is made to rotate."

### CABLE SUBWAY FOR CHICAGO.

The plan which attracted a good deal of attention in 1891 was for a cable railway to operate beneath sidewalks—one track on



PROPOSED SIDEWALK CABLE RY., CHICAGO.

either side of the street. The illustration shows the plan, which was never carried into execution.

### THE CONVENTION OF 1891.

The annual convention of the American Street Railway Association is the prominent event by which we trace the history of street railway progress. The meeting of 1891, therefore, is of interest as showing the advance made up to that time, and furnishes a ready basis for comparison with present conditions and methods.

The convention was held in Pittsburg on October 21st, 22nd and 23d. The president was Henry M. Watson, of Buffalo, and the secretary the late Wm. J. Richardson, of Brooklyn.

In his address the president said: "Horse sense" counts for but little in this age of rapid transit. We old dogs have been obliged to learn new tricks, and without the usual privilege of serving an apprenticeship. Our stables are being converted into power houses; the electrician is taking the place of the veterinary



smugglers, our drivers are being educated as motormen, and most of us have horse cars for sale."

"It is interesting to note that since November, 1890, the number of horses employed on street railway lines has fallen from 116,795 to 88,134—a decrease of 28,681 in one year. At this rate it will not take long to emancipate the horse from street-railway work."

The president also called attention to the introduction of mail boxes on the cars of several lines, by which considerable time was being saved in the forwarding of outgoing mail.

This was the first convention which might be called an "electric meeting," although the cable system was still in good standing and the best report ever made on cables was presented at this time. The association had not yet been recognized by the steam roads, and delegates had to pay full fare. The papers read were of good length and showed much care and study in preparation. Subjects and writers were: "A Perfect Motor," by H. A. Everett, who urged the general adoption of electricity; "The Progress of Cable Motive Power," by J. Clifton Robinson; "The Dependent—Overhead or Underground—System of Electric Motive Power," by Geo. W. Mansfield; "State Treatment of Corporate Property," by Hon. G. Hilton Scribner; "The Independent Storage or Primary Battery System of Electric Motive Power," by Knight Nefel; and "Standards in Electric Street Railway Practice," by O. T. Crosby. The excursion—they had only one in those days—was made on a steamer, the trip being up the Allegheny River to visit glass and iron works.

The exhibits greatly surpassed any previous attempts, but were small in comparison with our present-day displays. In the absence of any suitable hall or store building convenient to the hotel, a barge—the Mayflower—was tied to the bank near the headquarters, and on this barge the exhibitors arranged the show. Not a little of the display then made would look today as if it had come over on the Mayflower for a surety. The second day brought late arrivals for whose accommodation a second and smaller scow was secured and tied to the first. It was altogether the most novel exhibit place in the history of conventions, either before or since. Lewis & Fowler had a special train from New York and brought 100 invited guests.

## NEW YORK STATE CONVENTION OF 1891.

The ninth annual convention of the Street Railway Association of the State of New York was held September 15th in New York City. As this was publication day with the "Review," its press was held 24 hours and the entire report of the meeting, filling nearly 10 pages of this magazine, was transmitted by telegraph. This was considered quite a feat in trade journalism "in those days." The president was Daniel F. Lewis, president of the Brooklyn City Ry., and Wm. J. Richardson was the secretary.

Among the interesting, and then important, features of the convention we select the following:

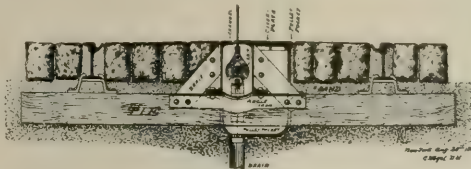
The president in his address found cause for congratulation that "the past year has been free from epidemics among horses"; and the executive committee reported the continued construction of cable roads, while hoping much in the future of electricity. The chief paper was on "Electric Motive Power for Street Surface Railways." It was presented by John N. Beckley. He stated among other things, "An electric car can be stopped as quickly, indeed more quickly, than can a cable or horse car running at the same speed, and there is no danger from the electric current itself propelling the car." He also gives an interesting account of the operation of a trolley line in Rochester during a convention, at which the street in front of a hotel was crowded, and says: "During the time of celebration, between 40 and 50 cars passed through the concourse of people, moving, if need be, at a snail's pace, backing when necessary by the reversal of the current, and without in the slightest degree injuring any person. Cars drawn by horses could not have gone through the crowd in safety." The comparative cost of operation was given as 13 cents for electric, 14 cents for cable, and 18 cents for horses, per car-mile. "Those who propose to substitute electric for horse power will make a great blunder if they attempt to put in cheap construction or material. We who have gone into this matter have learned that the track upon which it is proposed to operate electric cars should be of girder or T-rail, of not less weight than 50 lb. to the yard of T, and 62 lb. to the yard of girder rail."

After strongly advising condensing engines and a centrally located power station, and warning against trying to get too much power through too little copper, he gives what was then considered good practice as to cars. While amusing now, it was the judgment of best managers then. "It seems to me a mistake to equip a car body of greater length than 18 ft., and I think a 16-ft. body is better still. Use trailers when travel is heavy."

The representatives of electric motor systems were then heard—Chas. A. Benton of the Rac system; M. K. Bowen of the Short, and Geo. W. Mansfield of the Thomson & Houston.

## SOME EARLY ATTEMPTS.

A mechanical success is usually built upon the wrinkles and failures of contemporary endeavor. The few which survive out of the many which competed in the race, leave a trail of faded hopes which once seemed just full of promise to their promoters. During the past decade there have been not a few undertakings in the street railway field that struggled bravely for a foothold, but have been carried down into the valley of oblivion. And yet there was a time when people believed in them and invested large sums of money in the effort to, perfect a better motive power than any previously used. Although they failed, these men are entitled to due credit for the courage and perseverance with which they struggled in a losing battle. It will not be without interest, and to the younger members of the fraternity it will be information, to



VOGEL CABLE CONSTRUCTION.

briefly review some of the inventions, each of which was at one time expected to become the universal motive system for the thousands of cars which now daily transport busy millions.

Although it seems more than 10 years since the trolley demonstrated its superiority over the cable, in 1891 inventors were still busy trying to devise cable systems which could be installed at a comparatively low cost. One of these was the Vogel system, the design of Charles Vogel and Frank Whelan, of Butte, Mont., where a section was operated for two years. The cable was conducted in an iron cylinder only 4½ in. in diameter laid in the center of the track on the ties which supported the rails. The carrying pulleys were placed in boxes at intervals. The conduit cylinder was made of rolled steel in 30-ft. sections, held in place by braces fastened to the ties. It was never installed elsewhere than in Butte.

## CUTSHAW'S CABLE SYSTEM.

This belongs to the vintage of 1891 also, and was designed as an auxiliary to use on heavy grades. A small open trough in the center of the track, open at the top, contained the cable, which was securely fastened at the top of the grade. The motor car was to contain a steam or gas engine or electric motor, geared to a set of narrow drums, around which the cable was wound. The drum drew the rope in at one end of the car and paid it out at the other, thus propelling the car.

## STORAGE BATTERY IN DUBUQUE.

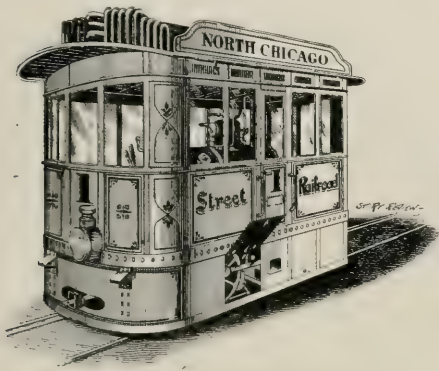
The entire Rhomberg system in Dubuque, Iowa, was put in operation with storage batteries on May 29, 1891; in the January following the overhead trolley was substituted. This test, although only six cars were in use, caused the greatest and most widespread interest. Many a manager based his selection of which of two systems he would install, on the outcome here. And when, after what was conceded to be a fair demonstration, the battery lost, it was a blow from which it has never recovered in this country. The power and speed were fairly satisfactory; not so was the buckling of grids, which then cost \$24 per cell per annum, where \$2.50 had been the estimate. The batteries were loaded at the end of the car and run under the seats after removing the dash.

## THE HEALY MOTOR.

This was built in Detroit and named for its inventor. It was a steam driven machine, weighed five tons and ran about 15 miles an hour. It seemed to be meeting with some success, and was in use on several lines around Detroit, when the inventor was accidentally drowned and the motor abandoned.

## BELGIAN STEAM MOTOR.

In January, 1892, the North Chicago road imported a steam dummy built in Ghent, Belgium. The car was of iron, 12 ft. long,

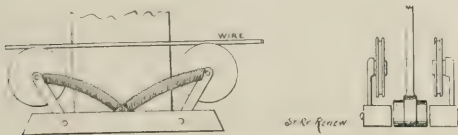


BELGIAN MOTOR FOR NORTH CHICAGO STREET R. R.

8 ft. wide, weighed 7 tons, contained 25 horse-power engines and cost \$7,000. The improvement lay in a muffling of the exhaust steam. It was given a fair trial, but soon abandoned.

## THE LOVE CONDUIT SYSTEM.

In the summer of 1891 work was begun on a conduit system on the North Side, in Chicago. The line was a single-track loop, 1½ miles long, and the scheme bore the name of the inventor—Col. Love. The conduit differed little from ordinary cable con-



LOVE'S CONDUIT TROLLEY.

duits, with the usual carrying pulleys removed. Two hard-drawn copper wires 9-16 in. diameter conducted and returned the current. The "conduit trolley" involved the chief invention. The system was given several months' trial, but finally abandoned. Cars with overhead trolley have since run over the track, which remains, the conduit having filled with dirt.

## THE JUDSON SYSTEM.

The Judson system was illustrated with models at the Minneapolis convention in 1889, and one mile of actual working line built in Washington in 1890. It was radically unlike anything attempted before or since. A conduit similar to that used in a cable road was laid and contained a hollow shaft 9 in. in diameter. This shaft extended the entire length of the road, and was driven by compressed-air engines placed in pits 20 ft. square, and located every 1,500 ft. A central compressing station furnished air to the engines. Motion, forward or backward, was communicated to the cars by friction wheels depending from the car like a grip, and pressing against the revolving shaft. The angle at which these wheels were set determined the direction of motion. The shaft followed curves in the track by using short sections connected by

universal joints. After three years of earnest promoting and experiment the scheme was abandoned, several hundred thousand dollars having been spent in the attempt.

## THE CONNELLY GAS MOTOR.

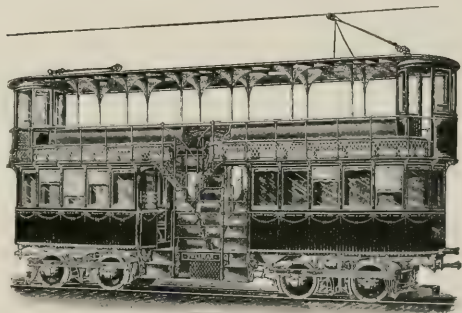
This was the best directed effort of any of the large number of failures to propel street cars with gas engines. The inventor was a thoroughly practical and well-educated mechanic, who had an equally good knowledge of gas and its properties, and plenty of money. Hence no effort was spared to achieve success. The motor car carried one or more gas engines of about 20 h. p. each, running continuously and driving a vertical disk. The periphery of another disk placed in a horizontal position was made to engage the engine disk, and this to turn a shaft which was carried down and geared to the car axle. When the horizontal disk centered on the other no motion was given the car; when it was moved to one side of the center the car advanced at the rate of one mile per hour for each inch from the center. When the disk was moved in the other direction the car moved backward. Both gasoline and natural gas carried in tanks under pressure, were tried. Chicago was the principal scene of these experiments, which lasted five years. Twenty of these motors were sent here in 1892, but after the usual hopes and disappointments were abandoned.

## THE HILL STOP.

The "Hill Stop" was a device with a disk attached to the car axles whereby the disk was pressed against a stationary frame, and automatically operated by magnets when the current failed or the trolley jumped.

## DOUBLE DECK CAR.

In October, 1891, an attempt was made to popularize double-deck cars in this country. The Pullman Co. built at its main shops a car of this description, capable of seating 80 passengers, and



PULLMAN DOUBLE DECK CAR.

room for 50 standing passengers. It attracted much attention, and every effort was made to boom it in the daily press throughout the country. Only a few, however, were ever built, and the project was soon abandoned.

## BARR SLIDING RAILWAY.

This system was being promoted in Chicago in 1891. The plan was to place the cars on slides instead of wheels, the slides being in the shape of an inverted V and fitting over the rail. A pipe extended the entire length of the track and contained water under enormous pressure. The water was forced between slides and rails and also against "propellers" attached to the car, thus forcing the car along at an estimated speed of 200 miles an hour. A half mile of track was built two years later at the World's Fair, but was a dismal failure.

The Pottsville (Pa.) Union Traction Co., operating 35 miles of electric railways in Schuylkill County, on December 20th put in operation a five-mile branch from Port Carbon to New Philadelphia. This branch will form a link in the proposed trolley line to Middleport.



## ELECTROLYSIS.

BY ALBERT B. HERRICK.

Historically the condition of subterranean electrolysis arose when two metals of different character were buried in the earth and connected together. In this way earth batteries were formed at an early date in the history of the electrical art, and this means of producing an electric current has been suggested a number of times since. The difficulty with this character of battery is that electrolysis is produced on the plate, from which the current flows into the ground, and surrounds the plate with the products of decomposition, which gradually increase the resistance of this electrode and reduce the flow of current from it, until it eventually becomes inert.

In sub-surface metallic structures the materials employed often vary in composition. Electrolysis can be found where a lead pipe is joined to a cast iron pipe, the mechanical junction of the lead with the iron forming the connection and the moisture suspended in the earth between the lead and iron pipe forming the electrolyte, having all the elements of the earth battery, the current circulating between the lead and iron through the electrolyte and joint.

The advent of electric railways through streets and highways introduced another element, which caused a flow of foreign current into the existing sub-surface metallic structures. In the first application of the electric railway, the return circuit through the rails was not sufficiently understood. It was supposed that the earth would largely assist in carrying this current back to the power station, and the connections between rails were of a very imperfect character, composed essentially of No. 1 galvanized iron wire connecting the rails across the joint; this wire was secured to the rail by an iron rivet. The fishplate also was largely relied upon for establishing the continuity of this circuit. It soon became evident, from the increasing ground return losses, that this method of construction was not adequate for the purpose. The next step was to rivet an iron rod across the rail joint to improve the continuity of the circuit.

About this time it was discovered that considerable current, being deflected into the earth, was traversing the paralleling piping systems; and in some cases the piping system was connected to the ground return bus at the station; this deflected current from the rail into the earth and induced it to find its way to the power station through the piping system. There was a tendency, under this condition of distribution, for the current to leave the piping system in the territory adjacent to the power station, when the trolley was positive, and pass to the earth and enter the rail near the power station, which was also connected to the ground return bus. When this current flows from the pipe surface it produces an effect analogous to that produced by the local current in an earth battery.

The chemical action is as follows: It is necessary that there be an electrolyte adjacent to the surface from which the current passes; this is formed by the earth when water is percolating through the soil. If this water were pure, it would offer a very imperfect path for the current from the pipes to the rails, but on percolating through the earth it takes up those elements in the soil which reduce the resistance of the water and increase the chemical affinity between the decomposed electrolyte and the iron. This change produces nascent or free oxygen, which combines with the iron and forms iron oxides, or, where salts are present, may form chlorides, and in some cases, nitrates. There are a number of complex chemical combinations formed at this point, depending upon the character of the salts in the solution of the electrolyte. But the resultant effect of this action is identical with the one cited in the case of an earth battery; that is, the accumulation of this electrolytic product increases the electrical resistance of the path between the water pipe and rails, and reduces the flow of current between these two surfaces.

It will be noticed in a railway system, which parallels a water pipe system into which the current seeps, that there will be a gradual falling off of current flow between the water pipes and the rails. This is especially true where the water companies have not made any metallic connections between the rails and water pipe system.

The gate box, which is located in the streets and is essentially a cast iron pipe, erected from the main to the street surface for

the purpose of operating the gate valves in the main, has in a great many instances been located against the rails; in this way it made a metallic connection between the water pipe system and the rail. Some cities have been very free from this flow of current from the pipes to the rails. In connection with this, Philadelphia may be mentioned. Here the water company has used wooden gate boxes, which introduce an earth resistance between the rails and water pipe system. Other companies, which have been affected, have changed their iron gate boxes to terra-cotta or an equivalent insulating material, and have greatly reduced the flow of current in the water pipe system. It is found with modern bonding, properly maintained, that the earth's resistance is high enough to afford great protection to the water pipe system.

The modern method of track laying, with concrete under the rails, has also greatly reduced this flow. Modern pavements, such as asphalt, paving brick on concrete and Belgian block cemented with tar, or any water-shedding pavement, decreases the moisture in the soil, and does not allow of the electrolyte being changed; these tend largely to reduce any electrolysis on the buried sub-surface metallic structures. It will be noticed that the potential will rise between the rail and water pipe system under improved pavement construction; from this condition it has been assumed that electrolysis has been increased, and recently attention has been brought to this matter, due to such tests which are fallacious, for the reason that the higher the resistance between the water pipe and the rail, the greater the difference of potential that can be maintained, and the higher this resistance, the less the current flow will be in the water pipe.

Earths vary greatly in their electrical conductivity, depending entirely upon the amount of moisture they carry, and the character of soluble materials in the earth. Dry earth is an insulator. Even where all caution is used to confine this current to the rails, some of it may leak to the water pipe system. The question then arises, how to drain this piping system of this current without inducing any greater flow in it than will occur where this precaution was not employed.

Of course, if the water pipe system was connected at short intervals to the rails of the railway system throughout its entire length, there could be no difference of potential, which would cause the current to take the path through the earth rather than through the metallic conductor; and, of course, the current flow through the metallic conductor would not induce any electrolysis on the piping system. Nevertheless, the piping system would then be made an auxiliary return for the rails.

There will be found, in making a test along a water pipe paralleling a railway, that the flow of current into the water pipe gradually reaches a maximum where it is taking current from the earth. There will be considerable distance along the pipe where the current first flows from the pipe to the rails, and then from the rails to the pipe, depending upon the load on the railway system. Then in another length of pipe the current will be found leaving the water pipe to the rails, generally adjacent to the power station when the trolley is positive.

In order to reduce this trouble to a minimum and below a point that is hazardous to the pipes, it has been found best in this locality, where the pipe is neutral to the rail, to connect a feeder back to the power station. This connection will take all the current that flows from the water pipe at this point back to the station; but this will also induce a greater flow from the rails to the water pipe, which varies from hour to hour, as the load on the system. In order that the water pipe may remain neutral to the rails at this point, the rails should also be connected to this feeder at this point; then any variation in potential on the railway return, due to the different demands of equipments operating, will increase or decrease the drop on this return feeder, and not change the relation between the water pipes and the rails in regard to their electrical conductivity.

The area to be protected is between the neutral territory and the power station, where the current is leaving the water pipes. By this connection in this neutral territory the current will be reversed in flow, and the tendency will be to flow from the rails to the water pipe and back to the neutral connection.

Past records show clearly that there are certain forms of construction which should be avoided, in order to reduce the trouble of electrolysis. This trouble has been principally complained of where service pipes pass underneath the track in the locality of

the power station. Here the current is focussed on a very short length of pipe, and the character of this pipe may be such as to be very easily decomposed by a flow of current. Lead pipes have proved to be unsatisfactory, and wrought iron pipes, while much less easily affected, should be protected from this local action. Service pipes with insulated coverings have been made for this purpose, where passing under tracks. Pipes have also been imbedded in cement, or inserted in terra-cotta pipe filled with cement. All of these methods introduce a resistance in the electrical circuit at the point to be protected, and, if properly applied, can reduce the flow of current to a negligible quantity.

The history of these electrolytic troubles shows a periodic wave of predicted disaster, and these forebodings have been arrived at by extending a purely local condition to cover the whole piping system. The cast iron employed in the mains of a water pipe system is very much less susceptible to electrolytic action than either wrought iron or lead, and in some soils it is immune from any damage, even where large current densities have been known to flow from the surfaces for a period of years. In support of the assertions of extensive damage to the mains, pipes have been excavated which show pittings. But, it is unfortunate for both the water and railway companies that the natural destruction of a water pipe system, due to the corroding action of the soil and the moisture it holds, and that produced by electrolysis (which is nothing more or less than accentuated corrosion), show from a physical examination no characteristic differences by which they can be distinguished.

Yet a chemical analysis can be made in some cases, which will define whether the decomposed iron adjacent to the pipe was produced by natural corrosion or electrolysis. Natural corrosion on piping systems is well known; this is especially evident in natural gas pipe mains throughout the natural gas region. In some cases in certain sections it is nearly impossible to hold these pipes, which are sometimes only a few miles long, and the piping system has to be continually renewed and protected in every way from the natural action of the soil. It is unfortunate that there are no statistics, from which actual data can be compiled, to show the depreciation in water pipe systems for the last 15 years per million gallons of water distributed; for the older water superintendents concur in the opinion that the depreciation is much less than it was before the advent of electric street railways, due largely, of course, to improved piping systems and methods of construction. But the actual depreciation due to electrolysis has never been determined, nor does it appear that the depreciation due to natural earth conditions and that due to electrolysis can be separated.

In connection with this it is interesting to note that where the current flows to the water pipe it forms a film of hydrate on the pipe, which protects it effectually from the natural corrosion due to any soil condition. This method of protecting water pipes has been suggested, and the railway companies should be credited with this preservation, as the territory in which the current flows to the pipe is vastly in excess of the territory in which the current flows from the pipe.

### PARKS AND PLEASURE RESORTS.

Like many other good things, the idea of artificially creating travel by providing an attraction of some kind at the end of a street railway line was born of dire necessity. As far as we can ascertain the first attempt at inducing what might be termed a strictly pleasure traffic was made at Reading, Pa., back in the old horse-car days. The road was built in 1876 and, like many another built in that and later decades, it had a flattering beginning, but when the novelty had worn off and bills for renewals began to accumulate things did not look so rosy. The company owned 50 horses and bonded the road to its full value to erect new stables. The following year half of the horses were sold to meet the deficit from operation. Finally a crisis was reached. No more horses could be sold and means to increase revenue had to be found or go under. In this predicament the manager in a moment of inspiration conceived the notion of building a short extension to reach a ravine outside the city limits and advertising it as a pleasure resort. A good band was engaged and before the season was over every car on the system was doing afternoon and evening service on the park line. The following

season new attractions were added, swings, summer houses, etc., and additional cars had to be purchased to handle the travel. The first street railway park had demonstrated its power to turn failure into success.

At the beginning of the year 1901 the statement can safely be made that practically every electric road in the country serves a park of some kind or transfers passengers to some line that does. Moreover, there are a considerable number of roads that are purely pleasure travel roads, and derive their entire revenue from passengers going to some park or resort.

The questions of enhancing the natural attractiveness of a park by offering various other inducements to visitors, and the best kind of attractions to provide, are open ones. For permanent features, merry-go-rounds, dancing pavilions, boats where possible, swings, etc., have been found to fill the requirements. Good music will always draw, and it is now nearly universally conceded, we believe, that high-class vaudeville performances can be counted upon under average conditions to prove good investments.

Pleasure riding has grown to such proportions that many roads have organized separate departments under the management of special officials, whose exclusive duties are to oversee the parks and park traffic. Other street railway proprietors have formed independent companies to own and operate the parks, the argument for this practice being that better results are secured and the railway company is freed from legal responsibilities.

Another question that has arisen with the development of pleasure resorts is the one of advertising. On a number of systems this, too, has been placed in charge of a department, and the daily press, well-printed, illustrated booklets, and handbills are coming into extensive use as mediums through which the public may be educated up to the habit of using the cars more extensively in the search for pleasure.

### U. S. MAILS ON ELECTRIC RAILWAYS.

The use of street railway cars to facilitate the collection and delivery of mail matter was given its first practical test in St. Louis in the fall of 1891. The service as at first inaugurated provided for a special mail car running on regular schedules and carrying pouches from the central postoffice to sub-stations throughout the city and suburbs. One clerk took charge of the pouches, and no attempt was made to sort mail along the way, with the exception of distributing such mail as was dropped into the car while en route.

The great advantages afforded by a street railway mail service became at once evident, and before the close of the year 1894, Boston, Brooklyn, Philadelphia, Washington, Rochester, Cincinnati, Chicago and San Francisco had adopted the idea, with various slight modifications, and had established either a regular postal car route or a pouch service on regular cars. Boston was probably the first city to have mail cars with all the accommodations for receiving in-coming and out-going mails in bulk, and pouching them en route for direct delivery to their destination, as is done on steam railroad postal cars.

An old feature revived within the past two years is the placing of letter boxes on regular cars, from which mail can be taken at frequent intervals and started on its way with minimum loss of time.

Wherever tried, the practice of carrying and distributing postal matter on city and interurban electric lines has proved to be a valuable and important adjunct to the general mail service and will undoubtedly reach greater developments within the next few years.

### SITE FOR NEW CHICAGO POWER HOUSE.

The Chicago City Railway Co. has purchased at a cost of \$65,000, a tract of land containing about three acres at 39th and Halsted Sts. The object of the purchase is to obtain a site for a new central power house that will supply all the electric lines of the system. General Manager McCulloch states that plans for the station are still in embryo and that it will be several months before definite action is taken for its construction.



## EXPRESS AND FREIGHT ON ELECTRIC RAILWAYS.

Almost before the overhead trolley had been generally recognized as a serious competitor of the horse, electricity had scored a telling point over its equine rival by proving its ability to transport with great saving in time and expense the bundles, packages and farm produce of the passengers, as well as the passengers themselves, and the third issue of the "Review," published in March, 1891, contains the statement that even then practically all the electric interurban lines in operation had added an express and freight department, which had proved to be not only of the greatest convenience to the public, but also a good investment to the railway companies.

As has been pointed out in later issues of this paper, the question of a goods service on electric railways is a logical one and the result of natural development. At first passengers were permitted to take upon the cars only such packages or luggage as they could hold on their laps or place under the seat without inconvenience to fellow passengers. This accommodation was soon extended to carrying large bundles on the front platform, in which case the owner was usually asked to pay an extra fare. It was soon found that the best interests of the public could be served by furnishing a few cars with special compartment for goods, and from this the special car exclusively for express or freight was but a step.

It would be difficult to estimate the total tonnage of goods now carried per annum by the electric roads of this country, but it must be enormous. There is scarcely an interurban line but has some sort of a goods service and many of the larger city systems have followed the example. In a number of places, notably at Cleveland, Bridgeport, Conn., and Los Angeles, Cal., it has been found advantageous to organize a separate express company to take charge of this service, and in several cities the old line express companies operate over the street railways in practically the same way as they do over the steam roads.

In addition to the goods tonnage carried in electric cars proper, there is an annually increasing amount hauled in regulation freight cars by electric locomotives over steam railroad feeders and sidings. There is also considerable carried in Bonner rail wagons, which enable the goods to be hauled over an electric line in the same wagon used for transporting them over the country roads.

The growth of this freight and express business on electric railways has not been without several severe legal battles, but the right of street railway companies to carry on this traffic has been almost without exception upheld by the higher courts. Perhaps the most important decision bearing upon the question is the one rendered by Judge Marean of the Supreme Court of New York, holding that the public "having discovered that the transportation of freight can be made more economically on electric railways than by former methods, there is no meritorious reason why it should not enjoy that advantage."

## FUNERAL CARS.

To the Atchison (Kan.) Street Railway Co. doubtless belongs the credit of putting into regular service the first funeral street car in this country. In 1889 while the road was still running with horses as the motive power, Mr. W. L. Challis, president of the company, designed and built a funeral car having a table in the center for the casket and seats along the sides for attendants. The car was popular with the public and proved a complete success. The City of Mexico prior to 1890 had 30 funeral cars all drawn by horses and varying in cost and appearance to suit all classes. The first electric funeral car was tried at Erie, Pa., in 1890 with satisfactory results. In this the mourners sat upon folding seats arranged along the interior sides and the casket was carried in the center aisle.

The economy, convenience and other advantages of a service of this nature are coming to be more fully recognized than formerly, and many cities are trying the innovation with good results. A regular street railway funeral service is now given either in specially built cars or with the ordinary rolling stock, at St. Louis, Milwaukee, Oshkosh, Wis., Chicago, Hartford, Detroit, Cleveland, Baltimore and other cities, and on many interurban roads.

## THESE WERE NEW IN 1891.

Hose bridges to keep surface lines open during fires were introduced in 1891.

Old horse cars spliced to make double-truck electric cars.

The Rochester (N. Y.) City Ry. issued 11 tickets for 50 cents, using a metal check resembling a nickel piece. The public and merchants took to using them as legal tender, and a special agent of the Treasury Department swooped down and confiscated all he could find. The company called in the "tickets" and retired them.

In September occurred the death of Hon. W. H. Kemble, at Philadelphia. It was he who originated the present Widener-Elkins syndicate of street railways.

The Van Buren St. tunnel, Chicago, the largest (not the longest) in the world, was nearing completion, at a cost of \$1,500,000. Built to take West Side cable cars under the Chicago River.

On October 28th, the Broadway (New York) cable line was opened. Experts placed the time required to build the track work at from two to five years. John D. Crimmins did the work in five months in the face of engineering difficulties of the most discouraging nature.

Couplers for connecting motor and trail cars to electrically light the trailers were put on the market in November.

In the fall of 1891 the horse market throughout the country felt the loss of trade due to the change to electricity, and the decline began which in four years saw horses which formerly sold at \$135 given away because owners could not afford to feed them.

In November was completed in Chicago the first movable sidewalk. The demonstration track was 900 ft. long and operated by electric motors. The same system on a larger scale was successfully operated at the World's Fair, and also the past year at the Paris Exposition.

On December 1st, the longest incline-plane railway in the world was opened at Duluth. The structure was 2,975 ft. long and gave an ascent of 512 ft.

The stage line on Fifth Ave., New York, lost \$32,000 in 1891.

The Thomson-Houston Co. started its street railway supply department in December, 1891.

The West End road, Boston, put in service 150 double-truck cars.

In Melbourne, Australia, were completed 85 miles of cable road. The same company had previously used 1,600 wagonettes.

First air brake for street cars tried on Chicago City Ry. cable line in February, 1891.

Dubuque likes storage-battery cars and orders more.

First elevated road in Chicago completed—South Side Rapid Transit Co.

Important legal decision in which electric railways are given equal rights with telephone companies in the use of the "ground circuit."

First electric car in Brooklyn, May 29th, on lines of the Brooklyn City.

Completion in June of interurban line connecting St. Paul and Minneapolis.

Street railway mail cars, with clerk in charge to sort mail, is proposed by postmaster in St. Louis.

# Electric Traction for Heavy Railway Service.

BY EDWARD P. BURCH.

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Mr. Burch was born in Wisconsin in 1860, and began his business career with the Chicago Edison Co. in 1887. He is a graduate of the University of Minnesota, where he was an instructor in electrical engineering in 1892. He was electrical engineer for the Twin City Rapid Transit Co., of Minneapolis and St. Paul, for seven years, during which time the St. Anthony Falls water-power plant was installed. Since 1899 Mr. Burch has been engaged in practice as consulting engineer. He is a member of the American Institute of Electrical Engineers.—Ed.

It is the purpose of this paper to show the present status of electric-railway engineering and to point out some definite reasons why electric motive power will supplant the steam locomotive for heavy railway service.

## PART I.

It will first be advantageous to review the development of electric traction toward heavy railway service. History relates that 20 years ago Edison built and ran small freight and passenger electric locomotives at Menlo Park.<sup>1</sup>

Five years later we find Van Depoele experimenting with the electric locomotive at Toronto and on the First Ave. steam line at Minneapolis.<sup>2</sup>

In 1887 Sprague, at Richmond, Va., installed the first successful street railway system.<sup>3</sup> In 1890 many of the street railroads in the United States were replacing their horse, cable and steam dummy power with electric power. In 1892 we find many short suburban lines. The 40-ft. 15-ton car with the 25-h. p. motor on each truck, running at 25 miles per hour, was common. Grades up to 10 per cent were mounted.

While a splendid development was made by the street railways, we find greater progress in heavier work. The Intramural Railroad at the World's Fair in 1893 was followed by the adoption of electric power on the heavy elevated trains at Chicago and elsewhere—electric motors on each truck often displacing the compound steam locomotive, and with remarkable increase in traffic and net income.<sup>4</sup>

Having passed the experimental stage, outgrown prejudice and a reputation for financial instability, we find electric power being utilized on long interurban and cross-country roads. Short interurbans were built first near Boston, Cleveland, Minneapolis and St. Paul, Buffalo and Niagara Falls. There is now an electric railroad through Indiana 90 miles long.<sup>5</sup>

In the same state a 171-mile road and several 100-mile roads have been started. Dayton, O., and Detroit, Mich., have each an 80-mile road.<sup>6</sup> Toledo, Dayton and Detroit each have a 50-mile road.<sup>7</sup> There are over 35 cross-country electric railways (not street railway systems) which are over 25 miles long.<sup>8</sup> Those now being built, extended or projected for this season's construction are legion.

The characteristics of the best recently built long electric railways are: A private right of way, ballasted roadbed, easy curves and grades, 75-lb. T-rails, long, comfortable and clean, splendidly lighted double-truck cars; one to three car trains; four 75-h. p. motors per car, rapid acceleration, a maximum speed of 50 miles per hour, swift stops, Westinghouse or other air brakes, air whistles, arc lamp head lights; axles, wheels, etc., following Master Car Builders' standards; telegraph, telephone and block signal systems. These passenger roads seldom have freight traffic, although heavy express and mail services are systemized. They are operated under the same rules as govern steam roads. Many of them are managed by our broad-gauge experienced steam railway men. The service is reliable and frequent, and fares are cheap. These are the inducements to travel. The greatly increased density of traffic enables the practice of increased economy in the use of the road bed and equipment, a fundamental principle to be observed in successful railway management.

The first application of electric locomotive cars to steam road service was made in 1895 on the Nastasket branch of the N. Y., N. H. & H. R. R. Two and three coaches were hauled at a maximum speed of 40 m. p. h. Both the trolley and third-rail contact

system were used. Later installations by this company embody the use of four 175-h. p. gearless motors under each 50-ft. standard passenger coach. Seventy miles of track on divisions near Boston, Hartford, New Britain and Berlin are now in service. The electric line from Hartford to Bristol, which has very heavy passenger traffic, yet in few trains, is now being extended to Waterbury, Conn. The N. Y., N. H. & H. R. R. has found electric traction on trunk railways economical and entirely successful. This company, the pioneer in electric traction as applied to steam roads, has published the results of most exhaustive tests made on its equipments—under normal operation with very high speed and under severe conditions; also complete and comparative statements showing the economy of operation.<sup>9</sup>

In 1896 the Pennsylvania R. R. introduced electric traction on its Mount Holly branch—some eight miles of double track. The Boston & Maine R. R., having operated an electric road at Portsmouth, N. H., for two years with good results, is reported to have purchased material for a heavy 30-mile road from Concord to Nashua.

Railway engineers now recognize that electric traction is adequately furnishing the service now being done by steam locomotives in heavy passenger service. At the September, 1900, Paris International Railway Congress, many engineering reasons for this were presented to the congress. The reports also showed that main lines of steam railroads, where electricity had been substituted, are operated under the same rules, with the same weight of trains, the existing railway train schedule, without loss of time and with financial success.

In 1895, the Baltimore & Ohio R. R. put in service three heavy electric locomotives for hauling standard passenger and freight trains through the B. & O. tunnel under Baltimore. Each locomotive weighs 194,000 lb., all on the drivers. They are rated 1,500 h. p. each. A draw bar pull of 60,000 lb. is easily obtained and trains weighing 1,900 tons have been hauled up the 42-ft. grade at 12 miles per hour. Ordinarily each locomotive hauls 1,400 tons on the level at 15 miles per hour.<sup>10</sup> Faster work can be done with these locomotives than with the steam locomotives. The management states that they thus save in the track required. They are handier, accelerate rapidly, yet are much less liable to break a train in two in starting. The advisability of extending the use of the electric locomotive on a 80-mile division of the road is now under consideration.

In 1896, two 660-h. p. electric locomotives having 136,000 lb. on the drivers, were installed on the Buffalo & Lockport Ry. for switching purposes over the tracks of the Erie R. R. Twenty loaded cars are commonly hauled.

Since these early installations, hundreds of heavy electric switching locomotives have been purchased for use in railroad yards, terminal railways, belt lines, at factories, steel mills, etc. Two hundred electric mining locomotives have been sold by one manufacturing company within two years. Great advance may be expected from the consolidation of interests of one of the steam locomotive builders with a leading electric manufacturing company.<sup>11</sup>

It is thus evident that conservative railroad managers, who are convinced of the advantages of electric traction as a matter of commercial economy, will now have plenty of precedent for their guidance.

The heavier electric roads and those hauling freight on a private right of way have replaced the heavy trolley with the less expensive and much safer third-rail system, the latter being superior for heavy traction. Examples are noted on the B. & O., the N.

<sup>1</sup>Electric Railroading on the N. Y., N. H. & H. R. R., Heft, St. Ry. Jour., June, 1897. Experiments with electric traction on trunk roads, Heft, St. Ry. Rev. and St. Ry. Jour., Sept. 1900. Electric Traction under steam railroad conditions. Boynton, Trans. A. I. E. E. XVII, Apr. 1900. Proceedings Am. St. Ry. Assn., Heft, Oct. 1900.

<sup>2</sup>Gen. Elec. Bulletin, No. 4188; Elec. Eng., Mar. 4, 96; Elec. World, July 13, 1895.

<sup>3</sup>"The Electric Locomotive," a Baldwin-Westinghouse publication.

<sup>4</sup>Elec. World and Engineer, June 10, 1899. <sup>5</sup>Trans. A. I. E. E. XVI, 1899, p. 245. <sup>6</sup>Elec. World and Engineer, 1896. <sup>7</sup>Trans. A. I. E. E., Sprague, XVI, 1899, p. 228. <sup>8</sup>Gerry, XIV, 1897.

<sup>9</sup>See St. Ry. Rev. and St. Ry. Jour., 1900, for detailed descriptions.



Y. N. H. & H. R. R., the Albany & Hudson railway, on elevated roads, etc. The third rail, located at the side of the track rails, gives little trouble. If necessary, it is easily protected. At grade crossings where the third rail is removed, the rear shoe of the 50 or 60-ft. coaches holds the connection until the front shoe regains it. In this case the circuit is run underground or on poles at each crossing. The overhead trolley, however, has advantages in switching yards, in which service we find a trolley pole (one which does not need turning) above the locomotive or car, and the third-rail contact shoes at the lower side.

A few years ago heavy electric traction received a set-back because of the great loss of power in transmitting the electrical energy. The standard low pressure then used, 600 volts direct current, was not economical in heavy railroad service where the distribution in a given direction from a central station exceeded 10 miles. However, this difficulty was removed by using a different transmission system. Since electricity can be transmitted with a very small loss at higher voltages, the longer roads found it necessary and economical to generate the power at one large station and transmit it at high voltages as alternating current, to from three to eight sub-stations or local distributing points. Examples of this are noted on the Union Traction Co.'s road through Indiana, the Toledo, Fremont & Norwalk, the Rapid Transit Railway Co.'s system from Detroit, etc., where 16,000 volts is the distributing potential.

The Albany & Hudson River Railway & Power Co., the Buffalo & Niagara Falls Electric Ry., the Southwestern Missouri Electric Ry., and many other roads, use a transmission pressure of 11,000 volts. As described in full in my April, 1900, paper before the club, 8,000 h. p. are transmitted from the Pillsbury dam in Minneapolis to the Twin Cities at from 3,500 to 12,000 volts' pressure by lead-covered transmission cables, part of this power being used on three heavy interurban roads. The finest example of this practice (now used by over 50 electric railway systems in the United States)<sup>12</sup> is in connection with the Metropolitan Railway Co.'s 70,000-h. p. station in New York City, where power at 6,600 volts pressure is distributed to six sub stations.<sup>13</sup> Improved types of lightning arresters have been developed which make these high voltages safe and the service most reliable.

In Europe, the development of electric traction for heavy railroad service has been most substantial. The City & South London railway was the first heavy electric railway, and has hauled three coach trains by electric locomotives since 1890.<sup>14</sup> The largest equipment of locomotives ever made was for the Central London Underground Ry. Forty 48-ton locomotives, each equipped with 800 h. p. in gearless motors, with a speed of 40 miles per hour, are used.<sup>15</sup> Germany leads, however, due to excellent experimental work on heavy trunk lines by the leading electric manufacturing companies and due to substantial aid from the Government. Very high voltages have been successfully used on locomotives when speeded up to 80 miles per hour.<sup>16</sup> Remarkable savings have been made by the use of the electric locomotive in freight switching yards.<sup>17</sup> The Dusseldorf-Krefeld Electric Railway and the Stadstad-Engelberg Railway are fine examples where freight and passenger locomotives are used on short main lines.<sup>18</sup> In Switzerland the leading electric railway is the Burgdorf and Thun trunk line,<sup>19</sup> carrying very heavy freight and passenger traffic; speed, 25 miles per hour. Experimental data, complete drawings and elaborate tests of the three-phase motor equipments used have been published by Carus-Wilson.<sup>20</sup> Italy is not behind.<sup>21</sup> Successful lines of importance are the Lugano light tramway, in operation since 1890; the Lecco Ry., 68 miles long, and the Varese 66-mile road with its heavy service in northern Italy. The Government has approved electric railway projects of great magnitude, and the work is

now in progress on important and very long trunk lines, which will be operated for high-speed passenger and heavy freight traffic.

The common features of these important heavy electric railways on the continent are: No connection with the street-railway systems, magnificent roadbeds over a private right of way, heavy cars in three and four car trains and with the motive power on the locomotive. Heavy grades are mounted—3 to 5 per cent. Water power is used in almost all cases. The transmissions are at about 15,000 volts and the motors are quite universally of a three-phase induction type operating under a pressure of 750 volts—although 3,000 volts are used on the Lecco and other roads.<sup>22</sup>

Recently some of these motors have been manufactured in the United States. The European engineers have attained great perfection in this development. This is due in large measure to the use of alternating current motors. These polyphase motors have advantages over the direct-current types perfected in this country. A matter of superior engineering advantage is that with all loads and grades the speed is practically uniform. On descending grades power is returned to the station. The induction motor is also much simpler and will stand more abuse. These motors are preferable on all long electric railroads.<sup>23</sup> The matter of series-parallel control and of standardization are now well developed and objectionable features are being removed. The polyphase system does not require moving machinery and labor at sub-stations.

The engineering departments of our American manufacturing concerns are fully cognizant of the development of the polyphase system of electric traction by our European fellows, and are now devoting their energies to the polyphase-traction problems, because of the demand which has arisen for equipment of this nature.

## PART II.

Electric traction applied to steam railroads will or should mean very few radical changes. Consider the adoption of electric power on some railroad having, say, five or more trains in each direction daily, for example, on any road radiating from the Twin Cities, to Fargo, to Duluth, the Soo, to Chicago, or to Omaha. The water tanks, with their coal depots and usual attendants, machinery, trestle work and buildings, will be consolidated in a few advantageously located central power stations. The locomotive tender, with its coal and water load, its repairs and depreciation, will be absent, and power will not be necessary for its propulsion. All the locomotive boilers and engine cylinders, the piping and accessories will be exchanged for a few large and economical steam producers and prime movers. Fewer locomotives will be necessary, as each will be capable of higher speed and greater annual mileage, a smaller proportion also being in the shops. Some of the locomotive firemen may be utilized in the power stations. The steam locomotive is short-lived and is either rebuilt, worn out or a drag on the service after 10 years' work. The mechanical superintendent need not worry about a larger scrap pile. Ordinarily the steam locomotives will be used up, on divisions not equipped for electric traction, or sold. The heavy electric locomotive will simply be substituted for its steam rival. The balanced working parts, general simplicity and ease of control will commend it. In addition to the substitution noted above, which will save an immense amount in depreciation, heavy additional investment will be necessary for metallic conductors to transmit the electrical energy, transformers (located at ticket stations) and working conductors for the electric motors.

An electric locomotive, or a train equipped with electric motors, has its starting torque or effort evenly distributed around the driving wheels—i. e., it does not vary due to the angularity of a connecting rod and an ununiform piston pressure. For these reasons the common electric locomotive has over 35 per cent greater tractive force than the steam locomotive with equal weights on the drivers. In a comparative test on B. & O. locomotives on a dry rail, without sand, a tractive coefficient of 30.8 per cent was found with the electric locomotive, while a tractive coefficient or maxi-

<sup>12</sup>St. Ry. Jour. June, July, 1900.

<sup>13</sup>Woodbridge Elec. World and Engineer, April, 1900. Berg, Trans. A. I. E. E. XV, 1898.

<sup>14</sup>Lond. Elec. Rev. Oct. 1890. E. E. N. Y. Nov. 26, 1890.

<sup>15</sup>Elec. World and Eng. July 21, 1900.

<sup>16</sup>St. Ry. Jour. Jan., Feb. 1901; Electrotechnische Zeitschrift, April, 1900; Eng. Mag. Aug. 1900; Elec. World and Eng. XXXV, 988.

<sup>17</sup>London Electric Engineer, Oct. 5, 1900.

<sup>18</sup>St. Ry. Jour. Aug. 1899, and St. Ry. Rev. Feb., 1899.

<sup>19</sup>St. Ry. Jour. Sept. and Dec. 1899.

<sup>20</sup>St. Ry. Rev. Sept. 1900.

<sup>21</sup>Eng. Mag. Nov. 1900.

<sup>22</sup>The Adriatic Ry. Lecco, Colico and Sondrio in Northern Italy; Jour. of Elec. Sept. 1900; Elec. Review, N. Y. Oct. 10, 1900; E. C. de Segundo in London Elec. Review, April and June, 1900; St. Ry. Jour. XVI, p. 1137, Nov. 1900; Cassier's, March, 1899; Elek. Zeit., Mar. 26, 1896.

<sup>23</sup>Use of Polyphase Motors on Railroads, Steinmetz, Elec. World, Jan. 1, 1898; also A. C. Motors, Davis, same paper; also Jour. of Elec., Sept. and Nov., 1899; also Elec. World and Eng. Feb. 10 and 24, 1900.

mum draw-bar pull of 20.6 per cent of the weight on the drivers was found for the steam locomotives.<sup>24</sup> (The coefficient of friction is not different in the two cases.) It has also been shown that, owing to the steady torque of electric motors, at least 50 per cent of the weight on the drivers is available for starting. Again, in the design of electric locomotives for heavy freight service, all the weight is placed on the drivers, utilizing every pound for traction. Heavy steam locomotives in common freight service lose by having from 12 to 20 per cent of their weight on the truck wheels. We may also note that for passenger service, the steam locomotive with its heavy boiler has a very much heavier dead load than is needed for traction. On the Empire State Express, the locomotive and tender amount to 37 per cent of the entire train weight; the electric locomotive would save 25 per cent of the entire train weight and 25 per cent of the power. The electric locomotive thus weighs at least 50 per cent less than the steam locomotive and coal tender, especially so for switching and passenger service. Electric traction for railway service also makes possible a most rapid acceleration. B. & O. electric locomotives hauling trains weighing 985 tons, easily accelerate up to a speed of 12 m. p. h. in one minute. In the well-known Sprague multiple unit system, in use on American elevated railroads and elsewhere, each coach is commonly equipped with two motors on each truck. (The train, with from three to seven coaches, is operated by a small master controller located at either end of any coach.) This system is economical and quite necessary where the service consists of many stops. Rapid acceleration is possible because the weight of the entire coach is distributed on driving wheels.<sup>25</sup>

From a strictly operating standpoint, electric traction will be found economical when substituted for steam locomotives on some steam roads. The Inter-State Commerce Commission in its statistics of railways in the United States for 1899, reports on the operating expenses of steam railways as follows:

	Per Cent.
Item 1—For repairs of roadway.....	10.72
Item 12—For repairs and renewals of locomotives....	6.20
Item 20—For water supply of locomotives.....	.62
Item 21—For engine and roundhouse men.....	9.69
Item 22—For fuel for locomotives.....	9.47

These five items amount to 36.7 per cent of the total operating expenses of railroads.

Take up the foregoing items. 1. Repairs of Roadway: As is well known, it is the steam locomotive and not the train that causes heavy repairs to roadways. The heavy dead weight on the driving wheels cannot be distributed, but is intensified by a short, rigid wheel base; damage results. Electric traction at once presents advantages. First, the dead weight on the drivers of the perfectly balanced electric locomotive is not over 75 per cent of its steam rival. As previously shown, this is due to the uniform and rotary application of the power. All the weight can be carried on the drivers. In freight locomotives every pound is needed for traction. Second, in electric passenger locomotives we eliminate the dead weight of the boilers, etc., which is greatly in excess of the requirement for traction. Third, the absence of the tender and its coal and water saves in the weight as well as in the capacity of the locomotive. Fourth, a very important consideration is the absence of the hammer blow of the drivers on the rail. This hammer blow subjects the track to a series of shocks and violent vibrations, from the effect of which the ties become loose in the ballast. As the two cranks are set 90 degrees apart, the unbalanced horizontal weight tends to swing the steam locomotive to one side and then to the other. Spikes loosen and rails spread. Many other practical demonstrations have been made of this unavoidable phenomenon. "Heavy rails have been kinked and bridges have been shaken to their fall, all under the action of heavily balanced drivers revolving at high speeds."<sup>26</sup> Fifth, in the ordinary design of the electric locomotive, the weight of the motors and frames on the driving wheels is distributed over a long wheel base and on at least two trucks. In the multiple unit system, when the motors are distributed to each truck of each passenger coach, the repairs to roadway are even less than with an electric locomotive at the head of the train.

For these reasons electric traction makes a remarkable saving in

<sup>24</sup>Report of Paris International Railway Congress, 1900. An abstract is found in St. Ry. Jour. weekly and St. Ry. Rev., Aug. and Sept., 1900.

<sup>25</sup>The Multiple Unit System. Trans. A. I. E. E. May, 1899.

<sup>26</sup>Goss, Trans. A. S. M. E., XVI, 1894.

the labor and material needed for the repairs and renewal of road-bed, of bridges, docks and wharves, trestle work, embankments, rails, ties, switches, frogs, curves and other special work. The damage due to soft spots in soggy track after heavy rains, and that caused by spreading of rails, is also diminished.

Item 12: Repairs and renewals of steam locomotives are heavier than they are on electric locomotives, simply because of the greater pounding, vibration, racking of machinery and the wear of heavy frames, boilers, cylinders, running gear, drive wheel tires, etc. The fact is also clear that in design the steaming qualities, capacity and speed are of greater importance than low repairs and renewals. The life of steam locomotives is but ten years. The same capacity stationary boilers and Corliss engines do not cost 10 per cent as much for repairs. At the end of ten years' service the modern power station does not show material depreciation. Repairs of the perfectly balanced electric locomotives are a small item, due largely to the absence of reciprocating parts, multiplicity of parts and unnecessary dead weight. After studying the details making up steam locomotive repairs as given by an authority, Mr. Arthur Wellington, one must conclude that from the very nature of things 60 to 75 per cent of the cost of these repairs disappear with the use of electric locomotives.

Item 20—Water supply for steam locomotives: This item, also repairs, renewals and supplies for the coal tender, the coal elevating and pumping machinery, power and labor at supply stations, disappear in electric traction.

Item 21—Engines and roundhouse men: This is an item where a great saving can be made. First, it is true that at present two men are generally needed on an electric locomotive for high speed passenger and for heavy freight service—for safety and reliability, if for no other reason. It is equally true that for construction work and for switching, which work constitutes over 25 per cent of all locomotive service, and for all branch lines hauling one or two combination coaches, one engineer would in almost all cases be sufficient. The greater simplicity of the electric motor would enable the train crew, near by, to be of service in case of an emergency. One of four motors being crippled, the remaining three would always serve all purposes until the end of the division was reached. Second, it is believed that when electric traction is introduced on a larger scale, the rate of wages paid can be materially reduced. This belief applies particularly to freight service. If it is true, and our steam railway men think it is, we have here another important saving. Third, time is saved by more rapid acceleration, faster speed, swifter stops, and by shortening the delays at water stations, etc. Fourth, in the roundhouse and shops, the same cleaning and inspection are needed by the electric locomotive, but fewer men are required, since there are fewer parts requiring inspection, renewal and repairs—a large part of the apparatus, the boilers, cylinders, etc., being centralized at the power station.

Item 22—Fuel for locomotives: This averages 9.47 per cent of all operating expenses.<sup>27</sup> The steam locomotive does not use fuel economically. The boiler produces steam with some economy at high pressure. An actual evaporation of 6.0 pounds of water per pound of coal, or 6.5 from and at 212 degrees, with good coal on heavy freight service, has recently been shown. But the steam is used at great disadvantage. In switching service it is very largely wasted. In passenger service, using about 2,300 pounds of coal per 10,000 ton-miles, or 3.60 pounds of coal per average indicated m. p. h., the cylinders chew steam with some economy when the cut-off is from 25 to 30 per cent of full stroke. Ordinarily the engine cannot be economically loaded. If the load is light or if the engineer is making up time, using steam at two-thirds stroke, or "down in the corner," the waste is abnormal, not only in the cylinder but in the boiler. Professor Goss recites a test on the C., C. & St. L., where the boiler decreased in efficiency 25 per cent when the number of pounds of coal burned, per square foot or grate service per hour, was increased from five pounds to 10 pounds.<sup>28</sup> In passenger service no attempt toward economy of fuel is practiced, economy being sacrificed to good service; for a broad railway manager believes in sacrificing coal whenever the regularity and punctuality of the train service can be improved.

Local roads. M. & St. L., coal \$2.20 per ton, 10.4 per cent; Soo, \$2.10 per ton, 10.7 per cent; N. P., \$2.08 per ton, 8.6 per cent; St. P. & D., \$2.32 per ton, 10.5 per cent; G. N., \$2.57 per ton, 15.4 per cent; Mnpls. Western, \$2.94 per ton, 22 per cent; Mnpls. Eastern, \$5.30 per ton, anthracite, 29 per cent. Year ending June 30, 1899, approximate data.

<sup>27</sup>Proc. Western Ry. Club, Feb. 1899.



In freight service the economy is relatively lower (not higher) per h. p. h. The modern freight locomotive requires about 1,300 lb. of coal per 10,000 ton-miles, or 5.0 lb. of coal per i. h. p. h. Here is where the greatest saving can be made. Modern steam plants in electric railway service show 10 lb. of water per lb. of coal and 1.75 lb. of coal per i. h. p. h.

A recent paper before the club shows the work done by the traveling engineer, especially the difficulty of making the fireman and engineer use good judgment in generating and using steam. Their minds and eyes should be ahead, on the track and signals. Economy of fuel should never be expected of them. It is a fact that the steam locomotive depends upon the skill of the men who handle it for its efficiency, while the electric locomotive does not.

Then in both the freight and passenger steam locomotive there are losses due to radiation of heat from the boiler, unlagged saddle castings, valves and cylinders. In the cylinder, the losses due to condensation and due to the high speed are large. The loss by direct leakage past the piston, with the high pressure used, is found to be heavy. The cylinder valve is designed with other consideration than economy in view. Wire-drawing is noted, and condensation where the live steam ports are also used for the exhaust steam. The feed water on steam locomotives is seldom heated to 100 degrees F. The possible saving here amounts to 10 per cent. A saving of 40 per cent of the steam would be possible if the simple steam locomotives could run compound condensing, a saving of 23 per cent if compound locomotives could run condensing. The compound locomotive, where used, saves but 15 to 20 per cent of the steam on heavy service and 5 to 15 per cent in light and faster service. The friction loss in the cylinder, crosshead and running gear is found to be abnormally high, commonly amounting to over 500 lb. draw-bar pull. Experiments by Goss show that from 72 to 94 per cent of the indicated power of the cylinder can be accounted for by the speed and dynamometer pull at the engine draw bar. The loss noted at 10 miles per hour averaged 6 per cent; at 55 miles per hour, 23 per cent.<sup>29</sup> The dynamometer car on the Pennsylvania road shows that a much greater loss (45 per cent) is common. The loss due to the friction of gearless electric motors is materially less, especially so at high speeds.

In the matter of capacity the steam locomotive is limited. Mr. Angus Sinclair, the able editor of *Locomotive Engineering*, writes: "The gage, 4 ft. 8½ in., is too narrow for admitting a properly designed boiler upon a large locomotive. Many steam locomotives have reached the limit of their capacity because the limited gage prevents the boiler being made larger." The gage does not limit the design and the capacity of the motors in electric locomotives. The steam locomotive has its source of power upon its back. The electric locomotive has the entire power station behind it. In steam locomotives, the moving parts reciprocate and thus the speed of passenger trains is limited. The moving parts of a motor rotate. Likewise, the backbone of railroad business, the freight traffic, now calls for heavier trains and much faster schedules. Railway managers demand this. Expenses are per train-mile and the revenue per ton-mile. How is this demand to be met if the limit has already been reached in the capacity of steam locomotives?

In the matter of economy of fuel there is, then, no comparison between ordinary simple or compound steam locomotives and the following: A large central power station, mechanical stokers under well-cleaned boilers supplying steam to an economically loaded, compound condensing Corliss engine, or to a steam turbine.<sup>30</sup> The larger unit is more economical than several small ones on steam locomotives. In central stations cheaper grades of fuel may be used—slack, hard coal screenings, or lignite—which are burned at a great disadvantage under a steam locomotive boiler. The writer recently conducted a series of commercial fuel tests at an electric railway power station, which showed a large saving per horse power-hour output, by using cheap Iowa slack in place of the best Illinois lump.

Summarizing, we may list the approximate net savings:

	Per Cent.
By using cheap fuels.....	20 to 10
By heating feed water to 212 degrees.....	20
In locomotive boiler economy.....	33 to 20

In cylinder radiation.....	10 to 5
By using larger prime movers.....	15 to 5
In leakage past the piston.....	5
By running condenser.....	40 to 25
In friction of piston, cross-head, rod and crank pin.....	5
Decrease in train weight (locomotive and tender).....	25 to 10

Total saving of central station over the steam locomotive..... 65  
Or, the relative economy of fuel by the central station and steam locomotive, 100 to 35. This is a most conservative estimate.  
The additional power generated by the stationary engine is:

	Per Cent.
For electric generator losses, average.....	4
For high tension transmission losses.....	5 to 8
For transformer losses.....	4
For low tension distribution losses.....	5
For electric motor and controller losses.....	10

Total additional power required (product).....	35
Total net relative economy of power required at the draw-bar, 100 to 35 × 1.35, or.....	47
Total net saving in fuel, reduced to draw-bar of locomotive.....	53

This saving of over half the coal bill on existing steam roads, made possible by the introduction of electric traction, means a net saving of 5 per cent of the total operating expenses of railways.

Generally speaking, it would be still more advisable to utilize the latent water power so abundant in our northwestern states, where coal is either expensive or poor. Water power when developed without excessive capital expenditure is the cheapest known source of mechanical or electrical energy. A water power station is ordinarily very reliable. The care of the water supply and the turbines is infinitely less than with coal supply, boilers, piping and engines—saving also in interest, depreciation, and especially in labor for operation and repair. A local 10,000-h. p. plant and transmission cables, with a daily maximum output of over 7,000-h. p., requires but eight men per 24-hour run.

The principal last-century arguments used against the use of electric power on heavy railroads are headed:

Inability to do the heavy work required.

Unreliability, especially during snowstorm, lightning storm, etc.

Danger of the third rails and trolleys, high voltages, etc.

Heavy investment for additional equipment.<sup>31</sup>

These arguments, with the exception of the last, have been touched upon in the paper. Heavy investments are only warranted when resultant economy can be clearly shown.<sup>32</sup> No one seriously considers the lack of judgment when fuel and labor saving devices such as condensers, large units, stokers, heaters, etc., are installed in our modern power stations. These are now as simple a proposition as investing money for storm windows on our houses. Some subsequent paper may bring out the equipment required for heavy railway service on trunk lines, the general plans, amount, distribution, specifications, cost and accompanying expenses.

In the application of electric traction to heavy railway service, the steam railway engineer and the electric railway engineer must work together. Their first work is to get the facts as they exist—to get the actual power required for all classes of service, switching, freight and passenger. The facts regarding average and maximum service require the best judgment. Each possible saving must be detailed, as outlined; in repairs of roadway, repairs and renewals and supplies for locomotives, in wages of engineers, firemen and helpers, and in the shops, in fuel and in many other items which at once suggest themselves. Contrariwise, there will be the interest, depreciation and maintenance of additional equipment, central power stations with either steam prime movers and boilers (or a dam and turbine), electric generators, transmission lines, transformers and alternating current distribution. Electric traction is clearly an important development in railway engineering, nothing radical being proposed. Its adoption is never warranted except on a basis of increased economy of operation. The supersession of the steam locomotive by the electric locomotive is primarily a question of profit and loss, and here the proposition stands in favorable light for commercial consideration.

<sup>29</sup>Purdue Univ. Exponent, Aug. 1899.

<sup>30</sup>Parsons and Laval Steam Turbine. Thurston A. S. M. E. Dec. 4, 1900; Hodkinson, Eng. Soc. of Western Pennsylvania. Nov. 20, 1900. Very high efficiency is shown, especially so on light loads.

<sup>31</sup>Difficulties in Heavy Electric Railroad, Elec. World, XXXI, Jan. 1898; Baxter, Elec. Eng., XXI, Feb. 1896.

<sup>32</sup>Electric Traction on Main Lines, Langdon before British Inst. Elec. Eng. Nov., 1900.

## The Progress of the Art.

### COMPRESSED AIR—THE IDEAL MOTIVE POWER.

BY HENRY D. COOKE, PRESIDENT COMPRESSED AIR CO.

All nature is a vast air using machine, and the use of air in machinery and propelling street cars is therefore a reasonable development.

The elasticity of air is a natural law, reliable and unailing, and in its mechanical operation there are no uncertainties. It is not changed by compression, and can be stored indefinitely without deterioration in its own qualities, or of the storage tubes. Steam using machines operate equally well with air. The application of air power is entering into all fields, and from crude beginnings is gradually but surely assuming an important place. First chosen for special work in mines, for railway brakes and other places, regardless of economy, now that its niceties are appreciated it is being applied to the operation of street cars, and wherever large amount of power is required it offers special economies. In this field from crude beginnings it has proved both economical, safe and reliable.

Air cars have been operated in Europe for more than ten years, notably in Nogentais, Nantes, Berne and Paris, in which latter place there are three systems of street railways operated with compressed air. There are also many miles of pipes conveying air from central air compressing stations through the streets of Paris for industrial uses. In cases where economy is desired, as in the operation of large machinery and elevators the air is heated before using, but in many instances where used by caterers, butchers, etc., the air is used cold and the exhaust from the engines is conducted into refrigerators for freezing in keeping meats, etc.

The barracks and hospitals of Paris are fitted with ventilators and refrigerators, and one section of Paris is lighted with electricity by dynamos operated with air from the common mains, supplied from central stations of 24,000-h. p. engines and compressors. The station in appearance and magnitude resembles gas stations, and suggest the magnitude and importance of the industry and the possibility that in the near future air will be as commonly used in all cities as gas.

Chicago was the first to experiment with air cars in 1890 and 1891, when Mr. George M. Pullman encouraged the building of two cars at Pullman, which were so successful as to warrant a party of capitalists to bid for the equipment of the Intramural road at the World's Fair, Chicago. Prominent bridge builders, engineers and capitalists composing the syndicate, were convinced of the practicability of air for this service and offered to carry the public for a 5-cent fare and divide profits with the World's Fair, if the contract was awarded for compressed air. The electric people, however, offered to divide a 10-cent fare, and secured the contract. The failure to get this contract discouraged the backers of the air combination, but the result at Pullman laid the foundation for the formation of the present Compressed Air Co., among whose stock-holders there are street railway men and capitalists, who individually control more miles of street and steam railways than any other combination in the world.

In this country compressed air is gradually growing in favor as a motive power for street railways. In Chicago, New York City and Rome, N. Y., air street cars are now being operated and air cars are being built for Buffalo, St. Louis and Boston. On the 28th and 29th St. lines of the Metropolitan Street Railway Co., of New York, the line is entirely equipped with cars operated with air power. Since September 26th, 20 cars have carried an average of over 20,000 passengers daily. The distance of the round trip is 4.86 miles, and the time 40 minutes. There were 36 fixed stops and 76 slow downs counted during an average round trip, the street being a narrow and crowded thoroughfare, permitting of only a single track, which was frequently obstructed. The cars run east on 28th St. to 34th St. ferry and west on 29th St. to 11th Ave., thence to 23d St. ferry, where the power plant is located. This station, as it stands, has a capacity to operate 80 cars, and with increased storage will operate 100 cars.

A careful estimate made to conform as closely as possible to the scope of the report of the Metropolitan Street Railway of New

York, establishes 17.42 cents per car-mile for the compressed air operation to date. Allowing for the fact that 20 cars are being operated from a central plant which has a capacity of 80 cars, the claim that when the service is increased to 80 cars the cost will be reduced to 13.57 cents per car-mile, is not unreasonable.

Plans are now being considered to operate other lines from this plant and a duplicate compressing station has been ordered to insure against break-downs. The compressors in this station are driven by 1,000-h. p. Reynolds-Corliss vertical cross compound condensing engines, steam pressure of 150 lb. and only 27 r. p. m. for present maximum service. Engines are direct connected to four stage single acting Ingersoll-Sargeant air compressors. The service is regular and reliable.

The air is conducted from compressors to coolers, then stripped of moisture before entering the station storage reservoirs. It takes from one to two minutes to charge a car, and two or more cars may be charged at one time, this including the passage of steam into the car heaters.

The car storage reservoirs are carried on the car trucks and under the seats, and take up no paying space. Operating, brake and controller stands on the platform are not dissimilar to electric car stands. In operating the car the air leaving the car storage passes through a reduction valve where the pressure is reduced from 2,000 lb. to a working pressure of 150 lb. It then passes into and through the water in the heater where it takes up the moisture and heat of which it was previously robbed after compression, and before the air was permitted to enter the station storage tanks.

In ordinary service, under fair conditions, an air car of 19,000 lb. weight, will use 400 cu. ft. free air per car-mile, but in the severe service on 28th and 29th Sts. the cars never consume less than 500 cu. ft., and frequently 800 cu. ft. per car-mile. These cars have 55 cu. ft. of storage, which at 2,000 lb. pressure provides each of the present cars at starting with 7,500 cu. ft. free air, while the additional cars now building will have storage of 88 cu. ft., containing 12,000 cu. ft. of free air. During the day's work in the operation of all railroads there is a large variation in the power exerted to run cars, no matter what the motive power may be. Compressed air presents an opportunity to relieve the strain during rush hours, as power during the slack hours of the day and at night may be used to charge air cars to be operated when needed. Pressure stored in cars can be retained for an indefinite length of time. It is a fact that the cars now used in Chicago were charged at the factory in Rome, N. Y., shipped as freight to Chicago, receiving all jars subject to such travel, and on their arrival had sufficient air remaining to operate from the railway terminal to the car barns, a distance of over two miles.

These facts suggest the use of air cars as auxiliaries on lines already equipped with other forms of power. It can thus be seen that plants may be so arranged to operate at a more nearly constant load, resulting in greatly increased power plant economy, and to the convenience and flexibility of service.

Air cars will also be found serviceable for operating feeder and branch lines through portions of the city desirable to reach where special track construction will not be permitted, for park service and in connecting important terminals over tracks equipped with other form of power.

The great advantage of having independent motors is generally conceded. Their adaptability to any road, however equipped, is valuable. In many ways a place will be found for air motors.

The introduction of an independent motor, free from the nuisance of smoke and steam, upon the suburban lines of steam roads is greatly needed at the present day. Air motors of a heavier type, but on the same general plan of the 28th and 29th St. cars, are now being built to meet this requirement. The trunk lines in and out of cities are considering the air motor, and find it especially adapted in developing suburban business where frequent intervals are necessary, and where regular made-up trains with the expenses of a crew to operate them are forbidden by reason of the expense. The fact that no special track construction is necessary, or change in terminal arrangements, and that independent air cars can be gradually introduced without great expense, and as needed, commend air cars for such service.



Locomotives are being designed to haul standard passenger steam locomotives, with regular trains attached, through tunnels approaching terminals. It is believed that this will be found practicable, and will rid the tunnels of the smoke nuisance.

The fact that air is being accepted both for service on street railroads and on suburban railroads, and the further fact that air can be compressed, stored in bottles or conveyed in pipes for use at distant points, suggests a common plant where air can be economically compressed to supply various lines of railroads. This is particularly true of terminals in large cities where the railroads center, where air could be compressed and sold to all the roads cheaper than each railroad could provide air in an independent plant. If this is so of steam railroads, it is equally true of street railroads, and it does not take any stretch of imagination to foresee, as has already been intimated in this article, a common air plant in a city distributing air to all for the various uses to which it can be applied.

The writer, from observation on the quiet growth of this great industry, thinks the facts warrant the belief that at no distant day the up-to-date buildings will be supplied with air-using devices just as they are now piped for water and gas, and wired for electricity. Air has its place in the mechanical world as the great conservator of water and steam power. The smoke and gloom of Western cities is greatly multiplied by the individual steam plants which are required to operate elevators and pumps in each building, instead of a common plant with carefully stoked fires and smoke destroyers, operating a wide range of buildings from a central plant.

#### FUTURE POSSIBILITIES.

Excellent results in heating are obtained from a flame composed of three parts air and one part oil. When air is generally introduced through the streets of cities, why may not oil or powdered coal dust be burned with air to heat coils of pipe containing water, and so furnish heat to buildings? In this connection, the manner of lighting one section of Paris with electric light made from an air-driven dynamo, would seem to warrant the statement that it may prove to be possible with air to furnish power, heat and light to cities. This is only in part an accomplished fact, but there are grounds at least for interesting speculation along these lines.

Wherever air has been intelligently tried it has fulfilled all expectations. With high pressures and the ease with which it can be subdivided, and the gain arising from being able to save what is not used at the moment, makes air especially economical. If human terms might be applied, it could be termed saving and thrifty.

Where large volumes are required, there is nothing as economical as compressed air, when heat lost in compression is replaced by reheating at point of using. High pressures should be used if air is to be conveyed long distances. Similar in this regard is electricity, which, for long-distance transmission, requires high voltages, the latter to save building heavier copper conductors, which are expensive, and for other reasons.

The friction of air is as the square of the velocity at which it moves; hence the higher the pressure the slower it will move to deliver a given volume of free air. At terminals the air may be stored in a station storage provided for that purpose, and the distributing pipes also act as additional storage.

The tendency of air development is in the direction of constantly increasing pressures. The convenience of compact storage more than compensating for the slight additional cost of compression. An idea of how slight this increased cost may be known when it is stated that theoretically it takes three-tenths of a horsepower to compress a cubic foot of free air per minute to 500 lb. pressure per sq. in., while it only takes four-tenths of a horsepower to compress a cubic foot of free air to 2,000 lb. per sq. in. This fact and the improved method in building mild steel bottles suggest a further development to high pressure. The bottles used for storage purposes on the modern air car are tested to 4,000 lb. within the elastic limit. Their bursting pressure is between 5,500 and 6,250 lb. to the sq. in., while bottles of reasonable weight can now be secured from Germany which will not burst under 14,000 lb. to the sq. in.

As the initial pressure on the street car rarely exceeds 2,200 lb. pressure, the safety of the system will be recognized.

## DEVELOPMENT AND USE OF LIGHTNING ARRESTERS.

BY J. V. E. TITUS, VICE-PRESIDENT GARTON-DANIELS CO.

The United States Patent Office has granted over 300 patents on lightning arresters. There are, however, but three manufacturers today offering the railway field marketable devices, and as this fact is not altogether due to the control of the patents by any one concern, it may be taken as fairly indicative of the difficulties to be overcome.

Among the inventors who have given this subject their attention, Thomas A. Edison, Elmer A. Sperry, Frank B. Rae, Merle T. Wightman, A. E. Kennelly, E. J. Houston, C. F. Scott, T. Ahern and others are prominent. The fact that practically none of the work of these men is used today is still further evidence that there was an exceedingly difficult problem to be solved.

The time was when it seemed to be the general impression that one arrester on a circuit was all that was required to secure perfect immunity from the lightning collected on overhead wires covering several miles of exposed territory. Today by a constant effort on the part of the manufacturers, the smallest number of arresters recommended to be used to the mile of line is two, while in many places four and five are used, and in a few instances arresters are to be seen on every alternate pole. The manufacturers got the credit of advising the use of a large number of pole arresters in order to increase their sales, but the impression is gradually gaining ground that the manufacturers have been honest in their recommendations, as this is the only method of protection that has proven adequate.

There is no other branch of electric railway work that contains so many uncertainties to be dealt with, and it is probably due to this fact that there are so few manufacturers giving it their attention. In every other direction we can determine with our meters and experimental apparatus, precisely the conditions of circuit, current, etc., to be provided for, but not so here. There never has been, and we believe there never will be a lightning arrester perfected, that will be absolutely infallible, always diverting the discharge to earth, without injury either to the apparatus to be protected, or to the arresters themselves. Notice that we say "absolutely infallible."

Today all the lightning arresters on the market employ an air-gap connected between the line and the ground, with some provision for either preventing or interrupting the flow of normal current, that almost always follows the path established by the discharge. From 1890 to 1892, the "Keystone" type arresters, made by the Westinghouse company, and the "Butterfly Wings" type, of the Thompson-Houston Co., together with the Sprague arresters, were holding the field. About this time appeared an arrester composed of metallic washers, separated by mica washers, and mounted upon an insulated retaining bolt, widely proclaimed as "The only arrester that has never failed"; these were shipped all over the country, in barrel lots, and melted down about as rapidly as they were connected with the line. Their failure brought the lightning arrester business into disrepute to a certain extent, as it had been expected that they were all that the name "lightning arresters" implied, but the electric railway fraternity "took things" more readily in those days than now, and had lots to learn.

In the fall of 1892, Garton lightning arresters were first placed on the market, and while in the light of today's developments in this field, the old wooden spools used in their construction look very crude, still there is no doubt but that they were a very decided improvement on anything at that time on the market. About this time or a little later, Mr. C. W. Wason brought out an arrester bearing his name, that was dependent upon the blowing of a fuse to interrupt the flow of normal current. The "Ajax" arrester, made by C. S. Van Nuis, of New York City, was built upon the same plan, but these have fallen into disfavor, owing to their not being thoroughly automatic, as after the fuses were blown the supposed protection was altogether lacking.

Later, Mr. A. J. Wurts, of the Westinghouse company, brought out his "non-arcing" railway type arresters, in which the charred lignum-vitae block offered the discharge a path to earth, over which the normal current could not follow, owing to the high ohmic resistance of such a path. During 1896, the Garton-Daniels Electric Co. originated the use of the graphite resistance rod in

series with the spark gap, to limit the flow of normal current, rather than to prevent its passage as was done by Mr. Wurts. This device met with immediate success, and was followed the next spring by the General Electric Co., which combined the limiting of the normal current by the graphite resistance rod, with its magnetic blow-out. These latter three devices are today practically the same as originally placed on the market, and are generally found to be fairly satisfactory, when properly and carefully installed.

Since the introduction of high voltage transmission by alternating currents on many of the long-distance railways, another and more difficult problem has presented itself. It is comparatively easy to handle the static discharges on the direct current side of such a plant, but it is an altogether different proposition with the alternating currents of 5,000, 10,000, or even higher voltages. Not only has it proven altogether impossible to provide arresters that will prevent the grounding of the circuit, but the resonance in many cases prevents the air-gap being adjusted as finely as is desirable. Electric railway men will therefore do well to investigate this detail thoroughly before installing a high voltage transmission plant.

An electrical engineer of considerable prominence, in speaking of the use of lightning arresters on an alternating current transmission plant, gave the following as his definition of a lightning arrester: "An apparatus for the protection of lines and generators, which sometimes diverts lightning."

Taking into consideration the fact that lightning is an altogether unknown and unknowable factor, we believe the advancement in the lightning arrester industry has kept pace with the rest of the electric railway branches during the last ten years. In the foreign markets American made lightning arresters are as popular as any other American made electrical apparatus—in fact more so, as we do not know of a single railway type arrester that is not made under patents of American inventors. This fact may be taken as an indication that the field has been pretty thoroughly worked over by the present American manufacturers, and we believe that they may be depended upon to provide to the best of their abilities, in the years to come.

## ALUMINUM CONDUCTORS FOR ELECTRICAL POWER DISTRIBUTION.

BY WILLIAM HOOPES.

One of the problems, upon which the electrical engineer has expended a great deal of ingenuity, is to distribute large quantities of energy with the least possible loss, over large areas with a minimum cost for conductors. Until recently the only available conducting material for this purpose, has been copper, since it was the only metal combining high conductivity with comparatively low cost, durability, and reasonably high tensile strength. Within the past few years, however, the cost of producing aluminum has been so reduced and the quality of the product so improved, that it is now in this field as a robust and able-bodied competitor of copper.

Below are given some data regarding commercially pure aluminum and commercially pure copper which are essential for determining the comparative cost of any given transmission and the comparative desirability irrespective of cost.

	Aluminum.	Copper.
Specific gravity . . . . .	2.68	8.93
Tensile strength per sq. in. . . . .	22,000	20,000
	to	to
	30,000	35,000
Conductivity for equal weights at 70° F. . . . .	210	100
Conductivity for equal sections at 70° F. . . . .	62.9	100
Temperature coefficient of resistance per degree F. . . . .	.00214	.00217
Temperature coefficient of expansion per degree F. . . . .	.0000128	.0000093

The tensile strengths given are for metal of the temper usually supplied in wires and cables of sizes suitable for power distribution, very hard drawn wire not being considered here.

From the foregoing data it is evident that, if any system of distribution should require 100,000 lb. of aluminum to carry a stated

current with a given loss in watts, it would require 210,000 lb. of copper to effect the same result, and with aluminum at 33½ cents per pound and copper at 17½ cents per pound the cost of conductors in aluminum would be \$33,500 and in copper \$36,750.

First cost, however, is only one of many matters which the engineer is required to take into consideration. The other salient features in the order of their importance are reliability, durability, and cost of erection and maintenance. To discuss these points thoroughly from all points of view would require a volume and they can only be briefly touched here.

With regard to the first point, it is only necessary to say that aluminum has passed the stages through which every new material must go and has encountered some failures which inevitably fall to the lot of every innovation. A considerable quantity of aluminum, containing a small percentage of alloy, was put into service on transmission lines, because this alloyed aluminum possesses higher tensile strength than the pure metal, but unfortunately this alloy is not always homogeneous in structure and as a result there were some breaks in the lines, which failures were, naturally, pretty thoroughly advertised and are responsible for the impression existing in the minds of many electrical men that aluminum is not wholly trustworthy. However, the trouble was soon located and the manufacturers discontinued putting out any wire not made of pure aluminum and there never has been a single break in any line made of this material.

In this connection it is appropriate to call attention to a rather remarkable characteristic of aluminum which recently fell within the observation of the writer. He had occasion to inspect an aluminum line which was erected as a feeder for a trolley line about a year ago. The feeder is a 350,000-c. m. cable carried on poles beside the track and the trolley wire is of No. 0000 copper. The writer happened to arrive on the day of a severe sleet storm and was quite surprised to note that while the copper trolley wire gathered so much sleet as to make impossible the operation of the road without the use of devices for scraping off the ice, the aluminum feeder was almost entirely free from sleet or ice, the nature of its surface being such that the ice and water appeared not to adhere to it in any quantity.

This instance is cited because the point has frequently been raised that aluminum conductors would be required to carry a heavier sleet load than copper conductors by reason of their 26 per cent greater diameter. The reverse, however, appears to be true. Temperature measurements showed that this effect was not due to any difference of temperature between the wires.

As a matter of fact, there seems to be no case in which aluminum on pole lines is subjected to greater stresses than is copper. Its tensile strength for equal resistance per unit of length is about the same as that of copper and while its greater coefficient of expansion causes it to assume a smaller deflection, at minimum temperatures, if the deflections are equal at ordinary temperatures, its smaller weight counteracts the effect of the smaller deflections, making the stresses on the wire and on the pole about equal with either metal at minimum temperatures. At ordinary temperatures the stresses are much less with aluminum. The results obtained by various users of aluminum wire as now made show that no more reliable material is available for electrical distribution.

The question of durability of aluminum conductors is as clearly determined as is possible with a material which has not actually undergone the test of a great number of years of service. Aluminum possesses chemical characteristics quite distinct from the other common metals. It is very slightly, if at all, attacked by sulphur, nitrogen, carbon, or hydrogen compounds, or by the acids or salts of which these are the active elements, and for this reason it shows almost no deterioration when subjected to the air in busy manufacturing centers, where iron oxidizes with great rapidity and even copper acquires a heavy coat of sulphide, carbonate, etc., in a very short time. Aluminum in these situations preserves its original bright finish unless actually discolored by a deposit of smoke, and in ordinary country air the writer's observation indicates that the original finish will be visible for many years. Hydrochloric acid, chlorine compounds, and caustic alkali are the natural solvents for aluminum; and while some aluminum has been exposed in air containing these, it has not yet been up long enough to determine what the ultimate effect will be, although the indications point to the formation of a protective coating of alumina. A recent examination of a sample of wire which had been exposed for a long



time to the fumes from a plant evolving sulphur and sulphuric acid fumes, showed that at the same rate of attack the wire would last for 850 years.

The cost of erecting aluminum conductors is very low because of their light weight, about 48 per cent of that of equivalent copper conductors. On account of this feature it is possible to handle it in much greater lengths, having therefore fewer joints and less delay to the construction force by reason thereof, besides lighter work for all hands. Several forms of joints adapted for readily, quickly, and thoroughly uniting aluminum wires and cables are now placed on the market from various sources and have successfully solved what at one time appeared to be a troublesome problem.

Aluminum conductors are now used throughout the country in surprisingly large quantities in view of the short time they have been on the market. One power transmission company has nearly finished the installation of a million pounds of it, which is to be used for a new transmission line, this being its second order for aluminum. The longest transmission within the writer's knowledge (154 miles) was recently put into operation over the lines of another company, 95 per cent of the circuit being aluminum. It is particularly well adapted for use in all overhead distribution of power and on account of the rapid recognition of this fact its use as feeders for electric railways has grown to large proportions within the last two years, a single company in one of our large cities having this fall installed 250,000 lb. of it. The increased diameter and surface of aluminum over that of copper of equal resistance per unit of length has considerable effect on its adaptability to various uses and while it is detrimental in some respects it is extremely beneficial in many others. One result of its greater surface is its ability to carry heavy overloads with a much smaller rise of temperature than equivalent copper; another is the curious way in which a balance is effected between the self-induction and capacity of long distance transmission lines carrying high potentials.

## THE DEVELOPMENT OF THE CAST WELDED JOINT.

BY E. A. WURSTER.

"Like a thunderbolt out of a clear sky came the announcement, several weeks ago, that the Falk company, of Milwaukee, would soon come forward with a process of welding cast iron around rail joints, which would make a continuous track and seriously compete with electric welding."

This was the introduction of the Falk cast-welded rail joint to the world as published by the "Street Railway Review" in 1894, and a sample joint was exhibited in that year at the Atlanta convention and was inspected by an eager throng of visitors. Immediately after the convention and in the fall of the year, Captain McCulloch, then general manager of the National Railway lines in St. Louis, and now general manager of the Chicago City Railway, contracted for about 700 rail joints to be welded. This track had been laid some time before and was on an equal basis with electric welded track laid previously, and the Falk company was cognizant of the fact that on this work depended the future success of its process of welding. The joints passed through the winter 1894-95, and in the spring Captain McCulloch was so much pleased with the result that he decided to have no more electric welding, but to substitute cast welding instead, and weld his entire track as fast as possible.

Next in line to take up this work was the late M. K. Bowen, president of the Chicago City Ry., who contracted for over 17,000 cast-welded rail joints in 1895, and nearly an equal number of joints were made for the West Chicago lines in the same year. During this time Mr. Goodrich of the Twin City Rapid Transit Co. kept a watchful eye on the operations at Chicago and ordered 2,000 joints to be welded on his tracks as a matter of trial, thinking that perhaps, on account of the severe winters in Minnesota, where the temperature goes as low as 35 and 40 below zero, the action of cast-welded joints might differ. This work was completed in the fall of 1896 and the joints passed through the winter with a total breakage of only 8 joints, and upon examination it was found that the broken joints were largely imperfect castings and full of blowholes.

With such results, the matter of cast welding was taken up by different street railway managers throughout the world and has

since become standard construction. Below are given some opinions rendered by some of the prominent street railway managers throughout this country:

Captain McCulloch: The welding by the Falk process is one of the advances made in methods of track construction in line with the use of electricity for propelling cars, and I think the laying of the track now without welding the ends of the rails together would be like going back to the operation of cars by horse power.

Winthrop Bartlett, of St. Louis: It cost about \$377 per year per mile of single track to keep up the joint in paved or improved streets in the city of St. Louis, but since we have cast-welded our joints the expense of maintenance has practically been nothing.

J. S. Minary, St. Louis: We were well pleased with the Falk joint after having seen it put in on other roads in St. Louis and, having watched its service, we were well enough pleased with it to give the Falk company a contract for welding all joints on our system.

M. K. Bowen, Chicago: The advantages of the Falk joint are continuity of an even surface past the joint point in the rail, saving of cost of maintenance over the old forms of joint, and the increased conductivity for electric current past the joint. The Falk joint is better than anything that I know of in the shape of a joint.

John I. Beggs, Milwaukee: The great advantage of the Falk joint is the fact that you have a continuous rail where there are no ends to take care of. We are not required to disturb the paving to tighten up the fish-peak, bolts or anything of that kind. We have a perfectly smooth road, which is one of the essential elements of a desirable electric line. The other important element is that of the return circuit and the conductivity of the rail. With this joint we entirely eliminate the copper bond.

J. M. Roach, Chicago: We consider the Falk cast-welded rail joint the nearest to a continuous rail of anything in practical use.

J. A. Collins, Cincinnati: We decided after investigation that the joint most satisfactory to us, in view of the price and all other considerations, and features, would be the Falk company's joint.

J. J. Stanley, Cleveland: We laid over 15,000 Falk joints and they have proved successful. The wear and tear to rolling stock has decreased and the comfort of the passengers has increased.

The Falk company today counts among its licensees some of the largest railway companies in the country and is prepared to either assume contracts for welding or sell outfits and license railways to do their own work under its patents and give such licensees all necessary assistance in getting started and doing the work properly.

## EVOLUTION OF THE STREET CAR WHEEL IN THE PAST DECADE.

BY CHARLES H. VANNIER, CONSULTING ENGINEER, GRIFFIN WHEEL CO.

The improvements which have taken place, especially in the United States in the past ten years in street railway transportation

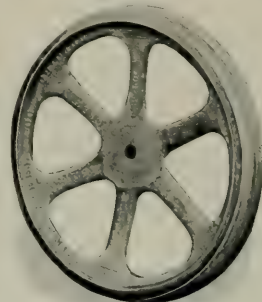


FIG. 1—30-IN. 200-LB. HORSE CAR WHEEL.

and equipment, have followed each other so rapidly that they may be called revolutionary rather than evolutionary. Not only has

horse power been replaced by electric power, but electric power has caused street railways to multiply to a degree undreamed of ten years ago. The problem of designing suitable wheels for these electric railways has been constantly before the car wheel manufacturers ever since the change from horse power to electric power has taken place.

Previous to 1890 most of the car wheel foundries were supplied with one or two patterns from which wheels were made when required for street railways. These patterns were designed with the primary object of lightness rather than strength, and in nearly every case the same style of wheel was used by different street railway companies, for the reason that the service was very much the same on all roads. The most common type of wheel used at that time was a 30-in., 200-lb. wheel, although a great many wheels of this diameter were made weighing not over 160 lb. The width of tread ranged from 2 in. to 3 in., and the height of flange was seldom over 5-8 in.

In those days the problem of furnishing satisfactory street car wheels gave the car wheel manufacturers but little concern, as no guarantee regarding mileage was given or required, and owing to the low speed and easy service, street car wheels of this type were almost as long-lived as the cars themselves. Fig. 1 represents the 30-in. 200-lb. wheel commonly used in horse car service ten years

ago. The width of tread of wheels used in cable service is 2 in. and depth of flange 5-8 in.

It was not until 1890 that there was much demand for street railway wheels for use under cars with electricity as the motive power, although as early as 1889 the wheel makers were called upon to furnish some wheels for this service. They were given to understand that the great aim was strength. Nothing was known at that time regarding the severity of the service as far as it related to the wear, and it was soon found that while the first wheels furnished did not break, they were very deficient in mileage and soon slid flat.

With the introduction of electric cars came a very material increase in the diameter of the axle, and also an increase in the pressure required at which the wheels were pressed on the axles, for it was found in many cases that the wheels became loose on the axles. This difficulty was first met by keying the wheels to the axles at the wheel seat. However, this method was soon abandoned, and instead the entire pattern of the cast-iron wheel was reconstructed by materially enlarging the diameter of the hub and increasing the area of the arms and tread sections, thus adding greatly to the weight.

This increase in the general weight of the wheel enabled the wheel makers to use harder metal, giving chilled iron in the tread



FIG. 2. 30-IN. 200-LB. CABLE CAR WHEEL.



FIG. 3.—24-IN. 200-LB. WHEEL.

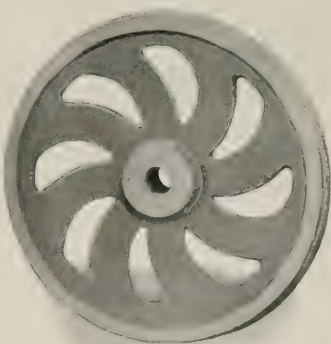


FIG. 4. 33-IN. 425-LB. MOTOR CAR WHEEL.

ago. A few of these wheels are still used under trailers and where the service is easy and horses are used for motive power.

The primary requisite for wheels of this type was lightness and the matter of securing a uniform and satisfactory chill in the tread was not considered of as much importance as was given to this detail a little later on when electric motive power came into use.

The advent of the cable system brought with it changes in the requirements of car wheels, for it was soon found that the wheels used and giving satisfaction under horse cars were too light for cable service. This was demonstrated in a very forcible way by the cracking of the arms and of the tread sections. It was also found that owing to the greater severity of the brake service resulting in sliding of the wheels, flat wheels were very common, and the mileage obtained from the wheels was disappointing; consequently, the matter was "up to" the wheel maker to overcome these difficulties, and it was met by increasing the weight of the pattern, especially by thickening the arms and rims, and also by increasing the number of spokes.

About this time some of the wheel makers began to realize the importance of taking chemistry and scientific investigation to their aid to enable them to turn out a product which would give more satisfactory wear and also increase its uniformity.

With the increase in section of arms and tread came an enlargement of the hub, owing to the increase in the size of the axle used under cable cars over those used under horse cars. Fig. 2 represents the 30-in. wheel used under trailers in cable service. The wheel weighs 200 lb.

Fig. 3 represents a wheel frequently used under the grip cars in cable service. It is 24 in. in diameter and weighs 200 lb. The usual

possessing much greater wearing quality than the soft metal which had formerly been used in the light street railway horse car and cable service wheels, and thus began the evolution of the street car wheel, resulting in the type of wheel used today under cars on electric railways. An illustration of the modern electric railway wheel is given in Fig. 4. It is 33 in. in diameter and weighs from 400 lb. to 475 lb. By comparing this wheel with the one used almost exclusively previous to 1890, we cannot fail to notice that great changes have taken place. Fig. 5 shows these two types of wheels side by side.

When electric street railways first began increasing in popularity, which was early in the 90's, it was thought that cast iron wheels would not be sufficiently strong, and consequently, some of the roads began putting in steel wheels. However, these steel wheels, with very few exceptions, were found to be not only very expensive, but unsatisfactory in service, on account of their wearing out rapidly, especially at the flanges, and therefore it was not long before the steel wheels were taken off and cast iron wheels put in their place, and it is safe to assert today that the cast iron wheels under cars with electricity as a motive power are giving entire satisfaction and are not only in almost exclusive use in this country, but are rapidly replacing the steel wheels abroad.

When electric street railways first began to spring up in different parts of the country, 30-in. wheels were specified, the width of tread and depth of flange varying with the track conditions. Where the track was straight and in good condition, treads varied from 2 in. to 2-2 in., and flanges from 5-8 in. to 3-4 in. were commonly called for. Where, however, the condition of the track was indifferent or poor with many curves, wheels with 3-in. tread



and 1 1-8 in. flange were preferred, so that it was not long before the wheel maker was obliged to carry equipment in stock for making wheels with flanges varying from 1-2 in. to 1 1-8 in. These variations required special chills for every sixteenth of an inch variation. And this was not all; it was not long before there was a demand for 33-in. wheels, and this was followed by 36-in. wheels. In some cases 28-in. wheels were called for, and nearly every order sent in specified a different depth of flange and width of tread. It was then that the car wheel manufacturer's troubles began in earnest in connection with the manufacture of wheels for electric motive power service, and the years from 1891 to 1896 may be called the evolutionary years in this line of work.

As the requirements for wheels and cars in electric service became better known, there followed more uniformity in the specifications

There are cases where the same type of wheels is used under cars in electric service as under cars for steam roads. We refer to the double plate wheel, which possesses maximum strength and elasticity. Such wheels are used on roads where, owing to high speed and imperfect track conditions, a wide tread and deep flange are necessary; in fact, there are cases where a standard railway car wheel is used. See Fig. 6.

The life of wheels used in electric street railway service, provided the wheels are made of the proper material and are well chilled, depends largely on the care used in handling the cars when in service; also, on the track conditions, and last, but not least, on the proper relation between the weight and bearings of the wheel and the service. We know of cases where wheels have not given satisfaction where the trouble was due to the use of wheels

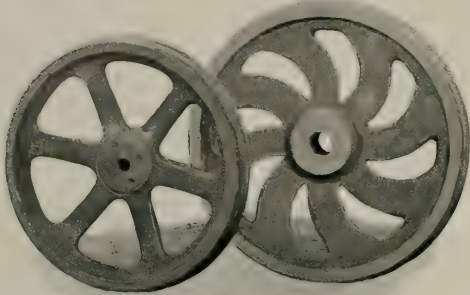


FIG. 5—33-IN. HORSE CAR AND 33-IN. MOTOR CAR WHEELS.

of wheels, so that in the present year it is safe to say that 75 per cent of the wheels used in this territory under electric cars are 33-in. in diameter. The 36-in. wheel has not been popular, and in the past two years there has been but little demand for it, and while there are more of the 30-in. wheels used than of the 36-in., they are rapidly being replaced by the standard 33-in. wheel.

Regarding the changes in weight of wheels used in electric service, we find as might be expected that the heaviest wheels are called for by the interurban roads which do a freight as well as passen-



FIG. 7—30-IN. REVERSE DISH WHEEL.

with improper depth of flange, in nearly all cases on account of the use of flanges which were too deep, thus causing the wheels to ride on the flanges instead of on the treads. It is found that with the improvement in tracks which is taking place throughout the country, the service of wheels is getting better, and this is what might be expected.

A sketch of the evolution of the street car wheel for the past ten years would be incomplete without mentioning the reverse dish wheel used almost exclusively under electric motor cars in the far Western States where the usual track gage is 4 ft. instead of 4 ft. 8 1-2 in., and to gain space between the hubs of the wheels used under the motor cars to make room for the motors, the expedient was resorted to of having the usual concave dish of the wheel reversed. Fig. 7 shows a 30-in. reverse dish wheel weighing 330 lb. The 30-in. wheel of this type is more frequently used than the 33-in. wheel.

It may not be generally known that it is not unusual to furnish axles for electric motor cars with 5-in. wheel fit, and 33-in. 475-lb. wheels are pressed on axles at a minimum pressure of 30 tons and a maximum pressure of 50 tons, while ten years ago the usual pressure used in pressing wheels on axles for horse cars was 15 tons and the wheel fit or bore of the wheel was seldom more than 2 1-2 in. in diameter.

#### THE BRONSDEN COUNTERWEIGHT SYSTEM.

The cable street railway was invented to overcome steep grades and the application to level roads was made after it was shown that the system would give "rapid transit." When electricity was so widely adopted as a motive power it was found that in some cases grades were encountered on which it was impracticable or at least considered unsafe to operate without some auxiliary power. To meet these conditions Mr. M. H. Bronsden, chief engineer of the Union R. R., Providence, R. I., designed his compound counterweight system and during the last five years four of these devices have been installed, two in Providence, one in Chicago, and one in St. Paul, Minn. The Chicago installation was for the old Chicago & Englewood, the storage battery road, where it was considered undesirable to equip the cars with batteries large enough to enable them to surmount the grade.

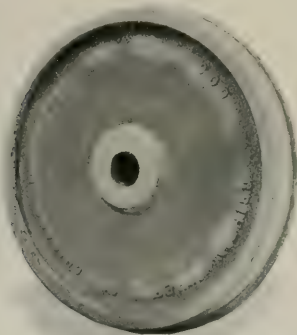


FIG. 6—33-IN. 525-LB. DOUBLE PLATE WHEEL.

ger business, and where coaches similar to those used on the steam roads are run, having double trucks and being equipped with air brakes. The speed attained on roads of this character approximates that on steam roads, so that it will be readily seen that the wheels required under cars used in this service should be much the same as those used on steam roads. As a matter of fact, we find that roads of this character are getting most excellent service from 33-in. 475-lb. wheels of the type illustrated in Fig. 4.

The object of the Bronsden counterweight system is to place the cars under the same conditions as nearly as possible, on the grade as if they were on level track, and this is done by opposing to the car weights and the internal friction of the connecting cables. A conduit is built under the street and in which the counterweights run; the weights are in the form of four-wheeled trucks with a sheave for the connecting cable, and two trucks fastened together are used. The cable is so wound that the weights move only half as far as the cars they balance, thus saving in the cost of construction, a smaller conduit sufficing for the other half of the distance. One end of the cable is fixed at the upper end of the weight conduit and the cable is then led down and around the sheave of the first weight and up to the top of the incline, thence down to the foot of the incline, thence up and around the sheave on the lower truck, thence down to the lower end of the weight conduit where the end is secured to a weight which is provided to take up the slack in the cable. A grip car which is always on the down grade side of the passenger cars is used.

The Providence installation completed in October, 1895, was illustrated in the "Review" for April, 1896, page 208, and that at St. Paul in the "Review" for May, 1898, page 286. The cost of this system is now given at about \$12 per linear foot of track.

### THE TRANSFER TICKET.

BY J. H. STEEDMAN.

Ten years ago the privileges of transfer were exercised by few street railway companies. About 1892 the question began to be seriously entertained by some of the corporations of the larger cities. It was bitterly opposed by the conservative men, and for some time such concessions to the public were extended only through compulsion. Even after four years time when the American Street Railway Association sent out blanks to get information, the question "Do transfers increase your cash receipts?" met almost unanimous reply—"Yes," but the next query, "Would you recommend their adoption?" was a sticker. All kinds of answers were made. Though they had admitted that the giving of transfers increased cash receipts, they still hesitated to indorse giving away transfers. It is so hard to teach an old dog new tricks. To-day there are few men in the profession who do not know of their own knowledge that giving transfers is the most lucrative thing the street railway companies ever hit upon for the increase of business and cash receipts. They not only induced people to ride, but they taught them to ride—they made riding a habit.

The New York Commercial Advertiser in an article showing the increase of the Metropolitan Street Railway Company from this cause, says: "Mr. Vreeland's statistical account of the miracle wrought by the transfer reads like a fairy tale. 'Not only have the receipts of the main lines been doubled and trebled under its magic influence, but subsidiary lines that were either dead or dying have been transformed into paying investments of the first rank. No other development in street railway traffic can be compared for a moment in pecuniary value to this. Electricity has accomplished a great deal in reducing operating expenses, but without the aid of the transfer system it would have led to a merely nominal growth in the business.'"

"Mr. Vreeland's figures are simply amazing. The Metropolitan system, with 131 miles of track, earned in 1894 about \$5,400,000 and gave its stockholders a profit of \$328,000. In 1899, with a 60 per cent increase in mileage, its gross earnings exceeded \$13,500,000, and its stockholders reaped a profit of nearly \$2,500,000. The adoption of electricity has a great deal to do with this increase in business and profit, but the transfer had more. This is not the whole story. Lines that were unprofitable before being brought into the system, and which were bought at prices that seemed unjustifiable if not ruinous, became profitable immediately after consolidation." Such evidence must convince the most obdurate and stubborn doubter.

Ten years ago brass checks—good forever—tickets for all day or all the week—old things—was good enough for a transfer ticket. In 1892 one man invented a time table and so arranged consecutive numbers and conductor's numbers and other details as to form a complete system of tickets comprehensive, efficient and protective. The street railway fraternity know who he is and many companies have gladly recognized and rewarded his genius.

### FENDERS.

Ten years ago the prevailing conception as to what constituted a proper fender for motor cars comprised a huge wooden buffer, shaped like the pilot of a steam locomotive and from its appearance designed to protect the car from injury rather than the person struck. However within a few years a hundred modifications of this idea were suggested, for the subject seems to have been a particularly fascinating one to inventors. The statement is made that while the fender craze was at its height a greater number of applications for patents were received at Washington for street railway safety devices than for any other single class of inventions.

The process of evolution has left less than half a dozen recognized makes of fenders on the market, and these may be divided into two general classes: those forming a scoop or net projecting in front of the car and intended to pick up and carry the body struck; and those consisting of a guard placed under the platform with the object of pushing the body to one side and preventing it from getting under the wheels.

### THIRD RAIL SYSTEMS.

It is interesting in tracing the development of electric railroading to note that on a number of the early successful experimental roads current was taken not from an overhead wire but from a conductor laid on the ground. Thomas A. Edison built a third-rail road in 1880, and in 1883 Leo Dalt equipped and operated successfully an electric system on the Saratoga (N. Y.) & McGregor R. R., on which a locomotive receiving current from a third rail between the track rails drew several trail cars, often attaining, it is said, a speed of eight miles an hour.

But the cheapness, simplicity and greater theoretical safety of the overhead trolley having singled that system out as the one susceptible of application to a wider range of conditions, experiments with the third rail were for a time practically discontinued.

The first demonstration proving that the third rail has an important place in modern electric railroading was planned and carried out by the New York, New Haven & Hartford R. R. on its Nantasket Beach division. In 1895-96, part of this section was equipped with overhead conductors and part with a third-rail system, and from the comparative results thus obtained, the company has been firmly convinced that for heavy, high-speed, electric railway service, the latter form of conveying current possess many advantages. The mechanical difficulties in the way of constructing overhead work to withstand the test of high speed are avoided, as are the more serious troubles encountered when attempting to pass heavy currents through the trolley wheels to the motor circuits. As far as the danger is concerned it is found no account need be taken of this element. This is true partly because the currents employed are not dangerous to life or limb; partly because it is not easy to obtain a serious shock without special effort; and partly because employees and the public have been so carefully warned about the conductor rail that they have learned to respect it.

The third-rail has found a special field of application in elevated railroad installations, and all the elevated lines in Chicago, Boston and Brooklyn are so equipped, while contracts have been let for similarly fitting all the elevated systems in the boroughs of Manhattan and the Bronx.

The most recent installation in which the overhead wire has given way to a conductor laid upon the ground is the system of the Albany & Hudson Railway & Power Co., running from Albany to Hudson a distance of 36 miles. In this case cars operate at a speed of 60 miles an hour and for the entire distance take current from an 80-lb. T-rail supported on wooden blocks resting on the ends of the ties.

During the past decade several attempts have been made to perfect surface contact systems in which only that section of the transmission conductors immediately under the car shall be alive, but the failure thus far to devise a satisfactory mechanical switch has prevented any of these from being applied on an extended scale.

The Memphis (Tenn.) Street Railway Co. has removed from its former offices at Hernando and Gayoso Sts., to new and elegantly furnished quarters at Du Bose and Middle Sts., the change being effected early in January.



## PROGRESS IN RAIL JOINTS.

In the old horse car days, when rolling stock was light and ran slowly over flat rails laid on longitudinal wooden stringers, the joint problem was a source of trouble to the street-railway manager. But when the old equipment and construction gave place to cars and rails several times heavier, and large cars with heavy loads began to travel at ten times the former speed, the joint question asserted itself as one of the most serious in the entire list. A few words, therefore, as to what the manufacturers of rail joints have done, to assist the constructing engineer in his effort to lay a lasting track, cannot fail to be of interest. The following symposium is contributed by men who have made a special study of the subject:

### THE WEBER JOINT.

By C. F. Cogswell, Jr., Western Representative, Weber Railway Joint Mfg. Co.

One of the most successful rail joints in use is that made by the Weber Railway Joint Manufacturing Co. This style of rail fastening has as its distinguishing feature a heavy angle sole plate and a channel containing a wood cushion or filler. The sole plate furnishes a rigid and substantial support for the rail ends, enormously supplementing the strength of the angle bar, and at the same time supporting the base of the rails in such a manner that the heads of the rail are of an even surface, thereby prolonging the life of the rail by preventing depressed and battered rail ends; decreasing the cost of track maintenance and reducing the cost of maintaining the rolling stock; and in no small manner is the wear and tear on the bonding very considerably reduced.

The filler acts as a cushion and as a packing, giving the necessary elasticity to the joint, keeping the bolts tight and furnishing a noiseless and easy riding track, so essential to street railway construction. The joint in its present improved form is theoretically, as well as practically, well constructed, and is the result of years of experience and experiment, altogether being as nearly an ideal fastening as anything that can be produced.

The only fit required in the manufacture of this joint is that of the ordinary angle bar; thus the absolute fit of the Weber joint to the rail is always guaranteed. This is shown conclusively by the fact that this company has had exceedingly large sales of joints to restore badly surface bent rail to its normal surface and alignment.

The Weber Railway Joint Manufacturing Co. is prepared to furnish joints in large and small amounts at short notice, and guarantee the product 100 per cent against breakage and to last the life of the rail. It manufactures rail fastenings for standard T-rail and girder rail, also step or compromise joints and insulated joints, for all weights of rail. This style of rail fastening is in use on many of the most prominent steam, electric and elevated railways throughout the United States, and everywhere is giving universal satisfaction; and no railroad engineer or contractor can afford to ignore these facts in making up specifications for material.

### THE ATLAS JOINT.

By C. D. Porterfield, Engineer, Atlas Railway Supply Co.

The last ten years have seen many marked improvements in the construction and maintenance of the street railways. Owing to the rapid growth of the use of electricity, there has been a corresponding growth of improvements of the articles and appliances in connection with this growth.

Railway officials are now fully cognizant of the fact that a saving can be made in the track construction as well as the overhead. A smooth-riding track is a thing that, aside from the satisfaction it gives to the public, is a great saving both in the maintenance of same and of rolling stock. To have a smooth-riding track means no low joints, no worn rail ends, no worn ties, etc.

To have the above mentioned poor condition of track, requires (in a shorter course of time) attention and replacing, which is an additional expense that would not be incurred if everything was first-class in the beginning.

First costs are small when buying first-class, high-grade material compared to the ultimate saving in the end. There is no better illustration of false economy than that of using the cheapest means possible in the endeavor to make the first expense appear small. A number of railways realize this means of saving; and those who

are in a position to do so, are profiting by their experience and that of others, and are equipping with material that has proved a saving, and that will do the same for their roads.

Among the most important improvements made in the track are the rail joints. In the past, the inefficiency of the rail joint has been one of the most troublesome questions in the maintenance of a smooth-riding track. With the view of doing away with these defects, we have designed a joint which we will guarantee not only to hold up your rail ends, positively doing away with the results that are derived from low joints, but they will keep your track in perfect alignment and extend the life of the rails indefinitely.

Owing to the design of the Atlas joints, they offer the largest amount of bearing surface possible, both to the rails and on the ties, and are strongly braced, making it impossible to get the joint down, or out of alignment.

### THE CONTINUOUS RAIL JOINT.

By F. T. Feary, Continuous Rail Joint Co. of America.

The rapid increase in engine and car loads in the last decade has made a better joint fastening imperative. A comprehensive study by railroad men on this question has resulted almost universally in the opinion that in some form a base support is necessary to give the requisite rigidity by aiding the angle bar, and at the same time retaining all the good features of the latter without multiplicity of parts.

The type of joint known as the continuous rail joint has received sufficient recognition by steam railroads during the past ten years to warrant its general adoption by the railroads generally, from the fact that it has given universal satisfaction, having overcome the defects formerly resulting from the use of the ordinary angle bar.

In the continuous rail joint there are only two parts, the base plate being an integral part of the joint, giving great horizontal and vertical rigidity, and preventing the play between surfaces, and holding the rail ends in perfect line surface. It is an established fact that this joint will save over 25 per cent in maintenance over the old form of joint that has been in common use throughout the United States for many years past. The Continuous rail joint is now in use on 135 railroads in the United States. It insures an easy-riding track.

The manufacturers of this rail joint during the past few years have completed an entire new equipment of special machinery, on which they have obtained patents to roll these joints for any T, or girder rail section, used by steam or street railways. This type of joint is now made to fit 92 different rail sections and is only manufactured by the Continuous Rail Joint Co., of America, having its general offices at Newark, N. J.

Recognition of the excellence of this appliance was made at the World's Paris Exposition, 1900, by awarding it a bronze medal, the highest award in its class.

### THE AMERICAN STANDARD RAIL JOINT.

By W. E. Ludlow, Manager, Chisholm & Moore Mfg. Co.

The "American Standard Rail Joint," made by the Chisholm & Moore Mfg. Co., of Cleveland, O., has probably made more rapid strides in the favor of the public, in the past year, than any other on the market. When this joint was first introduced, some five years ago, it was thought by most people that it was too short, but at that time, nearly all roads were using 6-hole suspended joints, but the stronger roads are now using 24-in. 4-hole plates, and placing the joint over the tie, and many of the engineers, now think that the shorter the joint, the better. There is no joint on the market that can give so many inches of wearing, or bearing surface, as the "American Standard," besides it has the advantage of not having bolts to become loose. High speed electric roads, that have had them in use during the past two years, report that they are the smoothest and most noiseless joint yet introduced, and as they have so much metal under the ends of the rail, it will be impossible to have a low joint. As these joints are now made in the company's own plant under the immediate supervision of the manager, they have been brought to perfection. Every joint is thoroughly tested at the works, and, in addition, is guaranteed against breakage.

This company expects to do a very largely increased business the coming year, and has provided for the early orders by making up a large stock of some of the standard sizes. They are specified on several of the new roads to be built early in the spring.

## THE ELECTRIC HEATER.

By James F. McElroy, Consulting Engineer, Consolidated Car Heating Co., Albany, N. Y.

The progress made in the past ten years in the art of electric heating may be said to have outstripped the advances made in almost all other uses of electricity, since the art of electric heating as it exists today has been created and brought to its present state of development entirely within the past ten years. It is true that the patents in the art of electric heating show that attempts to build electric heating apparatus were made as far back as 1858, and perhaps earlier, but the constructions shown in these earlier patents disclose such crude notions on the part of inventors in regard to both electricity and heat that the influence of the prior art cannot be traced in the electric heaters which came into general use within the past ten years.

The earliest heaters used a small amount of fine platinum wire, which was run at incandescence. The common practice today is to use a very large quantity of coarse wire and run it at a lower temperature, not over 400 or 430 degrees F.

In the earlier heaters regulation of temperature, so far as it was attempted, was accomplished by raising the temperature of the wire itself. Common practice today is to set a maximum temperature for the wire and increase the quantity of heat by increasing the amount of wire surface giving off heat.

The earliest electric heaters that came into use suppressed the air circulation around the heated wire. In fact, the first electric heaters used on electric cars were constructed by embedding a fine platinum wire in powdered heat insulating material, which was enclosed in a cavity between two castings. This was done for the purpose of excluding the air from contact with the wire and thus allow the wire to be raised to a higher incandescence than was possible with the wire exposed to the action of the air. Instead of communicating the heat readily from the wire to the air of the car, this construction prevented the escape of heat from the wire and thus raised its temperature to a point where the wire was soon destroyed.

The modern electric heaters have been constructed on an entirely different plan, and instead of covering the wire with heat insulating material, the wire is exposed freely to the circulation of air currents, every part of the wire is in direct contact with the moving current of air, so that the heat generated in the wire is carried by the air currents into the car or space to be heated. The result of this construction is that the heat is carried from the wire to the space to be heated with the greatest freedom, and in this way the temperature of the wire is kept down to a point where the life of the wire is not affected.

Many of the earlier forms of electric heaters made no provision whatever for the expansion and contraction of wires due to the difference of temperature between the wire and the heater frame upon which the wire was wound. The result was that when the current was first turned on, the wire on the frame work became loose because the wire expanded before the frame expanded. Short circuiting between neighboring wires frequently occurred from this cause. After the current had been on a heater for some time and the frame work had become heated up and the current was again cut off, the wires, being exposed to air, very quickly cooled, whilst the frame work on which these wires were wound remained hot. The result was that the contraction of the wires tightened them upon the heated and expanded frame work to a degree that frequently caused the wires to break.

In the type of heater used in the last ten years the wire is placed upon its insulated support in such a way that the expansion and contraction of the wire and its support are fully provided for, so that no damage occurs to the wire due to the difference of temperature of the different parts of the heater.

The very general introduction of electricity for propelling cars has caused electric heaters to be used for purposes of heating them. The further increase in the size of the generators now commonly found in large stations has cheapened the cost of current to a point where it is cheaper to heat cars with electricity than with steam, saving nothing about the many additional advantages possessed by the electric heater over the car stove. By their use the electric heaters occupy space in the car otherwise not used. They are cleanly and afford a much wider and more even distribution of heat. They are much easier controlled, and heat can be applied

at any time at a moment's notice. They do not affect or reduce the seating capacity of a car, as is invariably done by the car stove. They are altogether safer as regards the danger of fire, which is very great with a coal stove when fire and ashes must be removed. They can be applied for purposes of heating up a car when the car stands in a car barn, a thing not possible with a coal stove.

Electric heaters are almost universally adopted to the exclusion of the car stove in the cities of this country, and many of the cities of England, France and Germany. By their use a degree of comfort for the traveling public is obtained not possible with the method of heating prior to ten years ago. The advance in heating cars made in the past ten years is as great as the advance made by the use of the electric car over the car propelled by the horse or the mule.

## CARS AND PLOWS.

In 1890 what might be called the standard cars for street railways except cable trailers had 16-ft. bodies and were mounted on single trucks with a wheel base of about 6 ft. Open cars had eight benches. These sizes were the maximum that had been permissible with animal traction. One of the first demands from managers of electric roads was for larger cars and single truck cars were built with bodies 18, 20, and 22 ft. long, the platforms bringing the total length to 25 or 30 ft. Within two years cars have been made with 23-ft. bodies and mounted on single trucks with 7-ft. wheel base, though a longer wheel base is recommended where the curves will permit of its use, trucks with 9-ft. wheel bases being used with cars having 20 and 22-ft. bodies. Modern single truck motor cars weigh about 20,000 lb. complete, where those of ten years ago weighed less than 10,000 lb.

In 1890 the Pittsburg, Allegheny & Manchester Traction Co. had built some double truck cars with bodies 26 ft. 2 in. long and 29 ft. 2 in. over all; these cars had a compartment at the front end for the motorman, and were provided with only one entrance for passengers. In 1891 Mr. G. W. Baumhoff, of St. Louis, designed and had built a double truck car 44 ft. 6 in. long, which has scarcely been surpassed in size by later designs.

Double truck cars are coming to be more extensively used in urban service, while they are a necessity for interurban lines. For city roads closed cars lately built have bodies 25 to 36 ft. long and are 33 to 44 ft. over all. Open cars with 15 benches, 40 ft. over all, have been adopted by some of the large roads, though the majority prefer smaller sizes.

Some of the latest cars built for interurban roads have bodies 43 ft. long and are 53 ft. 6 in. long, weighing with trucks and motors nearly 60,000 lb.

Interurban cars are almost invariably built with straight sides, as are also some of the city cars though most of the latter still have sunken panels. Great advances have been made in the matter of painting and finishing street cars; elaborate lettering and striping for the exterior and carved work for the interior are rapidly disappearing, giving way to plainer and simpler designs.

The present tendency is towards cross seats with center aisles, and the long cars have large windows so arranged that they can be dropped down into the car side, making practically an open car, so far as ventilation is concerned, for summer service.

Several designs of convertible cars—adjustable cars they were called in 1891—have been presented to street railway men during the decade, and are now used more extensively than formerly. Double-deck cars have never appealed to American managers, though they are very popular abroad.

The types of trucks which are used today were all well known in the early 90's but the details have of course been perfected, the parts strengthened to carry heavier loads and the designs modified to meet the reasonable demands of purchasers as they arose.

The Lewis & Fowler snow sweeper designed in 1890 had two 20-h. p. motors for traction and one 20-h. p. motor to drive the brooms. Other sweepers of that time were generally provided with motors of about 30-h. p. for traction and 10-h. p. for driving the brooms. Plows had 30-h. p. traction motors. Modern snow plows and sweepers of which a number made by the Brill, the McGuire, the Peckham and the Taunton companies have been described in the "Review" within two or three years, weigh from 9 to 15 tons and have two 50-h. p. motors for traction. Sweepers now have 35 to 50-h. p. motors for the brooms and in the Ruggles rotary plow a 50-h. p. motor is used to drive the fans.

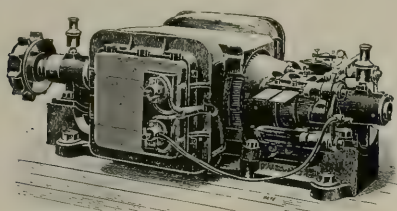


## MOTORS.

The early inventors who experimented with electric motors for traction purposes found the connection between the armature shaft and the car axle to be one of the important problems. After trials with leather belts, sprocket chains, worm gears and bevel gears, cylindrical gears have been almost universally adopted for street railway work; the motors first available ran at such speeds as to require double reduction gears. Sprague in 1887 endeavored to use a single reduction gear, but could not get motors of sufficiently slow speed.

The motors in use in 1890 were the Sprague No. 6, the Thomson-Houston F. 30 and the Westinghouse No. 1, all double reduction motors, with horse-shoe type of fields. These motors ran at from 900 to 1,500 r. p. m., and the gear ratio was from 10 to 19.

The first successful single reduction gear motors were the Westinghouse No. 3 and the Thomson-Houston S. R. G., brought out late in 1890. The S. R. G. motors had two salient poles, the fields



ENGLISH TRAMWAY MOTOR—1890.  
10 h. p. at 600 r. p. m. Weight, 800 lb.

partly protecting the armature, which was of the Gramme ring type. They were of 15 and 25 h. p. The 15-h. p. motor at full load ran at 764 r. p. m., the reduction ratio was 4.78, and the weight complete with gears, 2,275 lb. The Westinghouse No. 3 had four salient poles which is the type of field now universally adopted; these motors were rated at 20, 25 and 30 h. p.; speed, 300 to 350 r. p. m.; reduction ratio, 3.45; weight complete, 2,716 lb. The Edison-Sprague motor of 1891 had four poles, two of them consequent, and was made principally in 15 and 25-h. p. sizes.

The Short and the Eickemeyer gearless motors were also brought out in 1890 and 1891. The final form of the Short gearless motor (1892) had a triangular case with three salient and three consequent poles; it gave 20 h. p. at 120 r. p. m., and weighed about 2,600 lb. The Eickemeyer gearless motor had two poles, gave 25 h. p. at 16 r. p. m. and weighed about 4,000 lb.

The earlier motors mentioned were imperfectly protected from dust and moisture by sheet iron jackets, but the design was soon changed so that the frame itself protected the interior parts, giving the iron-clad motor. The first of this type were the W. P. 30 and the W. P. 50, brought out by the Thomson-Houston Co. in 1891. The W. P. 30 gave 15 h. p. at 540 r. p. m. and weighed 1,975 lb.; the W. P. 50 gave 25 h. p. at 595 r. p. m. and weighed 3,280 lb. These motors were bipolar, one salient pole above and a consequent pole below the armature.

The first motor brought out by the General Electric Co., formed in 1892 by the consolidation of the Edison-Sprague and the Thomson-Houston companies, was the G. E. 800, which had four poles, two of which were consequent poles, and an armature with Eickemeyer drum windings; this motor developed 25 h. p. at 530 r. p. m. In 1894 the G. E. 1,200 of 38 h. p., and in 1895 the G. E. 2,000 of 138 h. p., similar to the G. E. 800 in design, were brought out. In 1895 also the G. E. 1,000 motor appeared; this had four salient poles. The modern General Electric motors are the following: G. E. 52 of 25 h. p., brought out early in 1897 to replace the G. E. 800; G. E. 67 of 38 h. p., brought out in the fall of 1899 to replace the G. E. 1,000; G. E. 57 of 50 h. p., brought out early in 1897; G. E. 73 of 75 h. p., brought out in the spring of 1900 to replace the G. E. 51; G. E. 55 of 260 h. p., brought out about 1896. All these later motors are of the iron-clad type, with four salient poles; the armature windings are of modified Eickemeyer type, varied to suit the service.

The Westinghouse motors following the No. 3 were the No. 12

(May, 1893) and No. 12 A (October, 1894) of 25 and 30 h. p., and the No. 49 (February, 1897) of 35 h. p. for urban, and the No. 38 (May, 1895) and No. 38 B of 50 h. p. for interurban service. The later designs are the No. 69, which is offered as an improvement on the No. 3 and 12 A motors; the No. 49 B, a modification of the No. 49; the No. 68, similar to the No. 69, but more powerful; the No. 56, more powerful than the No. 38 B; the No. 70, for heavy slow speed interurban, locomotive or elevated service; the No. 50-C, which is the largest standard size. The Westinghouse company has abandoned the old method of rating its motors by the horse power developed at a given speed.

From 1892 until its consolidation with the Westinghouse company in 1898, the Walker Co. brought out a series of motors in sizes of 25, 30, 50, 75, 125 and 200 h. p., for standard gage, and 20 and 25 h. p. for narrow gage equipments.

The Steel Motor Co., of Johnstown, Pa., claims to have built the first street railway motors entirely enclosed and built of steel. The early type was a consequent pole motor, but later the style with four salient poles was adopted and motors manufactured in sizes from 25 to 100 h. p. The Steel motors are now made by the Lorain Steel Co.

## ELECTRIC WELDING OF TRACK.

The first electrically welded track joints were made at Johnstown and Boston in 1893 by the Johnson Co. These joints were made by welding two U-bars to the webs; the bars were about 8 in. long, the welds being 4 in. from the rail end. These joints failed apparently by reason of the strains set up because the metal of the web had been heated to a very high temperature at the point of the weld, while the surrounding metal was comparatively cool. The next year the company used blocks 1½ in. wide, which fitted the rail snugly and were welded to each side at the joint. The percentage of broken joints was considerably reduced as compared with the first work done, but was still far from satisfactory. Some work was done in Brooklyn, St. Louis, Cleveland and Detroit.

In 1896 the company developed the process of making butt-welds. The ends of the rails were cleaned by a sand blast and clamps attached so that when hot the rails could be forced together and a butt-weld thus effected. The difficulty experienced with this style of welding was its impracticability when applied to rails already in place in the streets, on account of the "upset" required which necessitated moving each rail bodily through the ground in which it was imbedded.

The latest process of rail welding by electricity is similar to the earlier process rather than the butt-welding of 1896, and has been fully described by Mr. R. E. Danforth, superintendent of the Buffalo Railway Co., in a paper before the New York State Street Railway Association in 1899. (See St. Ry. Rev., Sept., 1899, p. 575 and p. 815.) In the work done for the Buffalo Ry. in 1899, comprising all the new construction and much of the old, splice bars 1 x 3 x 17 in. were welded to the rail webs, the welds being made at three points, the center and the ends; the areas welded are of about 3½ sq. in. The Lorain Steel Co., successor to the Johnson Co., made 11,000 of these joints at Buffalo in 1899, and 18,000 in 1900; the results have been satisfactory, showing that the process has been perfected.

## THE ARC HEADLIGHT.

The arc headlight forcibly illustrates the advance from the horse car to the modern electric interurban. From no light at all to the arc which makes the track almost as light as day for several thousand feet is indeed a big jump. This intense light which is practically a necessity for fast running at night outside of cities is the natural outgrowth of an entirely new demand.

Arc headlights were introduced in 1897 and are now made by several headlight manufacturing companies.

## RAILS AND SPECIAL WORK.

In 1891 the recommended practice for electric railways was to use rails weighing at least 50 lb. per yard, and preferably 60 and 70-lb. sections, though not 10 per cent of the roads were using such weights. The first girder rails were those rolled in 1877 for

the Clay St. cable line, San Francisco, by the Cambria Iron Co., these were 3 in. deep. Mr. A. J. Moxham began rolling girder rails in 1881 at Birmingham, Ala., later at Louisville and in 1883 with the Johnson Co., at Johnstown, Pa. The early sections of the Johnson Co. had tram, groove and center bearing heads, and varied in height from  $3\frac{1}{2}$  to  $5\frac{1}{2}$  in. By 1891 6-in. and 7-in. girder sections were extensively used, but this was the maximum height; in the 1892 catalog of the Johnson Co. only four sections deeper than 7-in. were shown. From 1892 to 1894 the development of heavy and deep girder sections was rapid; in March, 1893, center bearing girders 9-in. deep, weighing 100 lb. per yard were made for the Metropolitan of Kansas City.

The first high T-rails were made in 1891 by the Illinois Steel Co. for the Twin City road at Minneapolis; these rails were  $5\frac{3}{4}$  in. deep. By 1894 the Johnson catalog showed 6, 7, 8 and 9-in. T sections and girders up to  $10\frac{1}{2}$  in., though only a few hundred tons of these deep girders were ever rolled.

Rails in 60-ft. lengths were first made in 1894 by the Johnson Co.

The T-rails not being permitted in most of the large cities we find the practice at the present time to be divided between the use of 7-in. girders weighing from 80 to 85 lb. and 9-in. girders, of from 90 to 107 lb. per yard. The rail head varies according to the paving ordinances in various cities. In smaller cities the rail most used is a 60-lb. 6-in. T-section; this is high enough to permit of using ordinary paving blocks, without supporting the rails on chairs. The present standard of the Twin City road is an 80-lb. 7-in. T.

Many rails with renewable heads have been designed but have never been extensively used. When rail chairs were used with low rails in order to permit of deeper paving blocks, some rail sections were designed without lower flanges; among these were the Wharton "butterfly" rails, and a Johnson rail (brought out in 1892) to the web of which feet were to be electrically welded at the desired points.

In 1890 the special work used was of two styles. For the low girders and flat tram rails the special work was of chilled cast iron; for deep girders the special work was built of girder sections secured by straps, bolts and braces. With shallow chilled cast iron construction the principal difficulty was in making the joints with the rails, and proved too light for the heavier equipments that were soon adopted; some of this cast iron special work laid in 1890 is now in use and in fair condition.

With T-sections the practice is and always has been very much the same as on the steam roads, frogs, split switches, etc., being similar types.

The hardened center special work was introduced in 1895, and is now extensively used; well-known products are the "guarantee" work of the Lorain Steel Co., and the "manganese steel" of the Wharton company. Though the practice is divided as to using hardened center special work, the Paige Iron Works, the Falk Co. and other makers have experimented along this line and are in a position to furnish this style when ordered.

### MODERN SNOW SWEEPERS.

BY W. J. COOKE, VICE-PRESIDENT McGUIRE MANUFACTURING COMPANY.

In none of the appliances for removing snow from electric railway tracks has there been greater improvement than in the snow sweeper. In the early days of electric railroading one of the manufacturing companies brought out a machine for this purpose on which a great deal of time and thought and much money were spent, but it proved a signal failure for the reason that it was so costly and complicated. Consequently the old home-made plow or scraper was the only means of cleaning track.

About 10 years ago there was put on the market a light machine with short brooms on each end that swept only one-half of the track from either end; the brooms were driven from the axles by a sprocket chain. While this was the first step, the machine did fairly good work in light snow, but was of no use in heavy storms. A little later another machine was brought out similar to the first but driven by a motor from the cab. This had the same fault in that it only swept one-half of the track from the front end, hence losing the traction on one side, which in heavy snow gave the sweeper a tendency to leave the track.

In 1894 the first practical snow sweeper was put upon the market and it immediately met with great success. This machine had a double broom on each end which swept the entire track from the front end and had a wing on either side to remove the snow about 2 ft. from the rail. This machine was much heavier than the other, which at first was thought to be an objection, but time demonstrated the fact that its weight was greatly to its advantage in heavy snow. It always had clean rails, thereby getting the benefit of all the traction.

An important feature of this sweeper is that the framing is diagonal and the brooms operating on the same angle. The snow being thrown outward and forward clear of the car by the relation of the position of the brooms to the platform, the sweeper cannot clog itself. The hangers for carrying the brooms are so arranged that they can be removed or exchanged in a few minutes. In the large cities they now use one of these sweepers for each 8 or 10 miles of track, running them between the cars, in this way they keep the track clear and the road open. In the smallest towns they have demonstrated the fact that a first class double broom sweeper is not only a necessity but a good investment. The machine has been found to be a very good locomotive and is used for that purpose on many roads.

### STREET RAILWAY AIR BRAKES.

The most important adjunct to rolling stock which the decade has produced is the air brake. Without it the high speed, heavy double-truck car would be greatly limited in its usefulness. As long cars take the place of the present general equipment the air brake is destined to occupy a large field.

The first air brake in service was the invention of L. J. Gennett, and was tried on a cable car of the Chicago City Ry., in October, 1890. It was of the axle-driven compressor type and somewhat crude. Several years and thousands of dollars were spent in perfecting it.

The air brakes now on the market comprise several types—compression by automatically controlled motor on the car; compression by pumps driven from the car axle, and a storage system, the car reservoirs being filled from a reservoir at the power house.

The manufacture of air brakes has now been brought to a degree of perfection which renders the apparatus as reliable as the air brake on steam roads. All the electric elevated roads in this country, practically all the interurbans, and several thousand surface cars are already equipped. The American-made street car air brake is meeting with a large demand abroad.

### INTERURBAN RAILWAYS.

The most striking feature in street railway development has been the interurban road. Construction of county lines now constitutes much the larger share of new work, and will continue to do so during the next 10 years. Not only have large cities been thus connected, but lines between smaller places are found to yield a good revenue. The prejudice against interurbans as hurting business in one town to the advantage of another has been demonstrated as without grounds. From a speed of 12 miles per hour on the earlier roads we have steadily increased to 40 and 50 miles per hour. The carrying of mails and express is general, and quite a number are hauling piece freight in large quantities, and original carloads of stock, coal, lumber and other heavy shipments. The interurban forms the stepping stone from the urban street railway to the trunk line traffic. With very few exceptions the interurbans have been successful financially, and hence are favorite selections for investment.

### ROBBING ELEVATED STATIONS.

The robbing of elevated ticket agents has almost attained the dignity of an industry in Chicago. The record of the robberies with amounts secured for the present century is: January 1st, the 33d St. station, South Side Elevated, \$93; January 2d, Indiana Ave. station, South Side Elevated, \$74; January 6th, the St. Louis Ave. station, Metropolitan Elevated, \$50; Ashland Ave. station, Lake Street Elevated, \$30.



### STEPHENSON COMPANY BUSY.

It is with great pleasure that we announce that the John Stephenson Co., having been reorganized after the sale of the works in June last, is again actively engaged in car building, continuing the work begun in 1831. The accompanying illustration shows the type of car recently built for the Washington Traction & Electric Co. These cars have already been delivered, and the



STEPHENSON CAR FOR WASHINGTON.

company has been highly complimented upon the design and workmanship. Other recent deliveries have been cars for Auburn, N. Y., and for Wheeling, W. Va. The company reports plenty of work on hand. Among the orders are two for Mexico, one for England, one for the Boston Elevated, one for Hamilton, Ont.; for Youngstown, O.; Wilmington, Del., and Camden, N. J.

Mr. P. M. Kling is general manager of the company.

### A LARGE RAIL BOND CONTRACT.

In the conversion of the Manhattan Elevated Railway of New York City, from steam to electric power an enormous amount of material of various kinds is required. One of the items, usually considered a small one in the ordinary operation, is rail bonds, though in this instance of the Manhattan company it is a very large and interesting order. After a most thorough and practical test on the part of the engineers of the Manhattan company contracts have been awarded to the Mayer & Englund Co., of Philadelphia, general eastern sales agent for the Protected Rail Bond Co., maker of the well-known "Protected" rail bonds. Orders placed thus far cover bonds for the Second Ave., Third Ave. and suburban lines, and are for various sizes and types for the third or contact rail, the traffic rail, bonds for connecting the structure girders, together with bonds for connecting the traffic rail to the structure. Most of the bonds are of the type designated as "P-4" by the maker, and are made of flexible copper cable with terminals fused on the ends and then reheated and forged down to accurate size. A particular feature of this type of bond is a cylindrical protecting sleeve around the cable, which sleeve is a part of the cast terminal. In forging down the terminals about one-half of this sleeve is left in its original cylindrical shape, thereby allowing the cable to come out of the terminals perfectly round and without injury to the individual strands. This improved construction, which is covered by recent patents, is of particular value in rail bonds used on elevated structures and other places where the vibration is excessive, as it effectually stops crystallization at the point where the terminal and cable join. Heretofore bonds of similar design have been made with the cable flattened in forging at the point where it leaves the terminal, thereby weakening and frequently cutting the individual strands.

An interesting feature of this Manhattan rail bond contract is the special hydraulic tools, which have been developed by the Mayer & Englund Co. for the installation of the bonds. Two types of hydraulic compressors will be used, both of 35 tons indicated power; one is for compressing the foot bond terminals on the third or contact rail, and the other for the traffic rail bonds. These machines have been especially designed to work in the limited space between the guard stringers, and with such rapidity

as not to interfere with the present time schedule of the elevated trains.

This contract is unquestionably the largest ever placed in the world for rail bonds, and the Mayer & Englund Co. is to be congratulated upon its enterprising and successful campaign in the effort to secure the most important order of its kind ever placed.

### NOTES FROM JAPAN.

Mr. Hidezo Arita, of Tokio, Japan, sends us the following information concerning some of the important street railway enterprises of the Empire.

The Tokio Street Railway Co. is capitalized at \$7,500,000 and within five years will build 200 miles of track. The power station is to be located in Tokio on the Sumida River; steam power will be used but after seven years a change to water power will be made. The double overhead trolley system has been chosen; alternating current is transmitted at 5,500 volts to eight sub-stations where it is transformed to 500-volt direct current. The rails are a 60-lb. girder section. Mr. K. Smemiy has been chosen chairman of the promoters, of whom Mr. Arita is one.

The Tokio Electric Car Railway Co. is now operating 21 miles of horse railways which will be changed for a double overhead trolley system within two years. Mr. G. Mudaguchi is president.

The Kehin Electric Railway ("Kehin" means between Tokio and Yokohama) now operates 7½ miles on the single overhead trolley system and within two years will increase to 20 miles. Mr. Y. Tachikawa is president. Mr. Arita is also interested in this road.

The Odawara Electric Railway Co. operates 24 miles, single overhead trolley system. There is a 1,500-h. p. water power station generating high-tension current which is transformed at four sub-stations. Mr. B. Nakano is president.

The Nagoya Electric Railway Co. is now operating five miles, single overhead trolley, steam plant.

The Kyoto Electric Railway Co. has the oldest electric road in Japan, built six years ago. It now operates nine miles of track using water power. Mr. B. Jakagi is president.

The Hanshin Electric Railway Co. is now building a 25-mile line between Osaka and Kobe, single overhead trolley, steam plant.

The Hoshu Electric Railway Co. is now building a seven-mile line, single overhead trolley.

The Osaka Horse Car Railway Co. is operating a four-mile line, and will probably increase to 6½ miles and equip for electricity. The city of Osaka has since ancient times been a good market place but the business streets are so narrow that it will be difficult to build the electric lines that would prove of great convenience to the people.

### NORTH AMERICAN CO'S. CAPITAL STOCK REDUCED.

The North American Co., which owns \$2,200,000 of the preferred and \$2,000,000 of the common stock in the Milwaukee Electric Railway & Light Co., will reduce its capitalization from \$40,000,000 to \$12,000,000 as was determined by vote at a recent meeting of the stockholders of the North American Co. As the stock of the Milwaukee Electric Railway & Light Co. has been doubled, and is now \$12,000,000, the parent and the subsidiary companies have now an equal capitalization. The North American interests will underwrite the new Milwaukee stock as it is issued. Among those principally interested in the North American Co. are Henry C. Payne and John I. Beggs, of Milwaukee. The North American's main offices are located in the Johnson Building, New York City, and the Prudential Building, Newark, N. J.

It is announced that the North American, which owns the property of the Cincinnati Edison Co., is negotiating for the control of the various interurban electric railways between Cincinnati and Cleveland, and purposes establishing a direct trolley service between these cities.

December 29th, the Union Traction Co. of Indiana inaugurated a direct service between Anderson and Indianapolis over its newly completed line. The power house at Anderson, equipped with three 2,500-h. p. engines, was built at a cost of \$750,000.

## CANADIAN NOTES

Right of way has been secured for a projected electric railway between Essex and Wheatley, Ont.

The Ontario Power Co., of Niagara Falls, has offered to supply the Toronto Railway Co. with 20,000 electrical horse-power.

The town council of Toronto Junction, Ont., has taken action against the Suburban Railway Co., for failure to live up to its agreement in the matter of running a sufficient number of cars.

The Winnipeg Electric Ry. is considerably augmenting its power plant in order to provide for the increased car service necessary to handle the traffic.

Owing to the extraordinary snow fall during the present winter, the street railway company of St. Johns, Newfoundland, has decided to abandon all attempts at running cars until spring.

A new power plant has just been opened at Deschenes Rapids, near Ottawa, where electricity is generated for the Hull Electric Company, as well as numerous manufacturing concerns.

A by-law has been passed by the Barton Township council giving permission to the Cataract Power Co., to build a branch line from the Radial Railway station at Irondale, to the smelting works.

The plan for an electric road between Windsor and Leamington is taking definite shape, and a company will be organized shortly. Mr. J. F. Webb, of Ypsilanti, Mich., who is promoting the project, states that building operations will be commenced early in the spring.

There is a project now on foot to interest capital in the building of an electric railway between Toronto and Brampton, to connect with the local lines at both points. The proposed route of the road is along the lake shore as far as the Humber River, then around by way of Summerville.

The Hull Electric Co. has at last secured entrance into the city of Ottawa, Ont., arrangements having been made with the Pontiac & Pacific Junction Ry. to permit the Hull company to cross the new Inter-Provincial bridge at Aylmer, over its tracks. It is the intention of the Hull company to build a depot and waiting room at the Ontario end of the bridge.

Mr. Duncan McDonald, formerly superintendent for the Montreal Street Railway Co., was tendered a magnificent farewell on the eve of his departure for Paris. A procession of over 600 employees of the company, headed by their brass band, dragged the carriage containing Mr. McDonald and family from his hotel to the depot, where they gave him a rousing send-off.

The Montreal Street Railway Co. is making considerable additions to its power plant, having decided to put in new boilers, and two new 800-k. v. generators. These machines are being made by the Bullock Manufacturing Co. and are being rushed to completion. This is in addition to the large plant which is installing for the purpose of using the electricity generated by the water power at Chambly.

Considerable missionary work is being done along the route of the proposed electric line between Brighton and Heeley Falls, Ont. This road which is intended to pass through a number of smaller places between the terminal points named, is to be built in the most substantial manner, it being the intention of the promoters, (Messrs. Harden & Barber, of Brighton, Ont.) to connect with the Canadian Pacific Ry. at Havelock, and with the Grand Trunk Ry. at Brighton, and by allowing the locomotives of the former to use their

tracks, give them an outlet on the St. Lawrence River. Subscriptions are being solicited along the route of the proposed road, and the project is looked upon quite favorably by the various towns.

Negotiations are now in progress for the purchase of the Kingston street railway system. Mr. J. A. Shibley, the Napanée millionaire, has made an offer for the road, which will, in all probability, be accepted. It is not definitely known what Mr. Shibley's future plans are, but rumor has it that he contemplates considerably extending the existing lines as well as generally improving the property.

We are informed on good authority that the plan of the Toronto Railway Co. to take over the Metropolitan Ry. system has been consummated, and that the arrangement will go into effect at an early date. The Toronto Ry. will also extend its lines from the present terminus in the village of East Toronto to the village of Little York; work will be commenced as soon as the weather will permit.

The Hamilton city council is as yet unable to consider the propositions of the Hamilton, Guelph & Galt Electric Railway Co., for right of way through the city, and Mr. John Patterson, the promoter of the road, recently stated that the scheme had been abandoned. The action of the council in deferring action in the matter until it was too late to submit a by-law at the coming municipal elections is being freely criticized.

Advices from Victoria, B. C., state that the Alaska Exploration Co. intends building a million dollar electric street railway system, in Dawson City. This together with the fact that Messrs. Bemont & Ritchie, a firm of solicitors in Lindsay, Ont., are applying to the Government for an extension of the time allowed the Dawson City Electrical Co., in which to construct a road, with promises that work shall be commenced immediately the weather will permit, would indicate that the city will soon be provided with an up to date line.

A number of the existing electric railways throughout the province of Ontario, together with a number of the companies now applying for incorporation, will at the next session of the Provincial Legislature, ask for exemption from the statute prohibiting the running of cars on the Sabbath day, on the grounds that they do not come under the meaning of the act, being in every sense entitled to the exemption as common carriers of travelers. The Lord's Day Alliance will contest the application.

There were some amusing scenes around the street railway company shops in Montreal for two or three days prior to Christmas. The Montreal Street Ry., following its usual custom, presented each employee with a turkey and a plum pudding, and some of the discussions among the men, as to the fine points of their respective birds were worthy of publication. In all some 1,500 turkeys were distributed this year, and judging from the remarks overheard by your correspondent the feeling existing between the employees of the Montreal road and their officials is something of which the company may well be proud.

### NEW KANSAS CITY-ST. JOSEPH LINE.

In reply to an inquiry, Mr. P. A. Gibson, of Erie, Pa., president of the new Kansas City, (Mo.) & St. Joseph Electric Railroad Co., writes us that active engineering work upon the line will commence at once, and the road will be running by June next. The route starts north from Kansas City to Parkville; thence northwest through the center of Platte County to Platte City, the county seat; thence due north to Dearborn; thence north by way of Faucett to St. Joseph. Contracts are to be let at an early date.

The line will be built on private right of way, partly with 70 or 75 lb. T-rails, and partly with 90-lb. girder rails. There will be one or two steel bridges and several culverts.

The officers are: President, P. A. Gibson, Erie, Pa.; vice-president, C. E. Gibson, Kansas City, Mo.; secretary and treasurer, Robert P. McGeehan, Parkville, Mo. The company's offices are in the New York Life Building, Kansas City, Mo.



### CLOSED CARS FOR OIL CITY.

The car shown in the accompanying illustration is one of a lot recently purchased by the Citizens Traction Co., of Oil City, Pa., from the J. G. Brill Co. The length of the body is 25 ft., the length over the dashers 34 ft. The platforms are 4 ft. 6 in. long and are completely enclosed by round vestibules. The width at the sills is 7 ft. and over all 7 ft. 9 in. The car is mounted on 27-G trucks with nose suspension, and has one motor per truck. The trucks themselves are furnished with check chains in case of accident. The wheel base is 4 ft. For complete protection of motorman, conductor and passengers in stormy weather, vestibules are fitted with folding doors which close against the end of the car. The steps have 13-in. risers and are 16½ in. from the head of the rail. From the platform to the car floor is 8 in. A minor de-

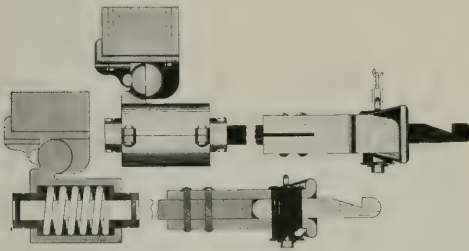


BRILL CAR FOR OIL CITY.

tail, usually considered of little importance, is the use of wood grab handles on the body of the car. For those who ride much, the wooden handle is decidedly superior to the bronze—there is no staining of the hands, as is the case with metal. The interior of the car has longitudinal seats of ash slats covered with Wilton carpet. Each post is provided with a push-button to signal the conductor. The windows have spring roller curtains of printed duck. The trim throughout is of bronze. Each end of the car is provided with Brill track scrapers and two Brill sand boxes. There are also two Dedenda gongs with the usual Brill angle iron buffers and radial draw bars. The cars have electric head lights set in the vestibules. The 27-G trucks with their powerful motors will enable these cars to maintain almost any desired speed and the addition of scrapers will, it is believed, render them even in the exposed country roads entirely independent of the snow plow, except in the heaviest storms. The weight of the car complete with air brakes and motors is 28,600 lb.

### AUTOMATIC COUPLER.

To meet a demand for a reliable and efficient automatic coupler for street, interurban and elevated railway cars that can be applied at comparatively small cost, the Auto Appliance Co., 1033-4 Marquette Bldg., Chicago, has placed on the market the device shown



THE "AUTO" CAR COUPLER.

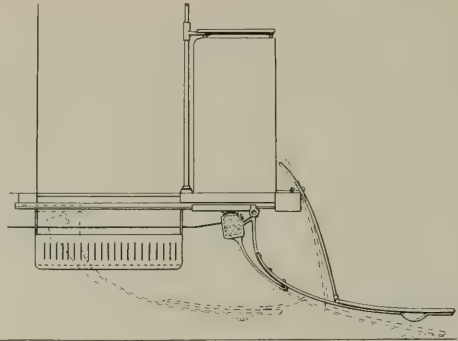
in the accompanying illustrations, and which is known as the "Auto" coupler. The spring is enclosed in a case having a top projection terminating in a sphere; this sphere engages a socket depending from a plate bolted to the sill or bolster. It will be noted

that there is a flange on the edge of this plate which relieves the bolts of the draft stresses. The gravity block in the head has a chain attached for manipulating the coupler from the platform.

The points to which the makers call attention are: The coupler is in but two pieces, which are fastened together; there is no changing of parts; the strength of the design; interchangeability of parts; there is but one spring; everything is under cover and protected from the weather.

### EUROPEAN MCGUIRE COMPANY.

The demand for home-made electric railway equipment in England has become so pointed that several American companies have found it necessary to establish European factories for the manufacture of their product. The McGuire Manufacturing Co., of Chicago, is among this number. Mr. W. A. McGuire, president of the company, has recently returned from Europe after establishing the European McGuire Manufacturing Co. The works will be built at Manchester, and it is expected that they will be completed by July 1st. The work of the McGuire Manufacturing Co. has attracted considerable attention; so much so, that many of the manufacturers of England are imitating as near as possible the McGuire products. The new company will not only build trucks, but all the articles which the old company now makes, such as snow-plows, snow-sweepers, sprinklers, fenders, stoves and brake handles. Until the new factory is completed, the McGuire Manufacturing Co., of Chicago, will fill all orders. While in England



MCGUIRE FENDER.

Mr. McGuire made patent application in all the European countries on his new design of fender. It is not unlike the one used in Chicago, and differs from it in that instead of folding up against the dashboard, it slips in under the car, a feature that is demanded in Europe, and may be desirable here. The company considers it as being more sightly than the old folding fender, and less liable to destruction. The German people are agitating the fender question very strongly. It is more than likely that all the railways of Germany will be required to equip their cars with fenders because of the number of deaths happening recently from this cause. The McGuire company thinks its fender is at least as good as anything offered, while it is much less expensive. On this ground it looks for a very large trade in Europe and America.

### CONSOLIDATION IN DETROIT.

On December 31st articles of association of the Detroit United Railway Co., capitalized at \$12,500,000, were filed with the secretary of state. The new company takes over the franchises and property rights of the Detroit Electric Railway Co.; the Detroit, Fort Wayne & Belle Isle Railway Co., the Detroit Citizens' Street Railway Co., and the Detroit Suburban Railway Co.

The following officers have been elected: President, James L. Edwards; vice-president and treasurer, J. C. Hutchins; secretary, J. F. Van Name; assistant secretary, E. A. Peters; consulting engineer, A. B. Dupont, now of St. Louis.

## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### WHETHER SHOULD LOOK AND LISTEN A QUESTION OF FACT.

*Riley v. Minneapolis Street Railway Co.* (Minn.), 83 N. W. Rep. 376. July 11, 1900.

As a general rule, it is a question of fact for the jury, to be determined from all the circumstances of each case, the supreme court of Minnesota holds, whether a party is guilty of negligence in attempting to cross a street railway track without first looking and listening for approaching cars.

### NEGLIGENCE OF DRIVER OF CARRIAGE NOT IMPUTABLE TO ONE RIDING WITH HIM.

*Noonan v. Consolidated Traction Co.* (N. J.), 46 Atl. Rep. 770. June 18, 1900.

When a person receives injury by collision with a car while riding by invitation, and without hire, in a carriage driven and owned by another, the negligence of the driver, the court of errors and appeals of New Jersey holds, is not imputable to him.

### MUST PAUSE AND LOOK AND LISTEN.

*Canedo v. New Orleans & Carrollton Railroad Co.* (La.), 28 So. Rep. 287. June 5, 1900.

In the syllabus of this case, where it reverses a judgment obtained for damages inflicted upon the plaintiff by being struck by a street car, the supreme court of Louisiana states that it is the duty of a person approaching a railway track to pause and look and listen, and govern himself with prudence, according as the situation demands.

### CONDITION OF HEADLIGHT NOT PROVABLE BY SUBSEQUENT OBSERVATION.

*Moldenhaur v. Minneapolis Street Railway Co.* (Minn.), 83 N. W. Rep. 381. July 11, 1900.

Inferences or conclusions based on observations of the headlights of other cars, under dissimilar conditions and circumstances, made by a witness for a year after an accident, the supreme court of Minnesota holds to have no reasonable tendency to show that the company did not exercise ordinary care in keeping the headlight in question in proper condition, and hence the admission of such evidence is prejudicial error.

### NOT LIABLE FOR PULLING OVER DERRICK DUE TO CITY'S NEGLIGENCE.

*Baltimore Consolidated Railway Co. v. State* (Md.), 46 Atl. Rep. 1000. June 15, 1900.

A street railway company is not liable, the court of appeals of Maryland holds, for damages done by pulling over a derrick being used in the street by the city where the negligence causing the disaster is purely that of the city, the fault being solely that of the city's employes in causing a cable attached to the derrick and crossing the street railway track to slacken, while the car is passing under it, so as to catch on the base of the trolley pole.

### MUST KNOW THAT TRACK IS SLIPPERY AND TAKE CARE ACCORDINGLY.

*Sickler v. North Jersey Street Railway Co.* (N. J.), 46 Atl. Rep. 779. June 11, 1900.

It appeared in this case that, when the plaintiff was about to drive on the car track, the car was several hundred feet away, and there was nothing to prevent the motorman from seeing him. The plaintiff, the supreme court of New Jersey goes on to say, had the right of way, and the motorman's duty was to hold his car in control, so as to avoid collision. The fact that the track was slippery did not excuse him. He knew, or should have known that fact, and was bound, the court holds, to take care accordingly.

### THE AUTHORITIES AUTHORIZED TO GRANT CONSENT TO USE OF BRIDGE.

*Town of Lysander v. Syracuse, Lakeside & Baldwinsville Railway Co.* (N. Y.), 65 N. Y. Supp. 415.

The authorities who are bound to maintain and repair a highway bridge, and not those who may enforce village by-laws or regulations thereon, a special term of the supreme court of New York, Onondaga county, holds, are the ones in control, within the meaning of the railroad law and the constitution, and are the ones in whose discretion is vested the power to consent to its use for the construction thereon of a street railroad.

### CANNOT INCORPORATE AS RAILROAD FOR CONVEYANCE OF PERSONS ONLY.

*Chicago & Northwestern Railway Co. v. Oshkosh, Algoma & Black Wolf Railroad Co.* (Wis.), 83 N. W. Rep. 294. June 2, 1900.

What is really a street railroad corporation, for the carriage of passengers only, the supreme court of Wisconsin holds, cannot be legally formed under section 1820 of the Revised Statutes of Wisconsin of 1898, although the section provides that any number of persons not less than five may form a corporation for the purpose of constructing, maintaining and operating a railroad for public use in the conveyance of persons or property, etc.

### LIABILITY FOR MOTORMAN BEING AWAY FROM HIS POST.

*Montgomery v. Johnson* (Ky.), 58 S. W. Rep. 476. Oct. 3, 1900.

A judgment for damages is affirmed in this case by the court of appeals of Kentucky, notwithstanding it says that there was evidence which would have warranted a different verdict, because it declares it cannot say that the jury was not warranted in concluding that the motorman's neglect, in being away from his post and inside the car fixing a seat, was the proximate cause of the injury, and that the collision might have been avoided by proper care on his part, after he perceived, or should have perceived, by the exercise of ordinary care, the danger there was on account of the team that whirled across the track just in front of the approaching car, showing that it was frightened.

### WILL NOT ENJOIN TRIMMING BY LESSEE COMPANY THAT WILL NOT MATERIALLY INJURE TREES.

*Huntington v. Hartford Street Railway Co.* (Conn.), 46 Atl. Rep. 824. July 13, 1900.

No injunction will be granted against the trimming of trees in the construction of a street railway, the supreme court of errors of Connecticut holds, where it is admitted, as by demurrer, that such trimming will not materially injure the trees, injunction being a writ which does not issue to prevent immaterial injury. Moreover, the court holds that it is a sufficient statement of the power to lay tracks of a company authorized to take leases of the property and franchises of any other street railway companies with which its tracks may connect that it is stated that a certain other company had power to lay tracks and that a lease has been taken from it.

### CONTRIBUTORY NEGLIGENCE IN MANNER OF DRIVING HOSE CART ACROSS TRACK.

*Birmingham Railway & Electric Co. v. Baker* (Ala.), 28 So. Rep. 87. April 18, 1900.

To drive a hose cart summoned to a fire along a street and over a cross street on which later there is a street railway track as fast as the horses drawing the cart can run, and without any effort to check the speed of the hose cart upon its approach to the street railway track, the supreme court of Alabama holds, is too plainly



negligence to admit of a doubt, and that it is wholly immaterial which had the right of way in the street—a car on the track or the hose cart—or whether the car, with which the cart collided, was at a standstill or had been started so that it was suddenly brought to within about eight feet of another track on the street on which the hose cart was being driven.

#### DUTY OF PASSENGERS IN VEHICLES TO LOOK OUT FOR CARS, ESPECIALLY IN SUBURBS.

*Wosika v. St. Paul City Railway Co. (Minn.)*, 83 N. W. Rep. 386. July 5, 1900.

The reciprocal relations of the public and a street railway company, the supreme court of Minnesota holds, vary according to circumstances and conditions. For example, a distinction, it says, is made as to their relative rights and duties in the populous and in the sparsely settled parts of a city. And it holds that the driver of a vehicle who drove upon a street railway track in the suburban, thinly settled district of a city, where the public use of the street was limited, without looking for approaching cars, was guilty of negligence. Moreover, one who, under such conditions, is riding in a rear seat, and who has no direct control over the horses at the time, but who is a joint contributor to the hire of the team for the occasion, is guilty of negligence, the court holds, if he does not look for approaching cars upon crossing a street car track. But, under such circumstances, a mere passenger, who has no control over the team, it holds, is not guilty of negligence in failing to look out for cars when crossing the track.

#### WOULD MAKE WANTONNESS OR ACCEPTANCE OF ORDINANCE CONDITION TO LIABILITY.

*Holwerson v. St. Louis & Suburban Railway Co. (Mo.)*, 57 S. W. Rep. 770. June 12, 1900.

In delivering what purports to be the opinion of the supreme court of Missouri, division No. 1, in this case, Mr. Justice Marshall says that, as it was conceded that the party for whose death this action was brought to recover damages was guilty of "prior negligence"—that is, contributory negligence—and as there was no allegation or proof of wantonness in the case, it followed that the plaintiff was not entitled to recover at all, and that therefore as the jury found for the defendant, and that verdict was in accordance with the true law, the trial court erred in granting the plaintiff a new trial, no matter what errors of law the court committed in giving or refusing instructions. Another point for which the opinion stands is that, while a city, under its police power, may enact police regulations, and enforce them by penalty in its own favor, the violation of such ordinances does not create a civil liability in favor of one citizen and against another, and hence a street railway company is not rendered liable to third persons by a violation of an ordinance regulating the operation of its road, it having in no way ever agreed to be bound thereby. The other justices concur in the result only.

#### RIGHT OF PASSENGER TO RELY ON SAFE PLACE BEING SELECTED TO STOP.

*Bass v. Concord Street Railway (N. H.)*, 46 Atl. 1056. Mar. 16, 1900.

The supreme court of New Hampshire is not willing to commit itself to the doctrine that it is the duty of all alighting passengers to look, and that, if they fail to do so, they are guilty of negligence as a conclusion of law. It says that the rule in that state is that each case is to be determined in the light of its own circumstances. And it asks why, if another plaintiff might rely upon the assistance offered by the conductor and brakeman as an assurance of safety, might not this one rely upon the assumption that, if the place was not safe, she would be assisted or warned by the conductor? So, considering all the surrounding circumstances—the plaintiff having been accustomed to alight where the ground was as high as the top of the rails, the conductor having been notified that she wanted to alight at the usual place, the conductor having failed to stop at that place, but stopped the car a little beyond it, where there was a depression of from two to eight inches, on the signal of another passenger, and the plaintiff having a couple of bunches of flowers

and a wrap to take attention—the court does not consider that it conclusively appeared that her conduct was not such as reasonable prudence required, in alighting without looking at the place, or that she was not justified in assuming upon the information she possessed, that it was safe to alight where and as she did.

#### EFFECT OF PAVING COMPANY'S NEGLIGENCE ON CONTRACT TO KEEP STREET IN GOOD ORDER.

*State v. New Orleans & Carrollton Railroad Co. (La.)*, 28 So. Rep. 111. June 4, 1900.

The railroad company was bound by contract to keep a street upon which it operated its street railroad in good order. Thereafter, the city made a contract with a paving company, to which contract the railroad company was a party, whereby the paving company assumed for a limited period the same obligation as the railroad company was under. That is to say, by this three-party contract, the paving company was to pave the street, keep it in good order and condition for five years, and deliver the same at the expiration of that time in perfect good order and condition, etc., and the railroad company stipulated in this contract to keep in repair that part of the street covered by the paving contract, to begin on the date of the expiration of the five years during which the paving company was required to keep it in repair. During said period no call was made by the city on the railroad company, but the street was neglected and allowed to fall into a condition of abnormal disorder, requiring an unusual expenditure to put it in good order. Then an application was made by the state, on the relation of the city, for a writ of mandamus to compel the railroad company to put the street in good order and repair, according to its contract. But, under the circumstances, the supreme court of Louisiana holds that the city should restore the street to a condition of good order, before the railroad company could be required to keep it so, though the railroad company, in another action, the court says, might perhaps be liable to contribute an amount equal to the expenditure which it might have been obliged to make under its contract. The obligation to keep a street in good order, the court further holds, necessarily involves repairs, and repairs may involve the use of new material, and this may be called "reconstruction," but it is nevertheless included in the obligation to keep the street in good order.

#### CONTRIBUTORY NEGLIGENCE IN CHILD INJURED ATTEMPTING TO CROSS TRACKS.

*Fitzhenry v. Consolidated Traction Co. (N. J.)*, 46 Atl. Rep. 698. June 18, 1900.

The rule of duty which requires the ordinary traveler in crossing a street railway to use his powers of observation to discover approaching vehicles, and his judgment how and when to cross without collision, the court of errors and appeals of New Jersey holds, is also binding upon a child that is sui juris, as it is called, or having legal capacity to act in the matter in its own right. Continuing, it says that in actions for injury to a child of that degree of responsibility when so crossing a street railway, the question of contributory negligence is generally one for the jury; but where it appears beyond dispute that the child, in its attempt to cross, acted in entire disregard of the degree of prudence which may be reasonably expected from one of its years, and has thereby contributed to the collision that caused the injury, then the question, contrary to the usual rule, becomes one for the court to determine. And this doctrine the court applies to this case, holding that a nonsuit should be sustained on the ground of contributory negligence, where a girl 9 years of age was injured by a collision with an approaching car while she was in the act of crossing a trolley track in a city street. In other words, the court thinks that when she attempted to cross the tracks at a quick pace, as she did, either in front of the car which she saw, or by rushing heedlessly into danger without looking, she acted in such entire disregard of her duty that there was room but for one opinion, and that was she was guilty of contributory negligence. Inasmuch as she lived only a block or two away from the street on which the accident occurred, the court holds that it must assume that she was familiar with the running of the trolley cars there, and the danger of collision therewith in crossing their tracks unless care was exercised.

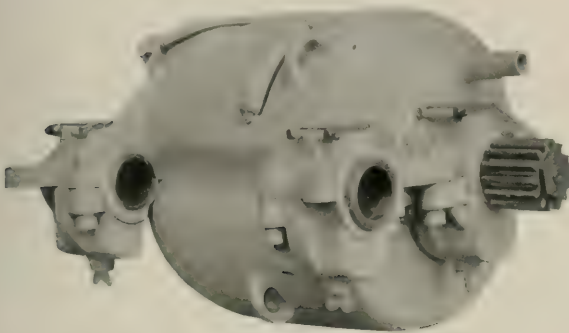
## THE BRUSH ELECTRICAL ENGINEERING COMPANY'S ELECTRICAL TRAMWAY EQUIPMENTS.

The Brush Electrical Engineering Co. has been the pioneer of British-made traction equipments, and credit is due to it for the successful manufacture of a line of standard apparatus competing in cost and excellence with the foreign-made equipments which were first in the field and backed by the prestige of a lengthened experience. The company can now point to equipments of its own make in which all initial difficulties have been surmounted, and

of an efficient equipment for narrow-gage lines requiring high speed on a gradient is the adoption of bogie trucks with four motor equipments.

The 25-h. p. motor of this class is a serviceable compromise between these extremes, and fills all the requirements as to speed and tractive effort for an average line. We give herewith its characteristic curve.

The rating of traction motors is a matter which is seemingly

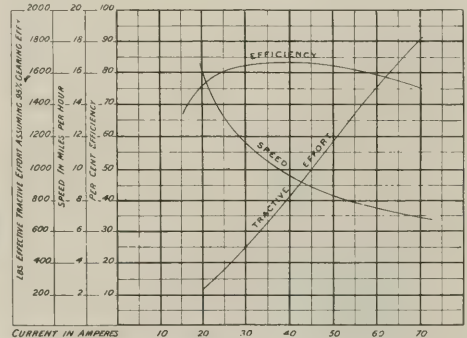


1000 TYPE BRUSH MOTOR CLOSED.

can confidently affirm that today Brush traction apparatus holds a position second to none in every essential that makes for success.

We illustrate the Brush standard motor for lines of 3 ft. 6 in. gage, known as the 1,000 type, and made with four different windings to give 17 h. p., 25 h. p., 30 h. p. and 35 h. p., at their standard rating.

The lower-rated motor is specially suitable for tramways without heavy gradients and with single-deck cars where a high speed is not required. It has a very high force factor, enabling a start to be made with a very small current. The 35-h. p. motor of this

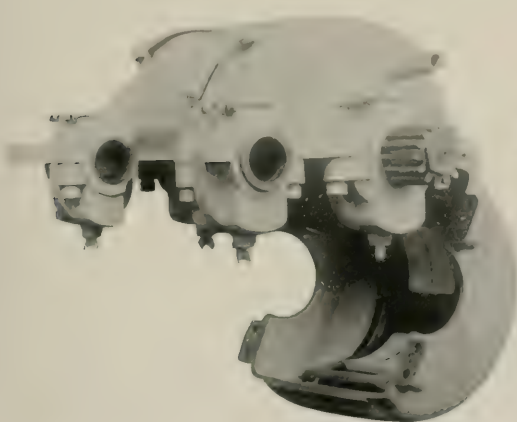


Safe Speed (m.p.h.) = miles per hour  $\times 1.475$   
 Armature . . . . .  $\times 53.75$

CHARACTERISTIC CURVE OF 1000 A TRACTION MOTOR.

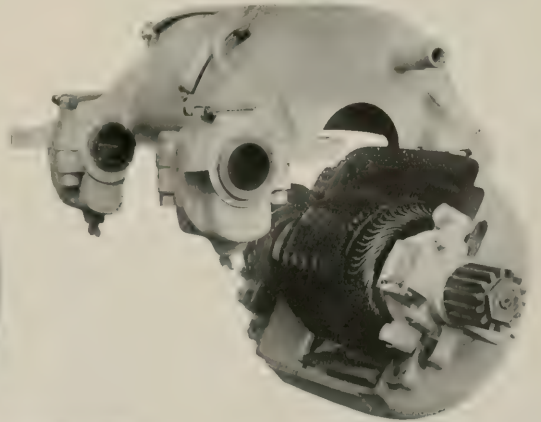
unimportant, but which nevertheless influences the purchaser and the use to which the apparatus is put. The standard American rating is based on one hour's run at rated load with a temperature rise of 135 degrees F. It is quite clear that this rating is empirical and is not intended to represent actual working conditions. The Brush company's rating is based on a rise of 115 degrees F. after one hour's run at rated load, and it claims that this represents more nearly the capacity of the motor to do its work without injurious heating.

Besides the 1,000 type, the Brush company is also offering a



1000 TYPE BRUSH MOTOR OPEN.

type has been made simply to satisfy the demand which is frequently found in specifications, for a 35 h. p. to fit a 3 ft. 6 in. gage. The limitation of space available on a 3 ft. 6 in. gage are such as to make it inevitable that a motor to develop 35 h. p. must run at a high speed. This means a low force factor and a very large increase of starting current. Apparently the only solution



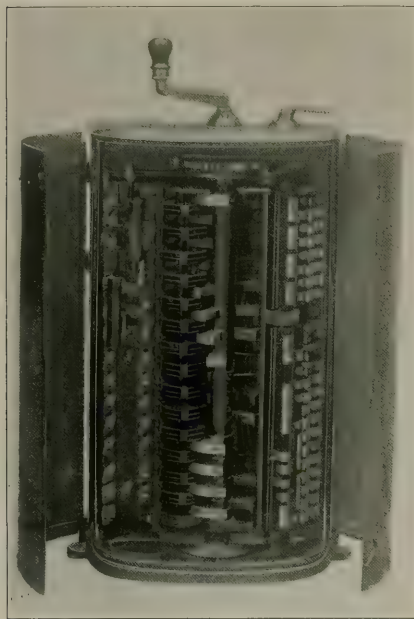
type of motor known as the 1,200, a type which is suitable for tramways of standard gage. This motor is rated at 35 h. p. at a low speed, and can handle the heaviest kind of holiday traffic on steep gradients without any danger of overheating.

The question of overheating is in fact the crux of the traction motor problem. The motors may exert on test and show on their



characteristic curves the necessary combination of speed and torque, but the proof of a good motor is its capacity to work at a temperature that does not quickly bring it into the repair shops. It is true that performances are sometimes demanded which are outside the possibilities of the dimensions available, but on the other hand the influence of good ventilation will often go a long way.

The ventilating arrangements on the Brush motors are very efficient indeed. The upper pole pieces are slotted out from their face to the outside of the frame and the openings are protected by a shield and a raised edge. The armature has a ventilating slot from the shaft to the periphery and air ducts parallel to the shaft supply air at a low speed, which is thrown out at the periphery and blown through the pole faces to the outside. This ven-



BRUSH H D 2 SERIES-PARALLEL CONTROLLER.

tilation (which is said to be the only positive ventilation yet fitted to a motor) is extremely effective and has enabled the Brush motors to be rated 20 degrees F. below most of the motors on the market, of similar capacity.

The frame is made to open downward, and the armature, by a very simple arrangement shown in our illustrations, can be lowered with the bottom half, or left suspended in the top half, as may be convenient.

Another feature of the motors is the application of automatic oil ring lubrication. This improvement is of the utmost importance in keeping down the cost of repairs and renewals. The life of the bearings is increased from three to four times that which is usual with grease lubrication, and the effect on the wear of the gear wheels is almost equally marked. The reason for this is often overlooked, which is that any wear in the motor axle bearings leads to a displacement of the gear pitch circles and a corresponding increase of wear and low efficiency. It is therefore true economy to give as much attention to the axle as to the armature bearings, and without oil lubrication this is not easy to do.

The Brush company makes several types of controllers, among them being the H1 single motor controller, H2 series parallel emergency brake type, HD2 series parallel controller with rheostatic brake, and the HG2 series parallel controller with emergency stop and a regenerative position by means of which the car may return energy to the line when descending long and steep inclines.

All these controllers are made with great accuracy and attention to details.

Besides the two chief items of traction equipments, motors and controllers, the Brush company makes the smaller accessories, such as rheostats, fuse boxes and canopy switches. When in addition to this we remember that it is also one of the largest builders of car bodies, and that it has just begun to place a whole line of standard trucks on the market, it must be admitted that they are in an unassailably advantageous position to supply the growing demand for electrical traction apparatus.

### PLASTIC-ALLOY BOND TEST.

A test was made recently of the Edison-Brown plastic-alloy bonds which were laid in Camden, N. J., five years ago. The test was as follows:

Beginning on the north side of Stevens St., and reading north to Mickel St., covering all joints in both rails, the average reading was .002 millivolts. The highest reading was .004 millivolts; this was one joint lying between several short sections of rail at the corner of Stevens St. on the north side. From the south side of Stevens St. south to Berkley St., the highest reading was so low that although the instrument was of the most delicate character, the reading was too small for practical figures. The average joint showed a reading of .001 millivolts, which was less than the same length of unbroken rail section which read from .003 to .004 millivolts.

Regarding this test General Manager Harrington of the Camden & Suburban, writes: "I have the pleasure of reporting the test made on Edison-Brown plastic bonds which were placed on section 200, Pennsylvania Steel Co's. girder rail (9-in.) in the fall of 1895.

"This test we made on South Fifth St., between Mickel and Berkley, on Friday, Nov. 16, 1900. The instrument used was one of the Weston Electrical Instrument Co's. make, reading in millivolts to the fifth decimal point. The only comment I can make upon the result is that it is very gratifying to know that work done years ago with your plastic alloys, and which at the time was considered a risky experiment, has been shown, after five years, to be a decided success."

### CINCINNATI, NEWPORT & COVINGTON.

President Ernst, of the Cincinnati, Newport & Covington Railway Co. sends us a condensed statement for November, 1900, which shows that the gross receipts for the month were \$63,007, as against \$60,089 in November, 1899; operating expenses \$28,290, as against \$23,213; toll, taxes and damages, \$12,315, as against \$11,981; net profits \$22,403, as against \$24,894. For the 11 months net profits were \$288,561, as against \$254,724 for the corresponding period of 1899.

The ratio of expense to earnings for the month were .5695 with tolls and .4489 without tolls in 1900, and .5072 with tolls and .3863 without tolls in 1899; for the 11 months they were .5260 with and .4088 without tolls in 1900, and .5243 with and .4023 without tolls in 1899.

### MR. CONNETTE'S WORK AT SYRACUSE.

We learn from a Syracuse, N. Y., paper that the public is greatly pleased with the improvements in the service of the Syracuse Rapid Transit Co. that have been made in the last year, and Mr. E. G. Connette, vice-president and general manager of the company, was heartily congratulated upon the results. Considerable money has been expended in making extensions and improving the rolling stock, while by uniting separate lines and rearranging the schedules Mr. Connette has been enabled to give a more frequent service while reducing the number of car-miles run per week by 10,000. Gross receipts for the first seven days of December were \$1,566.60 in excess of the corresponding week in 1899, and the car-miles run were 9,969 less.

Consolidated Traction, Pittsburg, has sold land formerly occupied by cable power stations, for \$368,000.

## IMPROVED ELECTRIC HEATERS.

With a record of six years, during which it has supplied over 60,000 electric heaters, the Gold Street Car Heating Co. now places on the market an improved design, known as the "Ideal." One of the first changes to which attention is called is the doing away with three of the supporting rods within the casing with the result of improving the circulation of air through the heater coils. The casings are made of wrought instead of cast iron as in the former designs, giving stronger and lighter casings; the saving in weight is 150 lb. per car where an eight-heater equipment is used. The back of the casing is stamped, ridges being provided to increase the stiffness, and an asbestos lining provided which resting on the ridges makes a series of air chambers, greatly reducing the heat radiated from the back. Both front and back are japanned.

Fig. 1 shows the exterior of the "Ideal" heater. Fig. 2 is a view of the interior; the supporting rods rest in solid porcelain blocks at each end, to which the binding posts, one for the single circuit

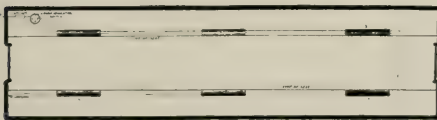
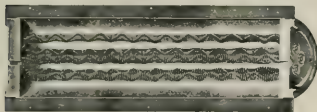


FIG. 4

and one for the double circuit, are attached. Six rods hold the coils; three are wound with larger wire than the others and give twice the heat, three coils giving one-third and the other three two-thirds. The coil and support are shown in Fig. 3 and do not differ from those heretofore used. It is claimed that the wire used does not deteriorate with age or use, so that the current consumption remains the same.

To provide a uniform distribution of the heat one-third (heating capacity) of each heater in the car is connected to point 1 on the regulating switch, two-thirds of each heater to point 2 and the whole to point 3. The switch is of sufficient capacity to control a heater circuit using 30 amperes at 500 volts and will stand the most severe usage. Only the handle projects through the cover which has a hole through which a number shows indicating the contact point then in use. The wiring is shown in Fig. 4.

The company now makes about 30 different styles of heaters, all constructed on the same principle, but adapted for different styles of cars, and it is believed that every detail from the trolley connection to the ground contact has been perfected.

A branch office of the Gold Car Heating Co. is maintained at No. 658 Rookery Bldg., Chicago, the main office being at Frankfort and Cliff Sts., New York.

According to the report of Maj. Isaac B. Brown, chief of the Pennsylvania Bureau of Railways, for the fiscal year ending June 30, 1900, out of a total of 94 street railway companies operating in Pennsylvania but 20 companies paid dividends during the year.

## OHIO NOTES.

(From Our Own Special Correspondent.)

The Toledo, Fremont & Norwalk Electric Ry. has inaugurated its freight system, new cars having been put in service.

General Manager Thomas H. McLean, of the Toledo Traction Co., whose health has been impaired for some months, is traveling in South America.

The new Toledo & Western Electric Ry. is rapidly nearing completion. The road is now being ballasted as far as Sylvania, and the power house machinery is being put in place. The rolling stock is all ready to be shipped.

The Columbus & Buckeye Lake Traction Co., which has in the course of construction a line from Columbus to Newark, has contracted with the Westinghouse company to furnish all the apparatus for the motive power for the new line. The amount of the contract was about \$160,000.

New York capitalists are interested in a project to connect Toledo and Columbus by electric railway. The proposed route is almost an air line from Columbus to Tiffin. It is the intention of the promoters to run from three to five cars in a train, at high speed, the third-rail system being used.

The Sandusky Interurban Electric Railway Co. has amended its charter so as to permit it to build branches from near Ceylon to Berlin Heights and Norwalk, and another from Oak Point in Lorain county, through North Amherst to South Amherst. The principal shareholders in this company are C. H. Stewart, E. W. Moore, Barney Mahler, Henry A. Everett and W. H. Price.

The secretary of state has issued papers of incorporation to the Northern Ohio Electric Co., of Defiance, with a capital stock of \$25,000. The projectors intend to build a road from Bryan to Defiance. Wm. D. Sherwood, Ellis Bartholomew, Charles H. Adkins, Charles H. Hubbard, C. A. Bartholomew, Herbert C. Warren, James N. Mehuin, Edwin W. Fink and G. L. McKibben are the incorporators.

The following have been chosen as officers and directors of the new electric railway known as the Norwalk, Ashland & Southern: President, C. P. Wickham, Norwalk; vice-president, John H. Beattie, Norwalk; secretary, J. R. McKnight, Norwalk; treasurer, C. F. Jackson, Norwalk. In addition to these, Judge G. T. Thomas, J. C. Curtis, Norwalk; H. A. Thomas, Ashland; John L. Pratt, Olena, and Josephus Clark, of New London, were elected as directors.

## A PECULIAR ACCIDENT.

Recently the Lynn & Boston R. R. was sued for \$7,500 damages on account of a woman having her back hurt by the brake handle. The injury was caused by the trolley rope catching in the brake handle and the trolley flying off the wire, throwing the handle around, and striking her. The railroad company claimed that it was not to blame and the attorney for the plaintiff claimed that it was, as the car was not equipped with "one of those little round things that the trolley rope ran in and out of," meaning the Wilson trolley pole catcher. The defendants' defense was that the road was always up to modern improvements and at the time of the accident the device named was not on the market. The judge charged the jury that if it was the common and best practice, at the time the accident occurred, to tie the rope to the brake handle, then the defendant was not to blame, but the road must always follow the best practice in order not to be held liable. The defendant having proved that the trolley catcher was not on the market, the jury found for the company.

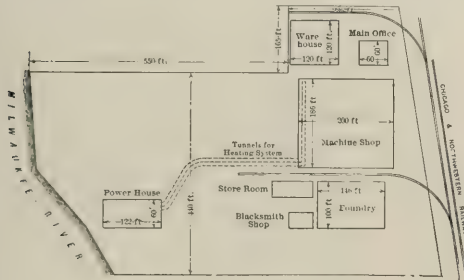
The United Traction Co. has reduced the fare from McKeesport, Pa., to the Wilmerding terminus, over the new short line, from 10 to 5 cents.





The new works are on the Milwaukee River, between it and the main lines of the Chicago & Northwestern Ry., and near River Park. The lot is nearly 10 acres, the buildings being arranged as shown in the general plan. There are two switch tracks from the railroad, one being used for receiving and one for shipping.

The foundry is 100 x 146 ft. and was first used in March, 1900. The equipment of this building is particularly complete, including



GENERAL PLAN OF WORKS.

traveling cranes, and all the sand mills, tumbling barrels, emery grinders and blowers are driven by individual enclosed and dust-proof motors. The steel furnaces are arranged for using oil fuel, which is controlled by compressed air, with efficient devices for preventing overflow or waste. The elevators for taking metal and fuel to the charging platforms of the cupolas are operated by compressed air, as are also the hammers, tamping tools, etc.

The machine shop which was commenced in February, 1900, is 186 x 200 ft. and is shown in section in one of the accompanying illustrations. The ground floor is for erecting heavy machinery. There are two bays 32 ft. wide with traveling cranes; on each side is a gallery 32 ft. wide, and in the center a gallery 51 ft. wide, and connecting bridges at each end of the shop, giving access between the galleries. In the center of the building a third floor 51 ft. wide is provided for lighter machinery. An intermediate



CORE DEPARTMENT AND HEATING APPARATUS.

floor is provided for storage purposes between the first floor and second gallery. On this floor are lavatory, wash room and coat room for the employee, the space occupied for this purpose being 16 ft. wide by 125 ft. long. The machinery is so arranged that the floor work is continuous with the least possible amount of carrying, and enables finished parts from the machines to be readily delivered either to the storage room or directly to the erecting

benches when required. One side of the shop is for the heavy machinery and the other has the erecting benches and testing apparatus.

The power house is 60 x 125 ft. and its equipment comprises two 130-h. p. Babcock & Wilcox boilers, one horizontal, automatic cut-off engine of 200-h. p. and 82-kw. generators of the Christen-



VIEW OF WORKS FROM RIVER.

sen company's own make. At one end of the power house is a room 24 x 60 ft. in which are installed the engine and heaters of a hot air heating and ventilating plant which was furnished by the William Bayley & Sons Co., of Milwaukee. A tunnel built of tile, 400 ft. long, conducts the heated air to the machine shop,



TOPS OF HEATING TUNNELS.

and another similar conduit enables the blowers to draw their air supply from the shop, sufficient fresh air being supplied by leaks in the windows. The electric cables are laid in the return tunnel.

The Christensen Engineering Co. is an extensive manufacturer of generators and power motors and is equipped to build generators up to 300 kw. capacity, for which it makes its own castings. Mr. George J. Cadwell, who was formerly with the General Electric Co., is sales manager of the motor department of the company, which enters its new field with a highly creditable record as a manufacturer, the latest facilities, and experienced men, and will enter an active campaign.

### FAST SERVICE BETWEEN DETROIT AND BAY CITY.

A fast trolley service between Detroit and Bay City will shortly be inaugurated, according to a traffic agreement recently effected between the Saginaw Suburban Electric; the Detroit, Lake Orion & Flint; the Detroit, Rochester, Romeo & Lake Orion; the Detroit & Pontiac, and the Detroit Citizens' Railway Cos. The distance between Detroit and Bay City, about 100 miles, can be made in 4 hours 30 minutes, and the rate of fare will not exceed 1½ cents per mile. The line of the Saginaw Suburban company is being rapidly constructed, and will be completed in the early spring. All the bonds of the company have been taken by Hiller, Clark & Co., of New York, the result of a contract with the International Construction Co.

The Rockford (Ill.) Railway, Light & Power Co. has petitioned for the right to extend its line to Avenue B east across the new North Town bridge and upon the highway to the intersection of North Second St. and the city limits. The bridge has yet to be completed.



## RAILWAY ADVERTISING.

We believe that many street railway managers might well ask themselves whether they are doing all they should to advertise their lines. The article on advertising street railways written by Mr. H. L. Beach, that appeared in our issue for August, 1900, page 495,

# S K A T I N G

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## HACKENSACK ICE-POND

Terminus Hudson River Line

Admission Free      River Street, Hackensack

Electrically Illuminated

New Jersey & Hudson River Railway & Ferry Company

showed the advantages of systematically presenting the attractions of a road to amusement seekers in summer. There are many street railways which also have winter attractions to offer, and there is no reason why they should not be properly advertised.

The New Jersey & Hudson River Railway & Ferry Co. has de-

### An Evening at the Theater *versus* A Night's Trip to the Theater

Take the "HUDSON RIVER" CAR leaving Hackensack 7.15, Englewood 7.17 P.M., reach foot W. 130th St. 8.02, and go to the HARLEM OPERA HOUSE, 125th St. and 7th Ave., where *all the best productions* appear. Returning, leave foot W. 130th St. at 11.15 or 11.45 P.M., and reach home by 12.06 or 12.36 A.M. Compare this trip with present steam-railroad schedules to lower New York theaters, and note *saving of from one-half to one and one-half hours.*

NEW JERSEY & HUDSON RIVER RAILWAY & FERRY CO.

voted a great deal of care to its advertising matter, and we have during the past year illustrated or described several of its circulars. At present the company is using placards which are shown reduced herewith; the originals are 12 x 18 in. and are displayed on the

## Shopping in Harlem

The 125th Street Department and other Stores sell as fine goods at prices as low as those in lower New York. Take the HUDSON RIVER LINE and save CARFARE and TIME

New Jersey & Hudson River Railway & Ferry Company

New Jersey & Hudson River Railway & Ferry Company

ferry boats and in the cars of the company. Pocket cards, 3 3/4 x 6 in. in size are placed in card racks within the cars, ferry boats and ferry houses; the pocket cards have time tables on the reverse side.

## DAYTON LINES TO BUILD A UNION DEPOT.

The several interurban street railway companies having Dayton, O., for their headquarters project building a union passenger and freight depot in that city. A site in the heart of the down town district may be secured for \$100,000, and the building, it is estimated, would cost nearly a half million dollars. The erection of a union depot is virtually necessitated by the increasing traffic on both local and interurban lines.

## CHICAGO ELEVATED DAMAGE SUIT.

In the case of the trustees of the Monadnock Building, Chicago, against the Union Elevated Railroad Co., for \$300,000 caused by building the road in Van Buren St., and shutting off light and air, making noise and dust, interfering with egress and ingress, etc., a demurrer by the defendant was sustained by the court on January 5th. It is interesting to know that while it is alleged that the elevated road has depreciated the property \$300,000, for the last 18 months the rents in this building have been increased as the leases of tenants expired from time to time, the increase ranging from 25 to 33 per cent.

## ASSESSMENT OF NORTH JERSEY COMPANY.

The State Board of Taxation of New Jersey has fixed the appraisal of the tracks of the North Jersey Street Railway Co. in Newark on the following basis: The actual cost of reproduction, plus cost of labor in laying the roadbed, exclusive of relaying pavement, the cost of overhead construction, etc., was taken, and 14 per cent subtracted as an allowance for depreciation.

## PORTABLE TELEPHONES.

For dispatching and regulating cars on interurban and suburban electric roads a reliable telephone system has come to be an essential adjunct, and it is particularly desirable to have a system whereby conductors and linemen may communicate with the general office from any point on the line. To meet these requirements



COUCH & SEELEY PORTABLE TELEPHONE.

the Couch & Seeley Co., of Boston, has perfected the portable telephone set shown herewith.

The entire mechanism, including a magneto bell, a four-bar generator, two cells of dry battery, and a combination transmitter and receiver attached to one handle, is enclosed in an oak box, 12 x 7 1/2 x 7 1/2 in., very strongly made, the whole outfit being compact and built to stand rough usage. Connection can be made with overhead wires by means of a jointed pole, or through plugs and jacks on the trolley poles at frequent intervals along the way.

## CONSOLIDATION OF SUPPLY INTERESTS.

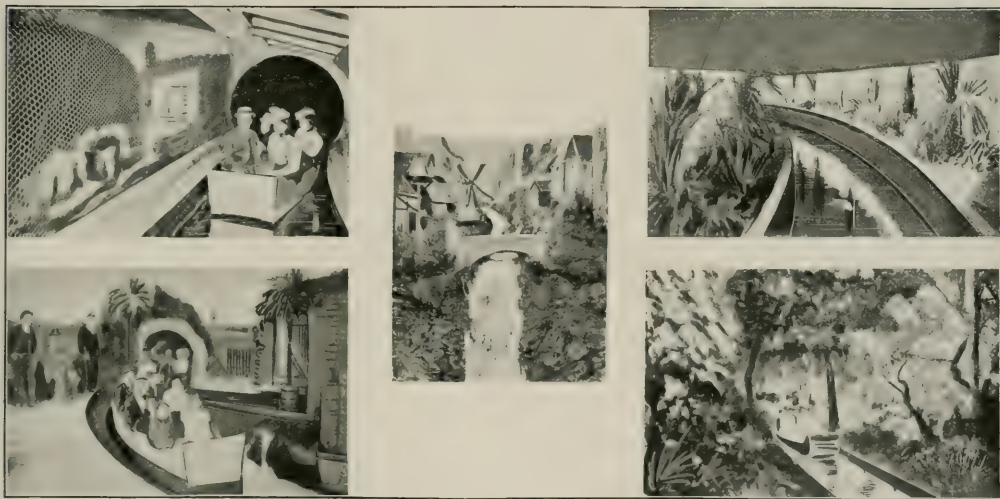
It is officially announced that the Railroad Supply Co., with headquarters in the Western Union Building, Chicago, has taken over and will hereafter transact the business formerly carried on by the Q & C Co., the Railroad Supply Co., and the Q & W Co. All the well-known specialties of the three firms, including Q & C street railway supplies, Hein couplers, Chicago crossing signals, pneumatic tools, metal cutting tools, tie plates, etc., will be sold by the new company, and for the present at least there will be no change in the staff of traveling representatives. Mr. D. S. Wegg is chairman of the new board, and Mr. C. F. Quincy is president.

### AN ARTIFICIAL RIVER FOR RESORTS.

The Aquarama Co. of 150 Nassau St., New York, has brought out a new attraction for parks and pleasure resorts. This is a slightly inclined wooden sluice-way 5 ft. wide, with sides 24 in. high, covered above by a wooden roof of either square, circular or hexagonal form. Over the sluice-way runs a current of water sufficiently swift to move boats seating from four to six persons, and along the banks of this miniature river are placed tunnels, novel lighting effects and interesting scenes that may represent any locality or event desired. The river winds its way for a distance of about one thousand feet in a sinuous course, and the easy, quiet drifting motion, unattended by mechanical movement, together with the surprises met with at every turn, make this new amusement exceedingly popular with the pleasure-loving public. It is one of the best attractions that can be used at pleasure

### EMPLOYEES TO BUY STOCK.

The Cincinnati Street Railway Co. has decided to permit its employes to purchase shares of its stock at par, and pay for them either in installments or in full at one payment. The stock is issued in shares of \$50 par value, and is at present quoted around 130. The shares will be transferred to the name of the employee desiring to buy them as soon as he has made his first payment, and they will be held by the company until paid for in full, interest being allowed on the money paid in until the shares are fully paid up. The stock will then be held by the company for five years, if the employee remains with the company, and at the end of that time will be delivered to the purchaser. If the employee leaves the company's service before the five years are up, the money he has paid in will be returned to him. The stock is held by the company for five years to prevent speculators from obtaining possession of it.



SCENES ON THE AQUARAMA.

resorts, is cheap in operation and devoid of danger. The ease with which the scenes may be changed each year renders it a lasting improvement.

The officers of the new Aquarama Co. are: President, L. A. Thompson; vice-president, Paul Boyton, who is the originator of this class of attractions; second vice-president, Geo. W. Schoefield; secretary, M. J. Wightman; treasurer, E. C. Boyce.

### CALENDARS FOR 1901.

The Mayer & Englund Co., of Philadelphia, has issued some very beautiful calendars for 1901. They have medallions of the poets done in colors and are handsome enough for the parlor. The American Electrical Works, of Providence, was early in the mails with a new calendar which bears an engraved portrait of Faraday, the discoverer of induction and other electrical phenomena. One of the finest calendars at hand is sent out by the Van Dorn & Dutton Co., of Cleveland. The upper half is devoted to a reproduction in colors of the painting, "The Last of the Harvest."

The Bethlehem Steel Co.'s new calendar is a unique effect in brown and white with a half-tone engraving of some one of the company's standard products on each of the 12 date pads.

The Peckham Manufacturing Co. as in former years is sending out a serviceable wall calendar which incidentally calls attention to the standard types of Peckham's single and double trucks, rotary snow plow and Price friction brake.

The merit system has been adopted in Terre Haute.

### MICHIGAN ASSOCIATION REORGANIZED.

The Michigan Interurban & Street Railway Association was organized last month at a meeting in Detroit of representatives of street railway and interurban companies throughout the state. The object is to acquire scientific and statistical knowledge for the mutual benefit of members, and to promote fraternal interest between Michigan street railway managers. The association is the revival of a former one which has existed in Michigan in a comatose condition for several years, the articles of the old association being amended to include interurban companies.

The officers of the new organization are: President, W. L. Jenks, of the City Electric Railway and the Rapid Railway Cos. of Port Huron; vice-president, J. D. Hawks, of the Detroit, Ypsilanti & Ann Arbor Railway and the Grand Rapids, Grand Haven & Muskegon Railway Cos., and secretary and treasurer, Ben S. Hanchette, of the Grand Rapids Street Railway and the Grand Rapids, Holland & Lake Michigan Railway Cos. The executive committee also includes R. S. Rand, of the Michigan Traction Co., of Kalamazoo, and George A. Hart, of the Manistee, Filer City & East Lake Railway Co. The next meeting of the association will be held in Detroit, this month, when the members will be the guests of the Detroit street railways.

The Atlanta (Ga.) Rapid Transit Co. has agreed to collect no fares from the mail carriers in that city, an arrangement having been effected whereby the United States Government will pay the company a certain sum annually for the transportation of carriers on duty.



## PERSONAL.

MR. GEORGE A. YUILLE on January 1st, resigned as assistant general manager of the Chicago Union Traction Co.

MR. DAVID HYMAN, lately appointed general superintendent of the Ithaca (N. Y.) Street Ry. has entered upon his new duties.

MR. C. H. WEAVER has been appointed manager of the Hot Springs (Ark.) Street Railroad Co. in place of Mr. C. C. Convers, resigned.

MR. C. W. WOODWARD has been appointed purchasing agent of the Electric Storage Battery Co., to succeed the late Mr. John B. Falkner, jr.

MR. WILLIAM HASELTINE has charge of track construction for the Sharon (Pa.) & Youngstown Street Railway Co. with headquarters at Sharon.

MR. MATTHEW J. KENNEDY, formerly of Minneapolis, has been elected superintendent of the Montreal Street Ry., succeeding Mr. Duncan McDonald.

MR. JAMES PARMELEE has been selected as president of the National Carbon Co., of Cleveland, to succeed Mr. W. H. Lawrence, recently deceased.

MR. A. P. DEEDS has assumed the duties of auditor of the Albany & Hudson Railway & Power Co. He was formerly auditor of the Zanesville & Ohio R. R.

MR. H. F. J. PORTER on January 15th addressed the students of the Armour Institute of Technology, Chicago, on the subject: "The Development of the Art of Forging."

MR. F. S. MARTIN, who several years ago resigned his position with the R. D. Nuttall Co., to engage in other business, has again become superintendent of the company.

MR. JOS. H. WILLIAMS, business manager of the Viennet Advertising Agency, announces the removal of his New York office from No. 127 Duane St. to Room No. 719 Temple Court.

MR. JAMES SMITH, of Elizabeth, N. J., will hereafter assume control as general manager of the Elizabeth, Plainfield & Central New Jersey Ry., with headquarters at Westfield, N. J.

MR. J. M. ATKINSON, of Chicago, the well-known electric railway supply dealer has returned from a long vacation tour of Europe, upon which he was accompanied by Mrs. Atkinson.

MR. C. H. CHAPMAN is the new superintendent of the Middletown (Conn.) Street Railway Co., and will act as assistant to Mr. E. W. Goss who was recently elected president of the road.

MR. MITCHELL JOANNES, general manager of the Fox River Electric Railway & Power Co., Green Bay, Wis., is ill with appendicitis. The necessity of an operation is apprehended.

MR. CHARLES BALDWIN, superintendent of the Muncie (Ind.) lines of the Union Traction Co., has been made general traffic manager of the entire system with office at Anderson, Ind.

MR. JOHN I. BEGGS, of Milwaukee, has published an attractive illustrated folder, descriptive of the pleasure resorts and trolley rides on the lines of the Milwaukee Electric Railway & Light Co.

MR. IRA FOSTER, who has been connected with street railways in Chattanooga, Tenn., for 16 years, has removed to Memphis, Tenn., where he becomes chief inspector of the Memphis Street Railway Co.

MR. GEORGE W. EDWARDS, superintendent of the Brooklyn Rapid Transit Co. and formerly assistant superintendent of the old Brooklyn Elevated road under Gen. Mgr. I. I. Barton, has resigned his position.

MR. M. M. STEPHENS, mayor of East St. Louis, Ill., has been elected president of the St. Louis & Belleville Traction Co., succeeding Mr. John A. Day. Mr. William S. Foreman was appointed attorney for the road.

MR. P. H. HAMPTON, treasurer of the Palmer (Mass.) & Monson Street Railway Co. has been succeeded by Mr. M. J. Warner, of New York. Mr. Hampton retires to devote his time to personal business interests.

MR. H. B. WESTCOTT, of Zanesville, O., for the present will be acting manager of the East Liverpool (O.) & Wellsville Street Ry., Mr. L. W. Healy, the general manager, having left for an extended trip through the East.

MR. JOHN H. GLADE, secretary and treasurer of the South Side Elevated Railroad Co., of Chicago, has been very ill with appendicitis. An operation has been performed and it is hoped Mr. Glade is now out of danger.

MR. S. S. HAMLIN, formerly of the Christensen Engineering Co., Milwaukee, has taken up the management of the sales department of the Auto Appliance Co., Chicago, maker of automatic couplers for street and elevated railway cars.

MR. A. S. LITTLEFIELD, president, and Mr. E. M. Fry, general superintendent, of the North American Railway Construction Co., Chicago, are now in California looking after certain interests of their company. They expect to remain until April.

MR. E. G. WYCKOFF has resigned as president of the Ithaca (N. Y.) Street Railway Co. Mr. Wyckoff retains a controlling interest in the road, and will continue to serve as a member of the executive committee. Mr. E. L. Fuller, formerly of Scranton, Pa., succeeds Mr. Wyckoff as president.

MR. A. C. RALPH succeeds Mr. H. E. Bradford as manager of the Marlborough Street Ry., the Framingham Street Ry., the Southborough & Marlborough Street Ry., and the Union Street Railway Co. Mr. Ralph has had street railway experience in Boston, Atlanta, Ga., Paterson, N. J., and Brockton, Mass. He is a thorough electrician and mechanic and withal a good overseer of men.

MR. H. E. BRADFORD, formerly general manager of the Marlborough (Mass.) Street Railway Co., and other street railway properties in the vicinity of Marlborough and Framingham, Mass., will hereafter devote all his time to the service of the new Consolidated company at Worcester, Mass. Just before leaving Marlborough he was tendered a banquet and reception by his late employees, and presented with a solitaire diamond ring as a mark of their esteem. Mr. Bradford is president of the New England Street Railway Club.

MR. J. WM. HELM has left the service of the North and West Chicago street railway system with which he has been connected for the past eleven years. He was at one time secretary and treasurer of the North Chicago Street Railroad Co.; vice-president of the construction company that built the West Chicago Street R. R.; and an officer and director in a number of Yerkes roads. Mr. Helm has not definitely decided upon his future work but after a short trip East he will return to Chicago. His address is 1320 Monadnock Block.

MR. A. B. DUPONT, general manager of the Detroit Citizens' Street Railway Co. has been elected second vice-president of the St. Louis Transit Co., and takes up his new duties this month. Mr. Dupont began street railway work in 1886 when he was connected with the Central Passenger Ry., of Louisville, Ky. After a few months he went to Brooklyn to engage in cable construction work under Tom L. Johnson but soon returned to his old position in Louisville. He went to Detroit in 1895, and under his guidance the entire Citizens' property has been rebuilt and re-equipped, and the company placed on a dividend basis. As an evidence of the cordial relations existing between Mr. Dupont and his former employees, he was presented before his departure with a magnificent loving cup suitably inscribed.

MR. W. M. ROSBOROUGH has resigned his position as superintendent of the Norfolk (Va.) Street Ry. He is succeeded by Mr. Leavenworth Wheeler, late of Pittsburgh.

MR. ROGER W. CONANT, who for the past nine years has been connected with the Boston Elevated Ry. as electrical engineer, has resigned the position to become New York manager of the Gold Car Heating Co. Mr. Conant is well and favorably known to street railway officials both here and abroad through his work on the Boston Elevated, and his writings on subjects pertaining to electrical and mechanical engineering. He was born in Gloucester, Mass., Nov. 20, 1869. He graduated from the Massachusetts Institute of Technology in 1891, having pursued the course in electrical engineering, and immediately engaged with the West End company of Boston. He is an inventor of considerable



R. W. CONANT.

skill, the Conant testing instrument for determining the drop at track joints being one of his latest devices. His resignation was received with regret by the Boston Elevated Railway Co., the management expressing its appreciation of his work and wishing him success in his new undertaking.

THE NORWALK (O.) ASHLAND & SOUTHERN RAILWAY CO., recently organized, has elected the following officers: President, C. P. Wickham; vice-president, J. H. Beattie; secretary, J. R. McKnight; treasurer, C. F. Jackson. Directors: C. P. Wickham, G. T. Thomas, J. H. Beattie, J. R. McKnight, C. F. Jackson, J. C. Curtis, of Norwalk, O.; H. A. Thomas, of Ashland, O.; John L. Pratt and Josephus Clark, New London, O.

#### OBITUARY.

MR. JACOB RICH, a heavy stockholder in the street railway properties of San Jose, Cal., died on January 6th.

MR. H. C. BOUCHER, a director in the St. Charles Street Railroad Co. of New Orleans, and a veteran merchant of the city, died on January 7th.

MR. PHILIP D. ARMOUR, of Chicago, who died January 6th, is said to have had \$5,000,000 invested in street railway securities in Chicago, Kansas City and other places.

MR. DAVID C. GOLDEN, comptroller of the Union Traction Co., of Philadelphia, since its organization, died last month at Asheville, N. C., where he had gone in search of relief from bronchial troubles. He was treasurer of the People's Passenger Railway Co. before the formation of the Union Traction.

MR. F. P. BROTHERS died December 25th at Ceigordeavilla, Cuba. He has been for several years one of the most prominent Canadian street railway operators, and was at the time of his death engaged in railway construction work for the Cuba Co., of which Sir Wm. Van Horne is president. Mr. Brothers was also interested in the South African syndicate when it controlled Mexico City lines and South American city tramways, and had built extensively in Canadian cities.

Passes have been declared void by the Bay City (Mich.) Consolidated Railway Co.

#### NEW PUBLICATIONS.

VERBATIM REPORT of the nineteenth annual meeting of the American Street Railway Association held at Kansas City, Mo., Oct. 16-19, 1900. Secretary Penington has put the 1900 report through the press in his usual prompt and artistic style, and has included in the book an account of everything of interest that occurred during the Kansas City meeting.

THE ECONOMIST, of Chicago, has made of its issue for Dec. 31, 1900, an extra number devoted to a review of the year and century in matters relating to trade, commerce, manufacturing, speculation, building, population and finance.

THE JOSEPH DIXON CRUCIBLE CO. has issued a small pamphlet containing two essays, one entitled "Where the New Century Will Really Begin," and the other, "The Evolution of School Pencils." The former is an interesting article on the location of the international date line, explaining how and why a day is gained or lost when this line is crossed. The article on pencils contains matter quite as interesting.

THE LEWIS INSTITUTE, CHICAGO, has issued its calendar and topics for the evening courses January 3d to March 12th. The curriculum for 1901 includes courses in electrical and mechanical engineering involving lecture demonstrations of engineering principles, applications of practical mathematics and laboratory work; also courses in shop work and shop drawing.

THE WESTERN ELECTRICIAN, of Chicago, has published a handsome twentieth century souvenir number containing a resume of electrical progress for the past 100 years. Special features are reports of interviews with Edison and Tesla on probable developments in electrical science during the coming century.

#### ELECTRIC RAILWAYS AND LIVE STOCK.

An Ohio farmer sought to enjoin the Columbus & Grove City Railway Co. from constructing its line along the pike on which his property abutted, because, he claimed, the roar of traffic over the electric road would frighten his domestic animals. The court held that noise was a necessary adjunct of the electric railway, which, as an improvement on the means of transportation to which the highway was originally dedicated, gave the company precedence over the sensibilities of the farmer's stock.

#### THE PHILIPPINE CO'S. PROJECT.

The announcement has been made that the Philippine Co., of New York City, will bid for railway and street railway franchises covering 300 miles on the Island of Luzon, and proposes to build an electric line from Dagupan, via Manila, to the southern end of the island. Further developments are pending the passage by Congress of the Spooner bill, which provides for the government of the Philippine Islands. The Philippine Co. is capitalized at \$1,000,000. Its counsel, William H. Stayton, has an office at 30 Broad St., New York. Those interested in the field for electric railways in the Philippines will find an article on that subject in our December issue.

#### ATTRACTIVE FOLDER FROM NEW ORLEANS.

We have received from the New Orleans City Railroad Co. a copy of its 1901 edition of the "Tourists' Guide to New Orleans," of which 100,000 copies have been printed. The company has found this method of advertising to be both popular and profitable. The folder is distributed at the car stations, transfer points and on the cars, and is furnished free in lots of 100 or more to the hotels, restaurants, cigar stands, cafes, etc., throughout the city.

The Hartford (Conn.) Street Ry. requires its employees to pay fare on the cars. Those on the way to or from work receive cash vouchers in return which, up to six per day, are redeemed in cash at the end of the week. Other passes have been abolished.



## J. R. CHAPMAN TO GO TO LONDON.

Mr. James R. Chapman, electrical engineer for the Chicago Union Traction Co. and the Lake Street, Union and Northwestern Elevated roads, has resigned from that position, his resignation taking effect March 1st. Shortly after that date Mr. Chapman will sail for London where he will take charge of the electrical features of Mr. Yerkes' projects there.

Mr. Chapman has been engaged in electric railroad work since 1888, having gone to Kansas City in that year; in 1891 he rebuilt the cable and horse lines of Grand Rapids, Mich. Since 1894 he has been intimately connected with the street railways of Chicago.

## NEW WATER PURIFYING AND SOFTENING SYSTEM.

It is well known that even a small accumulation of scale will greatly increase fuel and repair bills, reduce the capacity of the plant and cause the burning out of the boiler tubes. Numerous devices have been tried for the removal of this scale, but it has been found that the elimination of scale forming ingredients in the feed water supply is probably the easiest, safest and most satisfactory plan to avoid this difficulty.

The purifying system developed by the Chicago Boiler Cleaner Co., 321 Dearborn St., Chicago, is described by the company as follows:

"All foreign substances held in solution or suspension can be released by electric and chemical precipitation to the bottom of a stationary tank, whence they are easily withdrawn. The system requires the use of two tanks each holding sufficient supply for from 3 to 6 hours run. Each tank is fitted with aerator and oxidizer. The first sets up, by means of injected air, a strong agitation of the water; the second, by chemical action, separates the ingredients into atoms of different polarity which renders the process more simple and effective. At a certain juncture a small quantity of standardizing chemical reagent is injected into the water. This causes a coagulation of the various ingredients of the tank and forms a sort of filter in the water which carries down the impurities to the bottom of the tank by ordinary precipitation. No filter is used for none is required. The only filter is that which forms in the water itself. At the end of a few minutes the water supply is

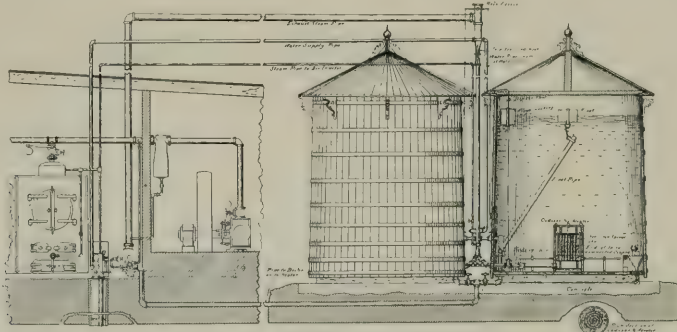
## LONDON LETTER.

(From Our Own Special Correspondent.)

The matter which is causing the greatest amount of discussion in English traction circles just now is the very important one of English versus American machinery. The large number of orders which of late have been going to America from this country is being very strongly commented on; and I think a patriotic reaction in favor of British made plant will shortly set in. The borough authorities of Leeds who are now advertising for tenders for two 2,000-h. p. two-phase alternators, state in their advertisement that preference will be given to plant of British manufacture. The secret of the whole thing is the question of delivery. Up to the present time American firms have nearly always been able to promise a quicker delivery than those in England. And not only American, but also German firms have been securing a share of the British orders, more especially for rails. To retain the home trade in their own hands, the British manufacturers must, and I am convinced will, make a great effort to ensure the prompt delivery of goods ordered from them.

In London at the present time, there are 47 miles of double track, underground, electric railway, either in operation, under construction, or authorized. The authorized capital for these undertakings is £23,721,000, or about £504,700 (nearly \$2,500,000) per mile of double track. At first sight, and when it is remembered that no land has to be bought except for stations, and that the London clay through which most of the lines go, is not a difficult medium to tunnel through, this cost seems excessive. But the land bought for stations, which, of necessity must have street frontages, and must be at the most important centers of traffic and business, is in many cases the most valuable land in the world, and very large prices have to be paid for it. Also the parliamentary and legal expense necessary for getting the construction of a new line authorized, and entailed by the preliminary financial arrangements is often very large.

The cable tramway system in Edinburgh, which is by far the largest cable system in this country, now appears to be running very smoothly. There was some difficulty, owing to inexperience on the part of the drivers who at first seem to have made very frequent mistakes at the junctions where they had to change from one cable to another. But experience is bringing wisdom, and now the



VIEW OF WATER PURIFYING PLANT—CHICAGO BOILER CLEANER CO.

rendered clear to the eye and soft to the touch. While one tank is being treated as described the water supply is taken from the companion tank. The whole process is amazingly simple, effective and economical, the chemical reagents costing only 1½ cents per thousand gallons. The apparatus as well as the reagents are quickly understood and easily handled by the ordinary engineer. Water treated by this process will not under any circumstances produce scale formation. It even disintegrates and removes scale already formed."

The Chicago Boiler Cleaner Co. has installed a number of these plants from Kansas City to Leadville during the past year. One of 1,000-h. p. capacity has been put in for the Pueblo Traction Co., Pueblo, Colo. Water which was considered impossible to successfully treat is reported to have yielded readily to this process, and all impurities have been easily precipitated and removed.

decidedly complicated junction at the Post Office end of Princes St., where there are three main and three auxiliary cables, is working with admirable smoothness.

The work connected with the installation of electric traction on the Glasgow tramways is going on rapidly. The power house at Pinkston is well forward; two of the Allis engines have arrived, and have for some time been lying in the yard, as well as two of the British Thomson-Houston generators. I understand that the foundations for these sets are ready, but that some trouble with the cranes has prevented their erection being commenced. The prompt delivery of the Allis engines—they were delivered some little time before they were due—is yet another example of the speed with which American firms can, and do, deal with orders. The work connected with the overhead equipment is well forward, and I do not anticipate that there will be much difficulty in having the

whole system in working order by the time the Exhibition opens next spring.

The new tramway system in Bristol is now complete and running. The power house is of a type unusual in England, having the engine room on the ground floor, the boilers on the floor above, and coal bunkers above them again. The 200 ft. steel smoke stack is also a striking feature. The generating plant consists of four cross-compound corliss type engines direct coupled to 500-kw. generators, the latter are 10-pole machines giving 1,000 amperes at 500-550 volts. Over 250 new cars are to be put on the line. Each car is 30 ft. long and carries 24 passengers inside and 29 outside.

Great interest is being taken in the international competition for the introduction of electric traction on the old London underground railway. The Metropolitan District Railway Co. invited proposals and tenders for the work, but gave no specification, leaving the whole scheme to be devised by the firms tendering, for themselves. The result has been a truly international contest. Among the firms which have submitted proposals, America is represented by the Thomson-Houston and Westinghouse companies; Germany by the Shuckert, Algemeine Electricitats Gesellschaft, and Felten & Gulleaume; France by the Brigueur Electrique Co., and M. M. Houten & Leblanc; and England by Dick, Kerr & Co., Mather & Platt, Brush Co., Crompton & Co., and Thomas Parker. It is generally supposed that the Westinghouse company will be successful in getting the work. This company is applying to Parliament for powers to do the work, independently of the railway company.

The construction of the new Charing Cross-Hampstead "Tube" is to be started at once. The average depth of the tunnel below the street level will not be more than 45 ft., the maximum depth being about 75 ft.; this is considerably less than the Central London which averages nearer 90 ft. The line will be working considerably sooner than the general public expects. I understand that two classes of accommodation—first and second—are to be provided, both in the cars, and in the elevators at the stations. On the Central London there is only one class, but as the Hampstead line will probably be very largely patronized by workmen, it is perhaps advisable, both for the comfort of ladies, and for the preservation of the cars to have the two classes.

### STEAM RIDING GALLERIES.

The Armitage-Herschell Co., of North Tonawanda, N. Y., is one of the leading makers of riding galleries and merry-go-rounds, and makes these in all styles and sizes. Its regular No. 1, or 24-horse machine is the most popular and consists of the following outfit:

One 6-h. p. portable engine and boiler, with all necessary attachments. One 41-key military band organ, which plays 16 tunes.

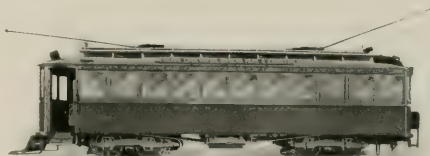


STEAM RIDING GALLERY.

One carved negro image, that appears to turn the organ. Twenty-four beautifully carved and handsomely painted horses, with galloping motion. Four carved and upholstered chariots, embellished in gold and silver bronze, which will seat four adults, or six children each. Sixteen folding chairs, of special make and design. One 8-oz. navy duck tent, 50-ft. in diameter, including top and side walls, and all necessary ropes, blocks, stakes, etc. Four gasoline torches, also all necessary tools that go to make a complete first class outfit.

### MODERN MCGUIRE TRUCKS.

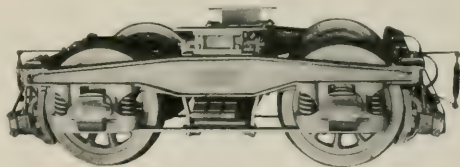
The Chicago Union Traction Co. has within a few months put in service 50 new cars, built in its own shops, which by reason of being the first cars of the kind to operate in the down-town district have attracted much attention. These cars are 39 ft. 6 in. over all, vestibuled, and have a seating capacity for 54 persons. The trucks were made by the McGuire Manufacturing Co. and except that they



NEW DOUBLE TRUCK CAR, CHICAGO.

have a wheel base of 4 ft. are in every respect similar to those used by the Indiana Ry., the San Francisco & San Mateo Ry. and the Peoria & Pekin Terminal Ry. where they have given excellent satisfaction.

The trail truck made by the McGuire company for the Northwestern Elevated R. R. is shown in one of the illustrations. The first of this type built by the company were used under an electric locomotive built by the General Electric Co. in 1896, and others of similar design have been made for various companies, notably the



MCGUIRE TRAIL TRUCK.

order for one of the London underground roads. In this last case gearless motors are used which have been found to be too severe on the track and the McGuire company is now designing an electric truck to replace these.

The new line at Versailles, France, which has McGuire No. 39 trucks, is attracting much attention in England and it is thought probable that all the underground London roads will adopt similar equipments.

### A WEARISOME WEIR.

The British Parliament has a member who, like a class of public officials not altogether unknown in this country, seems to fully appreciate the great responsibility resting upon him of saving the common people from the onslaughts of soulless corporations. The member's name is Weir, and his specialty is protection from public utility companies. Of him a colleague recently wrote:

The weary Weir with questions drear  
The notice paper crams;  
Surely there never was a weir  
That caused so many dams.

The Yardley (Pa.), Morrisville & Trenton Railroad Co. last month began operating a new trolley line between Morrisville and Yardley.

Early last month announcement was made that the New Orleans & Carrollton Street Railway Co. had secured options on a majority of the stock of the Orleans Street Railway Co., for the purpose of consolidating the two properties. Later advices state that the options have been forfeited and the deal is off.



### HALF FARES.

Boston will try vestibules.

W. M. McGrath promises to give Santa Fe, N. M. a trolley road.

The Brooklyn Rapid Transit Co. has abolished smoking cars on its elevated lines.

The Wellington-Oberlin branch of the Cleveland, Elyria & Western Ry. was opened January 1st.

Storage batteries will be installed in the power plant of the Cleveland (O.) & Chagrin Falls Electric Ry.

The Irwin-Manor extension of the Greensburg, Jeannette & Pittsburg (Pa.) Street Ry. was opened January 2d.

The repair work of the Chicago Union Traction Co. will henceforth all be done at the company's West Side shops.

The Elgin (Ill.), Carpentersville & Aurora Ry. on January 1st presented each of its employees with a \$5 gold piece.

The Aurora (Ill.) Street Railway Co. is installing electric lighting machinery under the franchise obtained last summer.

The Dayton, Springfield & Urbana Electric Railway Co. has inaugurated an express service between Springfield and Dayton.

December 23d, the Kansas City & Leavenworth Railway Co. commenced operating cars into the center of Kansas City, Kan.

Mr. Henry Hart, of New York, is reported to have redeemed \$2,000,000 stock in the Third Ave. Street Railroad Co., sold by him about a year ago.

Constantinople is to have an electric railway system. Mr. Iran Cidebcarn of that city recently visited Chicago and St. Paul to investigate American street railways.

The shops of the Des Moines City Ry. are turning out some large cars of an improved pattern. General Manager Hippe says that no more small cars will be built.

The Duluth-Superior Traction Co. is making war on disease germs, and to this end has stripped its cars of carpet seat coverings. Twelve new cars will be put in service.

Pres. S. W. Divine, of the Chattanooga Rapid Transit has discovered that a cross between an electric car and a scrub cow always produces a full-blooded Jersey if the cow is killed.

One of the lower courts at Columbus, O., has decided that the board of county commissioners being a legislative body for the purpose of granting railway franchises, may not be enjoined.

December 23d the employees of the Scranton (Pa.) Street Railway Co. struck for an increase in wages and a 10-hour day; a compromise was effected and the men returned to work December 31st.

The City Electric Railway Co., of Port Huron, Mich., is clearing 20 acres of land which will be equipped as an amusement park. For this purpose bonds to the amount of \$200,000 have been issued.

The Washington (D. C.) Traction & Electric Co. has been granted by the commissioners authority to remove such tracks as were abandoned a year ago upon the consolidation of the several street railway systems in Washington.

The City & Suburban Railway Co., of Portland, Ore., has completed a number of important improvements of its lines, double tracks having been laid over a portion of the system. The Mount Tabor branch from Sunnyside has been relaid with heavy rails, and the capacity of the central carhouse has been doubled.

The Cleveland Electric Ry., has had a prosperous year. Gross earnings were \$2,061,504; operating expenses and taxes \$1,121,037; interest \$258,483; leaving a surplus on the year of \$681,984. The operating expenses and taxes were 54.38 per cent of gross earnings.

Pres. H. A. Axline, of the Urbana, Mechanicsburg & Columbus (O.) Electric Railway Co. has accepted the terms of the franchise ordinance passed by the city council of Columbus several weeks ago, and a part of the proposed line will be constructed without further delay.

It is stated that the street railway earnings in the city of New Orleans keep pace with the bank clearings in that city, which show an increase of about 40 per cent a week. The preferred stock finds a strong market because of the steady and substantial gains in the company's earnings.

Satisfactory progress is being made in the construction of the Denison (Tex.) & Sherman Interurban Ry., of which Mr. J. P. Crerar is president. The grading of the roadbed between the two cities is completed, and a bridge over Iron Ore Creek has been erected. A number of miles of track have been laid.

At the horse show in New York in November, B. G. Hughes, a practical joker, entered a worn-out car horse for which he had paid \$11.50. He hoped it with stimulants and it was paraded under the name of "Puldecarr Orphan—by Metropolitan, dam Electricity." The name will be recognized as an adaptation of "pulled a car often."

Negotiations for the purchase of the water works, gas, electric light and power plants at Hot Springs, Ark., by Mr. S. W. Fordyce, president of the Hot Springs Railroad Co., are reported to be in progress. This acquisition to the property of the street railroad company will aggregate \$450,000 in value, and will cover all the franchises in Hot Springs held by Col. Martin, of Minneapolis.

December 15th the Consolidated Traction Co., Pittsburg, issued its statement for the month of November, 1900, showing gross passenger earnings \$235,545; operating expenses, \$106,588; net income after deducting taxes, rentals of leased lines and tenement expenses, \$93,902; surplus, after paying interest and dividends on preferred stock, \$7,426. For the first eight months of the present fiscal year the surplus is \$100,189, as against \$43,147 for the first eight months of the last year.

The Union Traction Co.'s new interurban line between McKeesport (Pa.) and Wilmerding was put in operation December 15th, through cars being run from 4th Ave. and Market St., Pittsburg, to the Pennsylvania R. R. station in Wilmerding on a 10-minute schedule. The trip is made in one hour and 28 minutes. The service has already proved a great accommodation to the people of the three cities, and has been inaugurated with entire success, the line being one of the most finely equipped interurbans in Pennsylvania.

At a recent meeting of the board of directors of the Nassau Electric Railway Co., whose property is leased by the Brooklyn Rapid Transit Co., a dividend of 4 per cent on the Nassau company's preferred stock, payable December 31st, was declared. This is the first dividend that the Nassau company has ever paid. It is confidently expected by the directors that the Brooklyn Heights R. R., which is also leased by the Brooklyn Rapid Transit Co., and which has never yet declared a dividend, will declare one in the near future.

In a suit brought by a foreign stockholder in the Newton & Boston Street Railway Co., to restrain the company from complying with the Massachusetts statute requiring street railway companies to transport school children at half the regular rate of fare, the court rendered an opinion that, upon its face, the statute appeared invalid, and might be adjudged a violation of the 14th amendment to the constitution of the United States. The motion for a preliminary injunction was denied, in order that the case might be heard later on its merits.

## UTILIZATION OF EXHAUST STEAM.

The subject of utilizing exhaust steam should appeal especially to electric railway and power companies, which regard their exhaust steam either as a wasted by-product or only partially used by means of condensers. Nearly ten times as much heat is required to generate steam as can be converted into mechanical energy in the steam engine, and thus the exhaust pipe has flowing in it steam with nearly 90 per cent of the original total heat. The Holly system turns this really valuable product to account.

It is demonstrated from actual practice that the exhaust steam from each 100 h. p. of engines operated will heat from 1,000,000 to 1,300,000 cu. ft. of space in average buildings in zero weather. This is worth from \$2.50 to \$5.50 per 1,000 cu. ft. of space heated, per heating season. Electric companies operating the Holly system of exhaust steam heating report that their receipts from the sale of steam are enough to pay all their fuel expenses for the entire year of 12 months, and 6 per cent interest on the investment for steam mains.

The American District Steam Co., whose main office and works are at Lockport, N. Y., is the originator and patentee of the Holly system of underground steam distribution and has been in the business for a number of years. The company has built over 200 steam heating plants in different cities of this country, and was the first company to utilize exhaust steam from electric and other power plants for heating purposes through underground steam mains. It reports that during the past year it has installed over twenty new plants, besides making additions to ones previously put in.

During the past year the business of the company has increased to such a degree that it finds it necessary to enlarge the works in order to take care of the increasing number of orders. Among the cities in which steam plants were installed during the past two years we mention the following: Erie, Wilkesburg, Johnstown, Washington, York, Towanda, Pa.; Pawtucket, R. I.; Hornellsville, Newburg, N. Y.; Atlanta, Ga.; Seattle, Wash.; Youngstown, O.; Crookston, Minn.; Grand Forks, N. D.; Champaign, Danville, Springfield, Ill.; Colorado Springs, Col.

The steam plant at Atlanta, Ga., was built for the Atlanta Railway & Power Co. to utilize the exhaust steam from the new station for heating purposes, and has been in operation about three months. It already has about 50,000 ft. of radiation connected up, and applications for a large amount more. The plant comprises some three miles of street mains, largest size of which is 16 in., reducing down to 6 in. The extreme end of the mains is over a mile from the power station, and the steam pressure carried at the station is about 3 lb., which does not decrease perceptibly at the end of the line. Among the buildings heated is the new 12-story office building, to which the steam was connected without making any change in the piping, merely shutting off the boilers and placing a steam trap on the return. During the coldest weather there was perfect service, all parts of the building being heated with less than 2 lb. pressure in the pipes in the basement.

The advantages of steam over other methods of heating, are the ease with which it can be connected to buildings already piped for steam or hot water, without any change in the piping, and the reduced cost of installation, safety from fire, the low pressure carried in the apparatus, and the safety from explosion.

The American District Steam Co. will be glad to furnish full information on request.

## WOOD STAINS AND COLORS.

BY J. L. JOHNSON.

Believing that criticism is one of the most kindly things, I beg to criticise the article on wood stains in the December, 1900, issue of the "Review," page 740. The stains as given may be perfect so far as water stains are concerned, but on street or steam railway work, water stains of any kind have long since been laid aside as impractical. It can easily be seen that water will raise the grain, which is something to be avoided as much as possible. Life is too short to raise the grain just for the sake of taking the time to sand paper it down again. The writer is very much of the opinion that if some inexperienced man should try to follow the plan there given on street car work he would soon be looking over the "Wanted" in

the "Review" for a position, and secretly making a solemn promise never to do it again.

With the wide range of quick-drying colors which are ever ready for the painter, it is difficult to understand why any painter should ask for water stains, particularly so when any shade is at his command. For instance, burnt sienna can be used to imitate mahogany or rosewood almost to perfection and Van Dyke brown will give almost anything in the line of antique shading; it also has a beautiful warm tint that water-color cannot excel. In the yellows we have an almost endless variety; these are always at hand in a shop and consequently ever ready.

The only real secret about using these colors as a stain is this, do not try to paint when staining. Make the stain up by taking out a little of the color desired, "break it up" with varnish (never use oil); then add turpentine till the stain is as thin as turpentine will make it. Apply freely with a soft brush; let it rest a moment or so, then wipe off all surplus with a cotton rag which is as free from lint as possible. The stain will have taken hold on the soft places or grains, and the harder parts wipe out clean, leaving a transparent stain fit for a president to look at. It is, of course, understood that skill is required in anything. Stains made in this way do not waste anything, as any surplus can be put in open color cans instead of using fresh turpentine. This stain can be varnished in an hour, or sooner if there is a lack of time.

With the help of a little overgraining, the writer has stained poplar and cherry and brought them up to go with mahogany and rosewood, and it would have required an expert to tell which was the real wood or which the imitation as they were side by side in the same piece of work. No person having used a turpentine stain will go back to a water stain unless he fancies that prehistoric methods would give antique effects.

## CHICAGO CITY RAILWAY ELECTION.

The annual meeting of the Chicago City Ry. was held Jan. 15th, re-electing the old board and officers. New stock will be issued to retire \$4,500,000 bonds coming due, and bringing the stock issued up to \$18,000,000. Net earnings for 1900 were \$1,680,301.

The United States will advertise in street cars for Navy recruits. Signs will first be placed in Philadelphia cars.

Announcement is made of the formation of the Chicago Compressed Air Co. under license of the Compressed Air Co., of New York, to control the Hardie air motor in Illinois.

The Sycamore (Ill.) & DeKalb Electric Railway Co. has changed its name to the DeKalb County Light, Heat & Power Co., and headquarters will be removed to DeKalb, Ill. The number of directors has been increased from three to five. E. B. Magill, president.

The Elgin City, Carpentersville & Aurora Ry. has been sold to a Cleveland syndicate of interurban railway promoters, the transfer being made by William Grote, of Elgin, president, to J. Mandebann & Co., through their agent, L. S. Wolf, who is also a member of the firm. The price was \$550,000, or \$110 per share. The purchasers propose to build an extension from Geneva to Batavia, and to enter Aurora over the tracks of the Aurora, Wheaton & Chicago R. R., and are negotiating for the purchase of the Aurora, Yorkville & Morris road, and the Wheaton line, now building to Chicago.

A number of street railway companies in Massachusetts have petitioned the general court for the right to generate, sell or purchase electricity, which would indicate that a new field of business activity is contemplated by the eastern managers. The Lynn & Boston Railroad Co., through E. C. Foster, general manager, has petitioned for such rights, and the Globe Street Railway Co., of Fall River, Mass., through its president, R. S. Goff, has asked authority to extend its lines to Swansea, Freetown and Berkeley, to lease and operate the Newport & Fall River Street Railway and to sell or purchase electricity. The right to sell electricity is also asked by the Lowell, Lawrence & Haverhill Street Railway Co., of Lawrence, Mass.



## ECHOES FROM THE TRADE

THE B. F. STURTEVANT CO. has just removed its Chicago office to much larger quarters at 281-289 South Clinton St.

THE GENERAL ELECTRIC CO. has awarded contracts for the construction of a new six-story office building at Schnectady.

THE BADGER BRASS MANUFACTURING CO., of Kenosha, Wis., has just installed a No. 1 special "Cross" oil filter, purchased from the Burt Manufacturing Co., of Akron, O.

THE JOSEPH DIXON CRUCIBLE CO.'S latest is a small pamphlet about Dixon's silica-graphite paint, a durable, protective coating, for steel smokestacks, boiler fronts and heated surfaces.

CHARLES E. BIBBER announces that he has severed all connection with the Bibber-White Co. and has taken an office at 37 Arch St., Boston, where he will continue business as contractor for railway and electric light plants.

THE J. M. JONES' SONS, car builders, West Troy, N. Y., are sending out a miniature leather covered book of vest pocket size entitled "The Car Builders." Closer examination discloses the book to be a very neat and convenient match box.

MR. CHARLES E. HAGUE, formerly with Edgar C. Moxham & Co., has become associated with Thayer & Co., eastern sales agent for the Aultman & Taylor Machinery Co., of Mansfield, O., maker of "Cahall" vertical and horizontal boilers.

THOMAS H. BIBBER, has withdrawn from the Bibber-White Co. and formed the firm of Thos. H. Bibber & Co., with offices at 37 Arch St., Boston. This firm will represent manufacturers of standard electrical merchandise, and make a specialty of bare and insulated wire.

THE STANLEY ELECTRIC MANUFACTURING CO. announces that it has opened branch offices at Room 110, Laclede Building, St. Louis, with Mr. W. R. Mason in charge. Mr. Mason will be pleased to hear from any one who is in the market for alternating machinery, transformers and supplies.

THE AMERICAN STEEL & WIRE CO., of Chicago, has issued a "pony" catalog and price list, being a condensed presentation of the leading features of, and specifications essential in ordering, electrical wire conductors and other equipment for electric railways, electric light systems and power circuits of all kinds.

THE R. BLISS MANUFACTURING CO., of Pawtucket, R. I., sole proprietor and maker of the Wood patent car gate, writes us that the demand for this gate has been greater during the present season than ever before. Among large orders recently booked are one from the Coney Island & Brooklyn Street Railway Co., and one from the North Jersey Street Railway Co., both for double folding gates for double door cars.

A. L. IDE & SONS, of Springfield, Ill., makers of "Ideal" engines, report over 50 recent sales to large customers, among which may be mentioned the following: The Great Northern R. R.; Illinois Central R. R.; Urbana (Ill.) Light, Heat & Power Co.; Pennsylvania R. R.; Otis Elevator Co.; American Smelting & Refining Co., of Argentine, Kan.; Iowa State University; Crane Co., of Chicago; Northern Pacific R. R., and Lincoln (Neb.) Gas & Electric Co.

FISHER & SAXTON, 123 G. St., N. E., Washington, D. C., call attention to their "Dromedary" concrete mixer in a large illustrated folder. Since first placing the mixer on the market the makers have introduced several changes in the working mechanism, and believe this machine is now emphatically better than ever and

the best apparatus ever offered for reducing the cost of making and laying concrete in electric railway work, putting in duct lines, curb and pole setting and paving.

THE J. G. BRILL CO. has issued a new edition of its pamphlet describing the patented round corner seat-end panel for open cars, which has proved so popular. The advantages of the round corner panel are that it facilitates entrance and exit, gives more room to passengers standing on the running-board without taking any of the space available for seats, enables outside curtains to be more effectively applied, and does away with the too convenient foot rest made by the square corner of the seat.

THE STURTEVANT ENGINEERING CO. has recently moved its London (Eng.) office to No. 147 Queen Victoria St. in order to secure the increased accommodation necessary for its rapidly growing business as the European representative of the B. F. Sturtevant Co., of Boston, Mass. A new branch office has been established at 31 Rue de Provence, Paris, and a change made in the location of the Glasgow office to 45 Hope St. The offices at Berlin, Stockholm, Amsterdam and Milan remain the same.

THE MAYER & ENGLUND CO., of Philadelphia, has just made a shipment of two carloads of overhead construction material to Honolulu, Hawaii, for the construction of the new electric railway of the Honolulu Rapid Transit & Land Company, Ltd. The necessary rail bonds for this tramway were furnished by the Mayer & Englund Co. about a year ago, and consisted of one full carload of its well known "Protected" bonds. The Mayer & Englund Co. is rapidly developing a large export business, which now extends all over the world.

THE EDWARD P. ALLIS CO. last month poured at its Milwaukee foundry what is claimed to be the largest single casting on record. The piece, which weighs 110,000 lb., is to serve as the bed plate for a new blowing engine at the works of the Carnegie Steel Co., Pittsburgh. The plate is 23 ft. 10 in. long, 9 ft. 9½ in. wide, with an extreme height of 5 ft.

THE H. W. JOHNS MANUFACTURING CO., of New York, is sending out a neat booklet entitled "Something About Coverings." It is devoted to the interests of the Johns non-heat-conducting coverings for steam pipes and boilers, hot-air flues, cold water, ammonia and brine pipes, etc. The Manville Covering Co., of Chicago, handles the Johns products in the West.

THE SHAW-WALKER CO., of Muskegon, Mich., patentee of the Shaw-Walker card indexing system, publishes a small monthly magazine called "System," which is devoted to explaining the various uses to which the card system can be put. The issue for December contains articles on "Telling the Cost of Production in Factories"; "How to Go After Business"; "Catalog Indexing," etc.

THE BABCOCK & WILCOX CO., just as the new century began, started work at its new plant in Bayonne, N. J. The ceremony of starting the first engine in the works was witnessed by a party of city officials and officers of the company, and after inspecting the shops, an elaborate supper was served. The plant is said to be the largest of its kind in the world. The buildings completed have a floor space of about 160,000 sq. ft., to which will be added at once buildings with approximately 40,000 sq. ft. of floor space.

THE COMPOSITE BRAKE-SHOE CO. has sold to the Allston Foundry Co., of Boston, Mass., its patent rights and interest in the well-known "Compo" brake shoe, having cork inserts in its face or contact surface. The Allston Foundry Co. has also purchased all the rights, title and business of the Barney & Reed Manufacturing Co., including a brick foundry and other buildings

where the shoes hereafter will be made. All orders should be sent to the Allston Foundry Co., 620 Atlantic Ave., Boston, by whom all accounts will be kept.

**THE CROUSE-HINDS ELECTRIC CO.**, of Syracuse, N. Y., has received a strong testimonial letter from the Elmira (N. Y.) Municipal Improvement Co., reading as follows: "We are very glad to tell any one that we consider the work which you are putting out, the very highest class in every respect, and the care and attention which you have shown to every detail has greatly pleased us. We do not think that in a single instance you have made the slightest error in following out any of our specifications, which is saying a good deal, considering the amount of work we have had done during the past year."

**THE B. F. STURTEVANT CO.**, of Boston, Mass., recently received a letter from the Enterprise Foundry Co., of Sackville, N. B., which contained this interesting evidence of the endurance of one of its blowers: "We have had one of your No. 6 noiseless blowers in use for 28 years with entire satisfaction, but the blast wheel is now apparently worn out and the left side piece is broken. If we had this left side piece and the blast wheel as shown in your circular it would make the blower all right. Can you furnish this for the No. 6 blower which you were selling in 1872? This blower is driven by two belts, but we fear we have been driving it at too high a speed."

**BRAKE SHOES.**—The American Brake Shoe Co., owner of the "Diamond S" and Sargent patents, has issued an instructive pamphlet thus entitled describing different styles of brake shoes made under its licenses by the Sargent Co., the Ramapo Iron Works and Parker & Topping. The shoes described are the skeleton steel driving brake shoe for locomotives, the skeleton steel insert-shoe for locomotives, the skeleton "Diamond S" shoe for general service, the standard "Diamond S," and the "U" brake shoe. The "U" shoe is one of the company's latest products; it is a cast iron shoe somewhat longer than the standard, the added portions being of chilled metal. The hardened ends increase the life of the shoe, while the increased area prevents the retarding effect being reduced.

**THE BETHLEHEM STEEL CO.** reports that a contract has been closed with the General Electric Co. for six more of the weldless field-rings of "Bethlehem" nickel-steel for the extension to the big power plant at Niagara Falls. These rings measure 142½ in. outside diameter, and 130¾ in. inside, leaving the walls 5¼ in. thick. The width of face is 50¼ in., and the estimated weight of each ring is about 35,000 lb. They will be worked up on a mandrel under the hydraulic press, and are said to be among the largest forgings of this sort which have yet been produced. Among other orders now in hand at the Bethlehem works may be noted the shafts and engine forgings for one of the new ferry-boats which are under construction at the yards of Harlan & Hollingsworth Co., Wilmington, Del., for the New York ferry of the Central Railroad of New Jersey.

**THE KEYSTONE ELECTRICAL INSTRUMENT CO.**, of Philadelphia, has found that the rapid increase in its business renders it advisable to carry a stock in New York, and it has accordingly recently placed there a complete stock of its indicating instruments, comprising combination portable voltmeters, ammeters and wattmeters; direct current portable voltmeters and ammeters; switchboard voltmeters and ammeters, in illuminated type "K" and type "R" cases; switchboard potential indicators; arc light voltmeters and ground detectors; constant potential ground detectors; polarity indicators and vehicle volt-ammeters. The stock is very complete, and in the various types enumerated covers all ordinary ranges in voltmeters, from 10 volts up to 700; and in ammeters, from 15 to 500 amperes. A portion of this stock will be on exhibition at No. 15 Cortlandt St. and the rest held in a storeroom, boxed and packed ready for delivery.

**W. T. VAN DORN**, Monadnock Block, Chicago, reports that the new year opens with a number of large orders for couplers on hand and bright prospects for future business. He has recently received an order for 100 couplers from the Brill company to be

placed on new cars for the United Railways & Electric Co., of Baltimore; also a contract for 25 sets of trail car couplers, and 5 sets of motor car couplers from the American Car & Foundry Co., for the Northwestern Elevated, of Chicago.

## NEWS NOTES.

### NEW CORPORATIONS.

**BUCYRUS, O.**—The Buckeye Traction Co., of Bucyrus, has been incorporated by H. V. Flickinger, R. V. Sears, C. Feringer, J. S. Kibber and W. A. Blüke and proposes to build an electric line to connect Bucyrus, Annapolis, New Washington, Chicago Junction and Norwalk.

**COLUMBUS, O.**—The Central Market Street Railway Co. has been incorporated by Dr. S. B. Hartman, O. A. Schenck, Louis Seidensticker, W. H. Luchtenburg and Benjamin Monnett, all of this city. They propose to construct an electric system from central market south over certain streets not occupied by the Columbus Street Ry., and thence south to the corporation line with ultimate extensions to the prominent villages south of the city.

**AUGUSTA, ME.**—The Saco Valley Electric Railway Co., capitalized at \$250,000, has petitioned the railroad commissioners for incorporation, and proposes to build a 20-mile line connecting Saco, Buxton, Bonney Eagle and Standish. Among the directors of the company are Henry A. McNeally, of Saco; Francis A. Hobart, of Braitree, Mass., and E. B. Loring, of Boston.

**WINDSOR LOCKS, CONN.**—H. C. Douglas, of Windsor Locks, H. A. Huntington, of Windsor, and T. C. Perkins, of Hartford, are interested in a project to build an electric railway system to connect Windsor Locks, Rainbow, Poquonock, Granby, Spoonby, Tarrifville, Suffield and the state line. Three separate charters will be applied for.

**PITMAN GROVE, N. J.**—The Wenonah, Glassboro & Clayton Electric Railway Co. has been incorporated by J. P. Shannon, of Philadelphia, and C. W. and E. H. Boynton, of Middlesex County. The company has a capital of \$50,000, and projects an extensive interurban road. The main offices will be located at Pitman Grove.

**MANSFIELD, O.**—The Mansfield, Mount Gilead & Columbus Electric Railway, Light & Power Co., has been incorporated with a present capitalization of \$200,000, by T. Y. McCray, T. Y. McCray, jr., J. F. Boals and T. E. Barrow to construct an electric railway between Mansfield and Columbus with a branch to Delaware, Mount Gilead and Marion, and to furnish light and power in these cities. The main office will be located at Mansfield.

**MOUNT CLEMENS, MICH.**—The Detroit, Mount Clemens, Romeo & Armada Electric Railway Co., of Mount Clemens, has been incorporated with a present capitalization of \$250,000, to build a 25-mile electric railway from Mount Clemens to Armada and Romeo. The board of directors comprises: Milo W. Davis, James G. Tucker, Henry G. Berry, Frank E. Nellis, William F. Switzer, Charles W. Taylor and M. Everett Taylor. James G. Tucker will be president and Frank E. Nellis secretary.

**JEFFERSONVILLE, IND.**—Articles of incorporation will shortly be filed for the Jeffersonville, New Albany & Sellersburg Rapid Transit Co. A petition will be presented the county commissioners for rights to build an electric railway to connect the cities named in the title.

**ANOKA, MINN.**—The St. Francis Electric Railway Co. has been incorporated to build a five-mile line from St. Francis to the eastern Minnesota cut-off. Those principally interested are Charles T. and John G. Woodbury, of Anoka, and Marshall S. Hamblen, of St. Francis.

**KANSAS CITY, MO.**—The Kansas City & St. Joseph Electric Railroad Co. has been incorporated with P. A. Gibson, of Erie, Pa., president, Charles E. Gibson, of Kansas City, vice-president; Robert P. McGeehan, of Parkville, Mo., secretary and treasurer. This is the company which was mentioned in the "Review" bulletin November 22d as having been organized to build an electric line from Kansas City to Parkville, Platte City, Dearborn, Faucett and St. Joseph. Mr. P. A. Gibson writes from Kansas City that contracts have not as yet been awarded for the construction work, but may soon be let, and that the line will be built almost wholly upon a private right of way. The line will be constructed with 70 or 75-lb. T and 90-lb. girder rails and the alternating direct current system will be employed. The company has an office in the New York Life Building, Kansas City.

**OKLAHOMA CITY, O. T.**—A charter has been issued to the Oklahoma Railway, Light, Power, Fuel & Gas Co., of Oklahoma City, which proposes to build and operate 25 miles of street railways in that city. The company has \$300,000 capital stock, and its directors are: Norman W. Gifford, of Chicago; Roscoe D. Farmer, of Benton Harbor, Mich., and A. C. Root, T. F. McMeacham and A. R. Hays, of Oklahoma City.

**TAMPA, FLA.**—The Florida Peninsular Transportation Co., capitalized at \$1,000,000, has filed articles of incorporation and proposes to build an electric railway from Tampa to St. Petersburg. President and general manager, John P. Martin, Xenia, Ohio; Charles C. Cleveland, and William A. Martin and W. Reddell, of Xenia, are also interested.

**PUEBLO, COL.**—The Pueblo Traction & Lighting Co., capitalized at \$100,000, has been incorporated by W. Rice, J. F. Vail, C. E. East, T. N. Davis and M. J. O'Connell. It is reported that the new company will succeed the Pueblo Traction & Electric Co.

**GALVESTON, TEX.**—The Galveston City Street Railway Co. has been incorporated by W. G. Oakman, George R. Turnbull and Edward Grunnell, of New York. R. B. Hays, of Houston, and W. T. Terry, of Galveston, are successors to the Galveston City Railroad Co. The company is capitalized at \$800,000. Charles E. Hotchkiss, the local representative of the purchasers, has paid to the clerk of the United States Court \$950,000 in bonds, which amount represents the purchase price of the road.

**GREENFIELD, O.** A company known as the Little Miami Traction Co. has been incorporated to build an electric line from Cincinnati to Springfield, O., through the counties of Hamilton, Warren, Clinton, Greene and Clark, with branches off to Wilmington, Middletown, Dayton and other places not on the direct route. The president is John P. Martin, of Greenfield, and the other incorporators are residents of Cincinnati, Springfield, Xenia and Cleveland.





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OKLAHOMA CITY, O. T.—The Oklahoma Railway, Light, Power, Fuel & Gas Co. has been chartered, with a capital of \$300,000, to build and operate a 25-mile electric railway. The directors are: Norman W. Gifford, of Chicago; Roscoe D. Farmer, of Benton Harbor, Mich.; A. C. Root, T. F. McMecham and A. R. Hays, of Oklahoma City.

OLYMPIA, WASH.—Articles of incorporation have been issued to the Washington & Oregon Railway Co., which proposes to build a railway from Portland, Ore., to Seattle, Wash. Incorporators are: Allen C. Mason, of Tacoma; Edmund Rice, of Olympia; and E. H. Guile, of Seattle.

ST. FRANCIS, MINN.—A charter has been issued to the St. Francis Electric Railway Co. for constructing a road to the state line. The scheme includes the building of a dam and a water-power station at St. Francis. Incorporators are C. I. and J. S. Woodbury, of Anoka, Minn.; G. D. Woodbury, of Wallisett, Mass.; Wm. Streetly and S. Hamblen, of St. Francis.

GREAT BARRINGTON, MASS.—The Southern Berkshire Street Railway Co., of Great Barrington, has been organized by George Church, P. A. Russell and William Stanley, to build an electric railway from Great Barrington to Fremont and from Stockbridge to Sheffield.

TRENTON, N. J.—The American Street Railway, Engineering & Power Co., with a capital of \$2,500,000 has been incorporated.

GETTYSBURG, PA.—The Chambersburg & Gettysburg Electric Railway Co. has been incorporated with a capital stock of \$50,000.

WARREN, PA.—The Warren & Sheffield Street Railway Co. has secured a charter and proposes to build a 12-mile electric railway to connect Glade Run, Warren and Sheffield. The company is incorporated with a capital stock of \$66,000. The directors are: D. H. and H. A. Siggins, H. A. Jamison, W. W. Rankin and F. E. Rice, all of Warren.

INDIANAPOLIS, IND.—Articles of incorporation are being prepared for the Indianapolis & Northwestern Railway Co., which proposes to build an electric railway between Indianapolis and Crawfordsville. A franchise for the interurban over the Crawfordsville pike has been asked of the Marion County commissioners. The promoters of the Indianapolis & Northwestern company are: Frederick M. Ayres, William M. Taylor and John F. Carson.

MIAMISBURG, O.—The Miamisburg & Germantown Traction Co. has been organized by Samuel Mays and W. L. Dodds, of Miamisburg, to build an electric railway between the cities named in the title. The promoters, in a recent conference with the officials of the Southern Ohio Traction Co. arranged to obtain power from that company, and connections may be made with the Southern Ohio lines at Middletown. Rights of way over private property have been secured for nearly the entire distance, and a number of contracts for construction material have been awarded.

SOUTH HAVEN, MICH.—The South Haven, Paw Paw Lake & St. Joe Electric Railway Co. has filed articles of incorporation. Its line, which will run from South Haven to Paw Paw Lake and St. Joe, will be built by the South Haven Construction Co., and work will be commenced in January. S. A. Deaner, South Haven, may be addressed.

AUSTIN, TEX.—The Grand Avenue Railroad Co. has been incorporated with a capital stock of \$15,000 by Otto Koehler, Otto Whomund and John J. Stevens to build an electric railway system in Austin.

NATCHEZ, MISS.—The Natchez Electric Street Railway & Power Co., has been incorporated with a capital stock of \$150,000, by A. G. Campbell, Capt. James W. Lambert, Thomas Keber and P. W. Mulvihill, all of Natchez. An extensive street railway system in Natchez is projected.

WEST POINT, TENN.—A company is being organized to build an electric railway between West Point and Memphis, Tenn. A committee on permanent organization has been appointed, comprising: F. M. Abbott, C. W. Gibson, T. C. Kimbrough and Captain T. W. Young.

TOLEDO, O.—The Toledo, Adrian & Jackson Railway Co. has been organized by A. P. Southworth, of Adrian, and Luther Allen, of Cleveland, to build an interstate electric railway connecting the cities named. Some of the rights of way have been secured, and the grading of the road bed is under way.

SULPHUR, I. T.—A charter has been issued to the Sulphur Springs Railroad Co., which is being promoted by Eugene White, of South McAlester, and Theodore H. Ellis and C. H. King, of Sulphur.

CLARKSVILLE, GA.—The Nachoochee Railroad Co. has perfected its organization will proceed with the construction of the proposed electric railway in Clarksville. Charles L. Boss and W. S. Erwin, of Clarksville, are interested.

#### RIGHTS OBTAINED.

COLUMBUS, O.—The Columbus, New Albany & Johnstown Traction Co., which proposes to build a 24-mile line through Columbus, Rarig, Shepards, Gahanna, New Albany and Johnstown has secured all rights of way and is completing surveys of the route. It is announced that the contracts for the construction work will shortly be awarded. W. J. Dusenbury, secretary, or Harry Gates, chief engineer, Columbus, may be addressed.

AKRON, O.—Thomas L. Childs, of Akron, who recently obtained franchises in Stark County for the proposed Akron-Canton Electric Ry., has also secured franchises for that road from the commissioners of Summit County. Mr. Childs represents a company of Akron and Canton capitalists recently organized with \$500,000 capital stock.

SMYRNA, PA.—A franchise for an electric railway through Smyrna has been granted James Lord, of Dover, who represents the Delaware Electric Railway Co. Mr. Lord proposes to build an interurban line from Smyrna to Milford, through Kent County, and has acquired most of the rights of way.

MEADVILLE, PA.—The Meadville & Titusville Street Railway Co., of which U. R. Shyrook is president and purchasing agent, has secured a franchise from the Blooming Valley council, and is preparing to build its proposed extension through Crawford County. The construction of the extension to Cambridge Springs, for which the Tennis Construction Co., of Philadelphia, has the contract, is progressing rapidly.



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#### CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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The "Review" begs to announce that with this issue H. H. Windsor resigns as managing editor and is succeeded by Daniel Royse. Mr. Windsor retires to engage in other work and his interest in the business has been purchased by Mr. Kenfield and Mr. Royse. In thus severing a connection of ten years Mr. Windsor desires to express his grateful appreciation of the many favors received from friends of the publication, which have contributed so largely to its success, and to bespeak the same kindly co-operation for the "Review" in the future.

During the time Mr. Windsor has served as editor of this paper the growing importance of interurban electric roads led him to make a special study of the possibilities of this field and during the past two years he has been instrumental in building an interurban line. His interests in this direction have now reached a point where he intends to devote his entire time and a street railway experience of eighteen years to organization and railway construction.

Mr. Royse, who during the past four years has been associate editor with Mr. Windsor, is a graduate in the engineering departments of Purdue and Cornell Universities, and his work in this country has been supplemented by study and travel abroad.

The "Review" has long occupied an influential position among the leading technical journals, and it is the purpose of the management to keep up to the high standard already set, and endeavors will be made to continue constantly abreast of all new developments, enlarging the scope of the "Review" to the utmost and always striving after new successes.

Mr. Windsor takes with him the good will and best wishes of the entire "Review" staff for success in his new enterprise.

One of the auxiliary or special services offered by street railway companies in the larger cities that promises to become an appreciable source of revenue is that of providing sight-seeing cars for visitors. The companies in Cleveland and Detroit put their observation cars in service last summer; Washington, D. C., has

such cars, and it now is announced that the Toronto Railway Co. intends to run similar cars during the coming season. The plan is to provide a guide on each car, who can point out sights of interest and answer questions, and thus afford strangers an opportunity to see something of the city in a short time. These special cars also provide residents with a novel means of agreeably entertaining their private guests.

The Liverymen and Undertakers' Association of St. Louis has decided not to discipline those of its members who assist in funerals at which funeral street cars are used; the association also expresses the belief (an erroneous one, we think) that the funeral car enterprise will soon prove a failure. There is no reason why undertakers should oppose the operation of funeral cars by railways; with liverymen it is a different matter, and they are expected to object to the competition.

The accident on the interurban line of the Union Traction Co., of Anderson, Ind., mentioned in our news columns, might have been much more serious than it was and should serve as a warning to managers of interurban roads. In this case two motormen undertook to run their cars down grade after a failure of the power, at an hour when it was dark. This in itself is a bad practice, but the greater neglect was in not having signal lamps other than electric for use in emergencies. Electric headlights are well-nigh a necessity for high-speed interurban roads, but they of course are rendered useless by a failure of the current. Without some other source of light cars are in serious danger in event of a breakdown at night, and head and rear signal lights for emergency use should be considered as essential a part of the equipment as the motors themselves.

When the promoters of an electric interurban road begin the work of securing rights of way for the proposed line they have usually to meet the opposition of merchants in the smaller towns who fear that the improved transportation will bring them into too active competition with larger firms in the cities to which the road is designed to run. The result in every such case that has come to our attention has been directly the reverse of that feared by the smaller mercantile firms, their business having increased instead of decreased after the new road was in operation. The principal reason is that while the residents of smaller towns have been placed in closer touch with merchants in larger places, to whom some custom has thus been transferred, the loss to stores in the towns has been more than made good by the increased trade of farmers who have also been brought nearer to them in point of time. An example is cited in the case of the Lewiston, Brunswick & Bath Street Ry., of Lewiston, Me., which is described elsewhere in this issue.

One of the objections brought forward when electricity was first suggested as a motive power on street railway lines, was the possibility of the overhead wires interfering with the work of the fire department when raising ladders and hose to burning buildings along the tracks, but a Peoria (Ill.) alderman now proposes to utilize street railways for extinguishing conflagrations. As mentioned elsewhere, the plan is to place upon a flat car, which will travel over the tracks, reels of hose, ladders and pumping apparatus, and it is believed the outfit will prove to be more efficient, particularly where long runs are necessary, than the horse-drawn fire engines and wagons. The use of such cars might have some disadvantages on short-schedule line, but in suburban and interurban districts and elsewhere they could do excellent work in saving life and property from destruction by fire. It is not impossible that street railway cars for extinguishing fires may soon come to be regular features in this country, as have mail, funeral, express and freight cars. In the scheme proposed a regulation steamer fire engine is contemplated to work either on the car or the ground. In some cities this could easily be modified to pumping apparatus fixed on the car and driven by electric motors taking current from the trolley wire.

The determination of an equitable basis for the taxation of corporations, particularly public service corporations, which depend for their prosperity upon a more or less exclusive grant to lay down tracks, wires, tubes, etc., in or on certain streets, appears



to be a difficult problem for our legislators and tax commissions. It is needless to expect that this question can ever be permanently settled except in a manner that will be just and reasonable for both the companies and the public.

The plan of collecting a percentage of the gross earnings of railways in lieu of other taxes has been tried in some states, but the difficulty in this method is the wide divergence in opinion as to what is a reasonable rate. A percentage that a large company in a city having favorable conditions as to distances and grades, could pay, would be quite impossible for smaller companies in the same state. Varieties in local conditions prevent a satisfactory classification on the basis of population.

If the attempt is made to tax railways on their holdings of real and personal property and include the franchise as one of the assets, there is always serious controversy and the final result is usually a more or less arbitrary decision by boards of assessors.

Mr. Frederick N. Judson, of the St. Louis bar, has proposed a plan he believes would be equitable and certain in its operation and temper the burden of taxes according to the ability to pay. Mr. Judson's idea is to capitalize the net earnings and assess this amount at the same percentage as is taken in the case of other property. Holders of the stocks and bonds would be exempt from taxation on them since the company's assessment has covered everything invested in the property.

There are a number of advantages to be gained by following the practice of filing for ready reference, supply dealers' catalogs and price lists, as is done at the offices of the Union Traction Co., of Philadelphia, whose method of filing and indexing is described elsewhere in this issue. To the manager or purchasing agent who is planning new work or is called upon to replenish the stock of any particular class of goods, it is of the utmost convenience and value to have before him comparative prices and details as to the design, sizes and quality of the material wanted as furnished by the different houses. The makers' catalogs usually contain just the information desired, but if the catalogs are tossed on top of a desk or into a corner because they are not needed at the particular moment they arrive, the information is of no use because it is not readily available. As such printed matter is now "filed" it is usually less trouble to write for a new circular or catalog than it is to dig down into a dust-covered pile of books and papers for what is wanted. Writing involves delay, which is quite annoying, since the information is nearly always wanted in a hurry.

Aside from the advantage of having descriptions of standard goods and material in such shape as to be easily reached, there is the additional one of having data on special tools and devices that may be required in the future. We have at various times received letters from managers stating that they are in need of a device to do certain work in the shop or on the road, and remember having seen a circular describing just the article wanted, but cannot recall the maker's name. If a convenient system of filing catalogs as they arrive is established, and these are indexed according to general subjects, as well as under firm names, the desired data can be secured with slight trouble. After a suitable filing case is once started it takes but little effort to keep it up. When a new catalog superseding an older one is received, the earlier one should be thrown away.

The Paris Metropolitan Underground Railway is operated by a private corporation which furnishes all the equipment, including tracks and power stations, the lines being laid in tunnels built by the city of Paris. There are some eight miles now built and building, this being about one-fifth of the total mileage contemplated. As stated elsewhere in this issue, the rates of fare are 2, 3 and 5 cents, the 2-cent rate being limited to certain hours and intended for workmen, the 3-cent regular second-class and the 5-cent rate the regular first-class. As compensation for the use of the tunnel the company pays a percentage of the fares, equivalent to approximately one-third of the gross passenger receipts, and in order for the city to receive 4 per cent on the cost of the tunnels the number of passengers per annum will have to be about 140,000,000.

The operating company is thus confronted with the problem of carrying passengers at the average rate of 2 cents, paying operating expenses and maintenance; recouping the original cost

of plant and equipment within 35 years and making a reasonable return on the investment. The only point where the company is favored is in the matter of track construction and maintenance; the tracks can be laid cheaper than in the case of a surface line and the maintenance will be less because there is no other traffic over them and 60 per cent of the line is in tunnels. This problem is perhaps easier of solution in Europe than it would be in this country because the minimum wage rate of \$30 per month is at least one-third to one-half less than the minimum rate in the large cities of America; though probably a considerable share of the saving due such a lower wage rate (from 8 to 16 per cent of the gross receipts) will be needed to meet the payments to employees when sick or disabled, the premiums to pension funds, etc.

Also, these 40 miles of the Paris Underground will serve only a limited area, three miles one way and four miles the other, in the congested district of the city, and the fact of its being a "short-haul" line exclusively takes it out of the class of transportation lines with which we are familiar in our own cities.

The provisions concerning the payments to employees during periods of sickness and while disabled from accidents appear very onerous to American managers, as laying the company liable to be imposed upon by "fake" accident men. In point of fact, the effect of the agreement is to place on the company the burden of disproving its liability instead of making the injured employee prove the liability.

On another page we give an abstract of the report of the Street Railway Commission of the Council of the City of Chicago, made to the council in December last, and also an abstract of the bill submitted as embodying the ideas of the commission. We shall only attempt to discuss here a few of the points covered by the report.

The first conclusion is that the business of urban transportation should be recognized as properly a monopoly. This idea is quite at variance with the opinions generally held by legislators and councilmen in the western states; but the proposed bill provides that a competing company may be given a franchise if approved by a popular vote, so that the recognition of the business as a monopoly is very slight.

On the question of public control and the duration of grants the commission commends the indeterminate grant such as obtains in Massachusetts with the further provision that at the end of the franchise term the city may take over the plant at its "then value." This provision of the bill is taken verbatim from the British Tramways Act of 1870, which street railway men are well aware has done more than any other one thing to repress and retard tramway development in the United Kingdom.

The average citizen does not recognize that the "then value (exclusive of any allowance for past or future profits of the undertaking; or any compensation for compulsory sale; or other consideration whatsoever)" is synonymous with the "scrap iron value" with which our British brethren have become familiar by bitter experience. In England capitalists did not at first appreciate what they were doing and a number of roads were built under the act of 1870, but they were all promoted in the 70's. When the Lighting Act of 1882, with a similar purchase clause, was passed investors profited by the experience of the tramways and held aloof, but little being done until 1888 when the Lighting Act was amended by making the franchise term 42 instead of 21 years. Up to 1896 there had been built under the British Tramways Act of 1870, about 1,000 miles of tramways of which only 50 miles were operated electrically. The existing companies refused to make expenditures for extensions and needed improvements, and much less would they consider a change to mechanical motive power, because in a few years the whole would have to be sold for its scrap value.

In 1896 Parliament passed the Light Railways Act originally designed to apply to agricultural and fishing districts where the traffic was too light to justify a steam railway. This act has been construed to apply to a tramway proper having lines in more than one local jurisdiction. The Light Railways Act provided that local authorities should have the right to purchase at the end of a period of from 25 to 40 years (the exact term to be a matter of negotiation and fixed when the order is granted) instead of 21 years as in the Tramways Act, also that the purchase price should be fixed not on the "scrap iron value" but on the value

as a GOING CONCERN. From December, 1896, to June, 1900, 3½ years, applications for permits to build 2,800 miles of road were filed with the Light Railways Commission under this act.

When the relative effect of these two acts upon development of urban and interurban transportation in England is considered, the Chicago Commission can scarcely be congratulated on its preference for the older purchase clause.

The report next proceeds to discuss the plan proposed for the municipal ownership of the street railways, which contemplates that the funds necessary shall be raised not on the credit of the city but by an issue of bonds or certificates to be paid out of the revenues of the street railways themselves. This scheme looks well on paper, but is it to be supposed that investors will advance money for a municipally managed (which means politically managed) enterprise where their only security depends upon the excellence of that management? The case is not at all analogous to that where the loan is made on the credit of the city itself; the security then is so ample that bondholders can ignore questions of mismanagement and let the taxpayers do the worrying. It is true that by the plan proposed the bonds might be secured by a mortgage on the plant and franchise, but this would not greatly help the bondholders, for in event of a foreclosure they would succeed to a run-down plant with only a short term in which to recoup themselves.

The proposed bill provides for the reference of street railway ordinances to a direct vote of the people, at the discretion of the council, or on the petition of 10 per cent of the qualified voters of the city. The referendum, thus provided, has many advocates who believe that it will be eminently satisfactory in operation. We can not feel sure, however, that a popular vote is the best way of deciding a question of business policy, and it is very doubtful whether the experience already had with the referendum in this country and elsewhere justifies the expectations of the friends of the system.

We do not believe that any corporation rendering a public service will object to a proper supervision of its accounts by public authorities, and in fact the men at the head of the large companies are today urging the adoption of such a policy in order to combat the erroneous belief now prevalent as to the unreasonable profits of such enterprises.

The commission, two members dissenting, believes that in all future franchise grants a provision should be inserted "requiring the company in case of a disagreement with its employees that threatens to interfere with service, to submit the same to arbitration and to abide by the decision of the arbitrator. THIS WOULD BE A SYSTEM OF ARBITRATION COMPULSORY UPON THE COMPANY AND NOT UPON THE MEN IT IS TRUE. But in the opinion of the commission this fact does not constitute a valid objection in this case, as it would if the attempt were to be made to apply the same system to industrial disputes generally. The city has no direct dealings with the employees which give it warrant to require special things of them. But the company comes to the city as a seeker for privileges, and as the city may grant or withhold the privilege at will, so it may properly grant the privilege subject to conditions, and one of these conditions may properly be an agreement upon the part of the recipient company to submit disputes with its employees to arbitration. It is as competent for the city to exact such an agreement from the company, as a condition of the grant, as it is for the city to exact compensation, or to require the company to carry policemen and firemen free, or to do a number of other things which the city does require of street railway companies but not of ordinary industrial corporations. Continuous service is the thing above all others which the public must have from its transportation agencies. If the city itself were managing the street railway system employees would be treated in such a manner as to insure a service free from interruption on account of strikes. In so far as fair treatment of employees may be necessary to continuous service, private corporations operating street railways under a franchise from the city should be required to treat employees as fairly as the city itself would treat them were it their direct employer."

In the sentence which we have printed in capitals the commission has stated the whole case. We believe that this is an insuperable objection to the plan. Look at the great street railway strikes of recent years, Milwaukee, Cleveland, St. Louis, Kansas City. In which of them was there anything to arbitrate? If the

city wishes to insure uninterrupted service, let it provide adequate police protection in times of disorder.

The question of low fares versus compensation is dismissed by the commission with the remark that it opens too broad a field for discussion. This, which really means how much shall street railway stocks be permitted to earn, is a very important question; in fact we believe that it is the only thing at issue, and that when it is settled the whole street railway problem will be settled. The popular demand now is that street railways shall be required to pay for their franchises or reduce their rates of fare. As we have frequently said in these columns, our own opinion is that the compensation should go first to the people who pay the fare, in the shape of increased accommodations, and only to the city after all desirable improvements in the service have been made.

### THE USUAL WAY.

He was a fresh reporter, just come to town, and was taken on trial by one of the leading dailies. As a starter he was told to go out and write something about the Virginia St. car line. In his confusion at receiving his first assignment he became considerably rattled, and failed to properly catch the city editor's line. So he went out hopefully and wrote the story as the local paper down in Hooptown, where he came from, would have done. This is what he turned in:

"The residents along the aristocratic Virginia Ave. are justly proud of the present electric street car service which the Citizens company is furnishing. During the past few years the old and antiquated cars have been replaced by modern palaces of transportation, in which the passengers may luxuriate on plush cushions of rich color and softest plush. The new time table which went into effect last week is greatly appreciated and a vast improvement on the old one. The new rule that cars stop only at street crossings is also praised as it avoids so many stops and enables much faster running time. The cars now going through the company's repair shops, are being painted in a deep sea green which is a most grateful change from the monotonous yellow which has heretofore designated this line. A few leather straps have been placed in the cars to assist aged people in passing to and from the seats, and in short the every evidence of the company is for the comfort and convenience of its patrons. In these days it is delightful to find at least one corporation which evidently has a soul and a kindly fellow feeling."

After handing in his story and receiving his discharge the cub went out to get a 10-cent lunch and met an old reporter to whom he related his troubles. The veteran smiled and told him to watch the local column next morning and get a pointer. He did and this is what he found:

"The residents along the aristocratic Virginia Ave. are justly incensed at the service which the greedy Citizens octopus street car company is furnishing. The cars look like stranded Noah's arks, and are not fit for anything better than hen houses. The dingy old red plush is full of dust and disease germs and the Board of Health should take some prompt action in the matter. The new time table is an abomination and has caused no end of complaint. Letters are pouring into this office protesting against the new rule about stopping for passengers. Apparently the company expects the public to walk to the end of the line to take a car so it will not have to stop on the entire trip. The reckless and regardless manner in which the cars are run is a menace to the safety and lives of all unfortunates compelled to cross the avenue. Imbued with another streak of economy the company is repainting the cars and changing the yellow, which everybody liked, to a tomato-worm green. Instead of adding more seats the company has put in a fresh consignment of old leather straps for the tired passenger to dangle from on his way home. The windows look as if they had not been washed in six months and every car has at least one flat wheel and goes pounding along making a noise like a boiler shop. In short the every evidence of the company is a fortissimo declaration of 'the public be damned policy.'"

And the cub pondered on these things.

The New York Court of Appeals has fixed the amount of the Brooklyn Rapid Transit Co.'s state tax at \$53,499. The stock of the company taxable in the state of New York is \$34,997,361.



## Lewiston, Brunswick & Bath Street Railway.



BY C. B. FAIRCHILD.

The system operated by the Lewiston, Brunswick & Bath Street Railway Co., of Lewiston, Me., is quite as interesting as any road in the country both from engineering and operating standpoints. The lines comprise 55 miles of track connecting the villages of Sabattus, Lisbon and Lisbon Falls with the cities of Lewiston, Auburn, Brunswick and Bath.

Current is generated at both steam and water power stations and transmitted at high potential to transformer sub-stations. One of the features that has been admirably developed is the park system. The company was chartered in 1897 and purchased the properties of Brunswick Electric Ry. and the Lewiston & Auburn Horse Ry. July 1, 1898, the Bath Street Ry. was leased for 999 years.

The suburban line proper runs in a direction nearly north and

increase in their business. This is because the road has placed the cities and towns into close touch with the farming elements. Where, before, it took a long time to reach the cities, the farmer can now enjoy at least one of the advantages of a city life by means of rapid transit.

At two points on the road, where the line crosses steam railway tracks, the tracks are elevated and pass over on steel viaducts, making quite abrupt grades. One of these bridges is illustrated in Fig. 2; because of its serpentine outlines, it is known as the "Snake Bridge." The tracks also cross numerous wooden trestles, over creeks and gorges, nearly all of which have been rebuilt, under the direction of the present manager and provided on each side with guard timbers, and between the rails with steel guard rails.

The line is single track, with turn outs, having ground throw spring switches. The trolley wire is double throughout the entire length, in order to avoid overhead switches.

In addition to the advantage of having the numerous towns and villages from which to draw traffic, the company owns two pleasure parks, one known as the "Merrymeeting Park," located at the junction of the Androscoggin and the Kennebec Rivers, a few miles south of Brunswick, and from which the park derives its name of "Merrymeeting." The other park is "Lake Grove," on the shore of a large fresh water lake, a few miles from Lewiston.

### POWER STATIONS.

When the road was originally built, it was thought that sufficient water power could be obtained for operating the entire line, but it has been found necessary to install an auxiliary steam power plant at Lewiston. This plant is used during the hours of heavy traffic or in the event of any trouble in the water power station which might decrease the power generated at that place. At such times the steam plant may be called upon to furnish power for the entire system.

A view of the Androscoggin Falls at Brunswick where the company's water power plant is located, is shown at the head of this article.

The power utilized for operating the street railway system is only a part of the capacity of the falls, the rest being used for operating large factories, which stand near the power house of the railway company. The available head is 17 ft. and the railway company has four "Victor" turbines, made by the Stilwell-Bierce & Smith-Vaile Co., Dayton, O., of the horizontal type, all mounted on one shaft. The power is transmitted by a rope drive from a large drum on an extension of the wheel shaft to a jack shaft on the upper floor of the station. The jack shaft drives the generators through leather belts.

The generators are Westinghouse 250-kw. double current machines; from collector rings at one end alternating current is taken and from the commutator at the other, direct current at 550 volts. The latter is led to the trolley line and the former to static transformers, located in a small brick building just across the street from the power house, where it is stepped-up to 10,000 volts, and, at this pressure is transmitted to three transformer stations. The



FIG. 1—SCENE ON PRIVATE RIGHT OF WAY.

south to Brunswick, then east to Bath, a distance of about 29 miles. Besides the town mentioned, the line passes through a number of manufacturing villages, with numerous pulp, cotton and woolen mills, and, in some sections, through a fine farming region; other portions of the line are through wild uncultivated tracts, on a private right of way, such as shown in Fig. 1, giving the patrons a great variety of scenery. Thus every mile of the distance brings one to new landscapes.

When the line was extended from Lewiston to Brunswick and Bath it was opposed to some extent by the Brunswick business men who held the mistaken belief that they would suffer by reason of being placed in too active competition with the larger firms of Lewiston, to their own disadvantage. The opposite, however, proved to be true, and the Brunswick business men are enjoying an

first sub-station is nine miles away, in the direction of Lewiston; the second at Lewiston, 19 miles distant, and the third at Bath. At the transformer stations the current is stepped down to 330 volts, alternating by stationary transformers, then into rotary converters, which transform it into a 550-volt direct current, for the trolley line. The transformer station at the second division of the line is a small brick building, which stands near one of the large car barns, of which there are three, one for each of the three divisions.



FIG. 2 SNAKE BRIDGE.

The steam power station which occupies a brick building near Lewiston, has several interesting features in connection with the high-tension service. The boilers are of the Babcock & Wilcox make, two new ones of 200-h. p. each having been recently installed. There are three Westinghouse compound engines of 400-h. p. each, one of which is directly coupled to a 300-kw., two-current generator. The other two engines drive machines of the



FIG. 3 INTERIOR OF CAR HOUSE.

same capacity by means of belts; these generators are also used as converters, being driven by current from the water power station. In order to run these machines as converters, the belt is freed from the driving drum by means of a semi-circular steel plate, having on its outer edges, lugs with eye holes. This plate is first placed against the face of the driving pulley of the generator shaft; a half turn of the engine brings the plate under the belt on the opposite side of the pulley, when by means of rods and hooks provided with turn buckles, which are anchored to the wall, the plate carrying the belt is moved about an inch away from the pulley, leaving the armature free to revolve.

Current for the converters is taken from static transformers, with which the station is provided, the operation being the same as at any of the other transformer stations. Should it become necessary to operate the whole system from this station, these machines being driven by the engine, deliver from one side a 550-volt current direct to the line, and from the other side alternating current to the static transformers, by which it is stepped up to 10,000 volts, and transmitted to the other transformer stations in the same manner as from the water power station. To facilitate this method of operation, the switchboard is provided with two sets of bus bars.

The condensers used with the engines in this station are from the works of the Dean Steam Pump Co., of Holyoke, Mass.

In connection with the power station is a motor which drives, when necessary, a Sturtevant blower for forced draft; the motor provides power for operating the shafting in the adjoining car house, driving the tools of the repair department.

This car house, Fig. 3, is 154 x 70 ft., with brick walls and a steel truss roof, and has ample pit area for trucks and motor repairs.

The third car house of the system is located near Bath, and is a large wooden building, which was formerly occupied as a factory for making oil cloth. Adjoining this are a number of out buildings, which together with quite a large tract of land are owned by the company.

#### ROLLING STOCK.

The suburban system has 14-bench, open cars with seats for 70 passengers. These cars are 40 ft. over all and have two steps on each side, as shown in Fig. 4. These cars are mounted on Peckham trucks, and are equipped with 50-h. p. motors. Both Westinghouse and General Electric motors are used on the cars of the system. The total number of cars, including open and closed, is 75. A number of the closed single truck cars have cross seats with center aisles. Included in the rolling stock, is a very fine parlor car, named "Merrymeeting." This car is 42 ft. over all with unusually long platforms, and with steps attached to the outer ends of



FIG. 4 TYPE OF OPEN CAR.

the platform, offering easy access to the car. This car is also mounted on Peckham trucks, and is equipped with air brakes with axle compressors. This car has easy chairs upholstered in green plush in the closed section and rattan chairs on the platforms. The special car is leased to private parties who may wish to ride over the line or visit the parks, and is very popular with the patrons. One of the suburban cars has recently been equipped with a searchlight headlight 5,000 candle power, made by the Dayton Manufacturing Co., of Dayton, O., which is said to be giving excellent satisfaction. The company is also making a trial of the Price friction brake, made by the Peckham Truck Co.



## PARKS.

Merrymeeting Park embraces a tract of 147 acres, all enclosed with a wire fence, located  $1\frac{1}{2}$  miles from Brunswick. The enclosure embraces an area of cleared land, formerly farming land, which slopes away in two directions to the Androscoggin River, interspersed with trees and bushes along some of the roughest portions, and a large section of a forest of native trees, in the edge of which is a deep ravine, where an open air theater is located. One of the attractions is a large pond, which is fed by numerous springs; this is divided by a wire fence, one side being known as the swan pond and the other the duck pond. The principal park building is a large three-story casino, shown in Fig. 5, which is located on the highest point of ground in the park, from which a fine view of the river can be had in either direction. In the river are numerous wooded islands, the shores of which are outlined by tall trees, presenting a scene of quiet beauty seldom equalled. The casino has broad verandas, and there is a very large dining room, also a dance hall, parlor and smoking rooms, all furnished in a tasteful manner and providing a charming resting place for the patrons. A specialty is made of "shore dinners."

The casino is surrounded by a beautiful lawn, with numerous beds of foliage and flowering plants, laid out in artistic designs, the plants growing more luxuriantly than is usual in parks of this kind. On the approach to the casino the visitor passes through the zoological department in which are numerous houses, cages and pens for the fine collection of animals which forms one of the principal attractions. The collection includes a herd of buffaloes, bears, moose, elk, deer, foxes, among the large animals, most of them being natives of the state of Maine. There are cages of guinea pigs, birds and other small specimens, while in the pond fine specimens of swans and ducks are to be found.

Under the trees in a grove are Fairfield lawn swings. Near the theater a rustic bridge crosses the pond, and in the middle of the pond is a wide platform with rustic railings, which is designed for dancing parties.

The stage of the theater is a wide open platform, with suitable dressing rooms. The seats are arranged in rows on the sloping bank of the glen, being well shaded.

A typical audience at the Merrymeeting theater was illustrated in our issue for June last, page 327. The attractions for this park



FIG. 5—CASINO.

Lake Grove Park is located three miles from Lewiston. The cars cross the river from Lewiston and pass through the adjoining city of Auburn, then out to the lake on which the park is located, and from which the cities of Lewiston and Auburn receive their water supply. The attractions here consist of a small rustic theater, with open stage, where the seats are supported in tiers by timbers and braces. The place is well shaded, and scattered among the trees are quite a number of animals including bears, moose and elk. On the lake a large number of boats are kept, which are hired to boating and fishing parties. This park, like the other, enjoys a liberal patronage, and very creditable vaudeville shows are given both afternoon and evening.

The street railway system embraces the local lines in Lewiston and Auburn, which are on opposite sides of the Androscoggin River, with lines leading out into the country in different directions, three miles to East Auburn, two miles to the grounds of the Maine State Agricultural Society, near the village of Barkerville, and  $6\frac{1}{4}$  miles to Sabattus. In Bath is operated the "Bath Local"— $4\frac{1}{4}$  miles in length—from the "North End" to Winegance. These



BUFFALO, DEER AND MOOSE AT MERRYMEETING PARK.

have been secured through the J. W. Gorman agency, of Boston, with most satisfactory results.

At the entrance to the park, which is over a high bridge crossing the Maine Central R. R., which is parallel to the trolley line, is a large covered platform with waiting rooms. After the afternoon and evening performances in the theater, the cars are banked along the platform ready to receive the patrons. The cars are headed in both directions, as the park attracts people from both Brunswick and Bath, and many come from as far as Lewiston. The fare from Brunswick is 5 cents with a free admission to the theater and park attractions, and frequently the attendance at the park entertainments is from 2,000 to 4,000 people. The seating capacity of the theater is about 3,000.

lines are operated in connection with the main line running direct from Lewiston to Bath, the run consuming  $2\frac{1}{4}$  hours, and it is safe to say that a more beautiful ride of  $2\frac{1}{4}$  hours cannot be found in New England.

The headquarters of the company are at Brunswick and its affairs are under the management of Mr. M. I. Masson, the treasurer and general manager, who was elected to those offices May 10, 1900. Mr. Masson has from an early age made New York City his home, where he has been connected with street railway interests since 1874.

The gross receipts of the Cleveland City Railway Co. for the past year show an increase of \$28,000.

## REPORT OF THE CHICAGO STREET RAILWAY COMMISSION.

Under a resolution of the Chicago City Council passed Dec. 18, 1899, the mayor on Jan. 3, 1900, appointed Aldermen Foreman, Herrman, Jackson, Brennan, Raynor, Mavor and Schlake a special commission to investigate various matters in connection with the street railway system of Chicago. The commission made a voluminous report under date of Dec. 17, 1900.

The report states that the commission believes the popular desire is that local control and short term grants should be maintained as the underlying principles of street railway policy, and has drafted a bill to be submitted to the Legislature at its present session.

The commission thus abstracts the report:

"1. Unification of Management. The street railway business should be recognized as a monopoly business and treated accordingly.

"2. Public Control and Duration of Grants. These two subjects should be treated together because of the intimate relations they bear to each other. If street railways are to remain under private management some means must be devised for rendering public control more effective. The commission favors the reservation to the council of broad powers of control and for the exercise of the powers thus reserved it recommends the creation of a new standing committee on local transportation, modeled in the main after the committee on track elevation. This committee should have regular quarters in the City Hall, which should be open during business hours for receiving complaints from citizens. The committee should have at its service such expert and clerical assistance as might be found necessary.

"3. Municipal Ownership. Cities should possess the power, under proper restrictions and safeguards, to own and operate street railways. The city may not deem it expedient to exercise this power, but with such a power in reserve to be used in case of need, the city would be in a position to make much better terms with private corporations. The commission, while believing it wise and important to give the power to operate, would not look with favor upon the proposition to have the city of Chicago operate street railways in the immediate future. It has no notion that such a proposition would meet with the favor of the people of Chicago at this time. Problems of the future may safely be left to the decision of the future. The commission is of the opinion, however, that it would be wise for the city, at the earliest practicable time, to acquire ownership of the trackage and of whatever may form a part of the public street, without going to the extent of ownership and operation of rolling stock.

"4. Referendum. In so far as practicable, the people should be given a direct voice through the referendum in the settlement of the most important questions of street railway policy.

"5. Publicity. Street railway companies are entrusted by the public with the management of a public business. The affairs of such companies, therefore, should be open and known to the public to the same extent as if the business were managed by the public directly.

"6. Control of Capitalization. The law should forbid overcapitalization.

"7. Frontage Law. Frontage consents should be required only when it is first sought to lay down tracks upon a street. The right of abutting property owners to prevent a street from being used for street railway purposes, regardless of the public need for a proposed railway, should not be absolute and unqualified.

"8. Labor Policy. The public has a right to demand uninterrupted street railway service. To that end, it has a right to insist that everything reasonably possible be done to prevent strikes and lock-outs. Companies, in accepting grants, should be required to submit all labor disputes to arbitration.

"9. Motive Power. The Chicago street railway field is profitable enough to warrant the use here of the most desirable form of motive power which experience has shown to be practical. The overhead system should not be permitted in the business district.

"10. Subways. The commission is of the opinion, in so far as it is qualified to judge without the assistance of engineering experts, that Chicago should have a system of subways in the down-town district for the accommodation of street cars entering that district, thus making possible the removal of such cars from the surface

of the streets within such subway district. The subject, however, is one calling for a careful and detailed investigation by engineers employed for that purpose by the city before any decisive steps are taken. Legislation should be secured at once permitting the construction and ownership of such subways either by the city or by a private corporation, which legislation should authorize the people themselves to say, through the referendum, which form of ownership they prefer, or whether they want subways at all.

"11. Rate of Fare and Compensation. These are matters requiring a more careful study than the commission has yet been able to make of them. The two should be considered together, for obviously the lowering of fares would reduce the possibilities in the way of compensation to be paid into the public treasury, and vice versa. The question of low fares vs. compensation and the question of the uniform fare as opposed to graded fares or the zone system of fares present themselves for consideration. The commission believes the question as to the amount of compensation for franchise grants should be left open until the terms of the grant otherwise are virtually decided upon.

"12. Co-ordination of Service. The commission is of the opinion that there should be more co-ordination between surface lines and steam and elevated roads.

"13. Legal Questions. The 99 Year Act. When the companies now in control in Chicago receive any further grant of privileges from the city they should be required, as a condition of such grant, to renounce any claim of rights under the so-called Ninety-nine Year Act of 1865."

The various points enumerated are taken up in order and discussed at greater length by the commission; then follows the draft of a street railway bill. An appendix contains reprints of special articles and of parts of reports on the subject from various sources.

The provisions of the bill (which we cannot publish in full for want of space) are in substance as follows:

Section 1. Definition of term "street railways."

Sec. 2. Grant of power to occupy streets and alleys.

Sec. 3. Grant of power to condemn private property.

Sec. 4. Consent of municipal or county authority required.

Sec. 5. Power reserved to municipality or county to control the improvement and repair of streets.

Sec. 6. Right to "regulate such street railways in the interest of the public" reserved.

Sec. 7. Street railways may not be located in a street except upon petition of owners of more than one-half the frontage.

Sec. 8. Franchise grants in cities (or leases of lines owned by municipality) for more than five years to be submitted to popular vote provided a number of voters equal to 10 per cent of the votes cast at the last preceding election for mayor shall so petition within 60 days from the date of the passage of the grant.

Sec. 9. Any incorporated city, village or town may submit street railway legislation to popular vote.

Sec. 10. New companies that will compete with existing lines may not receive franchise grants except the ordinance be approved by a popular vote.

Sec. 11. Method of submitting questions to popular vote.

Sec. 12-13-14. Cities authorized to purchase and operate street railways when the proposition is "approved by four-sevenths of the qualified voters of the city voting upon such proposition."

Sec. 15. Credit of city may not be pledged for building or acquiring street railways.

Sec. 16. Proceeds of operation or lease of municipal lines to go to a special street railway fund, to be held inviolate to meet street railway obligations.

Sec. 17. Street railways owned by city and franchises for their operation may be mortgaged to secure payment of obligations drawn on the street railway fund.

Sec. 18. In default of the street railway fund meeting obligations the street railways and franchises mortgaged may be sold to highest bidder under foreclosure proceedings in a court of competent jurisdiction.

Sec. 19. Certificates of indebtedness drawn on the street railway fund must be authorized by a popular vote and approved by four-sevenths of the qualified voters, etc. Emergency certificates to run for two years may be issued without a popular vote.

Sec. 20. Cities owning lines may lease them for periods not longer than 20 years.



Sec. 21. The council of any city operating street railways has power to prescribe rates of fare, but must make them high enough to meet operating, maintenance and interest charges.

Sec. 22. A railway company asking franchise grants must make full statement, under oath of proper officers, of the affairs of the company and full details of estimated cost of construction.

Sec. 23-24. Street railways to make annual reports of assets, liabilities and full details of operation to auditor of state.

Sec. 25. Street railway companies may not issue stock or bonds to an amount in excess of 25 per cent of the actual cost of the road and equipment.

Sec. 26. Sales, consolidations and leases permitted.

Sec. 27. Cities owning or operating street railways to make full report to auditor of state.

Sec. 28. Auditor of state to publish annual reports of street railways.

Sec. 29. Repeals inconsistent acts now in force.

### REAR-END COLLISION AT ANDERSON, IND.

About 6 o'clock in the evening of January 18th what might have been a very serious accident occurred on the line of the Union Traction Co., of Anderson, Ind., at the crossing of the White River, about two miles east of Anderson. There is a steep grade at this point sloping down to the river, and the division point between sections of the trolley line is near the top of the hill. The Muncie end of the line was supplied from the new station at North Anderson, and the Anderson section from the old station in Anderson. About 5 p. m. a belt in the latter station broke, thus cutting off power from the section of the trolley line fed by it; the 4:30 car from Muncie after passing the section insulator, drifted down the hill, stopping on the bridge. Power being cut off, there were no lights visible. The following car, one-half hour later, struck the dead section of the line, and the motorman decided to run as far as he could without current, just as the man on the first car had done.

When the second car was heard approaching a man went back to attempt to signal it, but was too late to prevent the second car from striking the first. Ten of the forty or more passengers were injured; the ones who suffered most had left the standing car and were attempting to get out of danger when the crash came. The cars were very strongly built, or the accident would have been much more serious.

### PROPOSED CINCINNATI LEASE.

Under date of January 17th President Kilgour and Secretary Collins, of the Cincinnati Street Railway Co., issued a call for a special meeting of the stockholders February 21st to take action on a proposition to lease the company's property to a new company, which it is understood will be controlled by Messrs. Widener, Elkins, Dolan and Morgan.

The provisions of the lease to be submitted to the stockholders are that it shall be for the full term of the unexpired grants to this company from the city of Cincinnati and any extension or renewal thereof. The property included is all the real and personal property of the Cincinnati Street Railway Co., except the books, papers and records of the company, and all the cash on hand at the date of the lease, excepting also the cash embraced in the company's insurance fund and sinking fund, and its investments in stocks, and the entire amount of its unissued capital stock. The rents reserved are estimated and intended to be equal to the interest on the bonds and dividends upon the capital stock of the Cincinnati Street Railway Co. of 5¼ per cent the first year, 5½ per cent the second year, 5¾ per cent the third year, and 6 per cent each year thereafter during the continuance of the lease. The lessee is to pay all taxes, license fees, etc., and also \$7,500 per year to maintain the organization of the old company.

The consent of two-thirds of the stock is requisite.

Vandals broke into the carhouse of the Akron (O.) & Cuyahoga Falls Rapid Transit Co., at Barbarton, on the night of January 12th, and ran one of the company's cars a mile down the track where it was overturned in a ditch. The car was considerably damaged. Four arrests have been made.

### FUNERAL CARS IN ST. LOUIS.

In the "Review" for January, 1900, we announced that the St. Louis Funeral Transportation Co. had entered into contracts with the St. Louis Traction Co. for the operation of funeral cars over the street railways of the city. The St. Louis Livemen and Undertakers' Association has not regarded this innovation with approval and a few weeks ago it threatened to impose fines upon such of the members as should assist at a funeral where funeral cars are used. After a week's reflection, however, the association decided not to take any such action against its members, leaving the funeral car to work out its own destruction. From the results in other cities we feel sure the opponents of funeral cars will have long to wait.

### REPORT OF TORONTO RAILWAY CO.

The annual meeting of the Toronto Railway Co. was held Jan. 16, 1901, when President William Mackenzie submitted the financial statement for the year ending Dec. 31, 1900. The table herewith shows the receipts, operating expenses and passenger statistics for the nine years since the organization of the company. The gross earnings for 1900 were \$167,459 in excess of those for 1899, an increase greater than the most sanguine expectations of the management. The net profit for the year was \$454,163, an increase of \$21,293 over 1899. After paying dividends of 4 per cent on the capital stock and paying \$64,000 to the city for paving charges, there remained a surplus of \$150,163. The total amount paid to the city in taxes and pavement charges was \$204,384, and in addition the company paid the provincial tax.

STATISTICS OF EARNINGS AND PASSENGERS.

COMPARATIVE STATEMENT	1900	1899	1898	1897	1896	1895	1894	1893	1892
GROSS EARNINGS	\$1,360,000.00	\$1,353,333.33	\$1,210,000.00	\$1,232,612.00	\$862,221.11	\$1,016,666.66	\$1,016,666.66	\$1,016,666.66	\$1,016,666.66
OPERATING EXPENSES	215,000.00	200,000.00	150,000.00	150,000.00	150,000.00	150,000.00	150,000.00	150,000.00	150,000.00
NET EARNINGS	215,000.00	200,000.00	150,000.00	150,000.00	150,000.00	150,000.00	150,000.00	150,000.00	150,000.00
PASSENGERS CARRIED	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000
TRANSFERS	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000
PERCENTAGE OF OPERATING EXPENSES TO EARNINGS	15.7	14.8	12.4	12.1	17.4	14.8	14.8	14.8	14.8

During 1900, \$185,000 was expended on capital account. As in previous years, the surplus has been expended in improvements, over \$1,000,000 having been thus spent out of surplus earnings since 1892. A new 1,600-h. p. direct connected unit was installed in the power house, the St. Lawrence St. power house extended and a large number of new cars built.

The capital stock of the company is \$6,000,000 and the outstanding bonds amount to almost \$3,000,000.

### WORK OF THE NEXT DECADE IN GREAT BRITAIN.

Among the things to be done during the first decade of the century, Mr. John S. Raworth, in Lightning enumerates the following:

Gas lamps to be replaced by electricity (this is only half the total, and it will require 750,000 kw. of electrical plant)....	50,000,000
Miles of horse tramways to be electrified.....	700
Miles of new electric lines to be constructed.....	5,000
Horses to be replaced by electric motors in London...	50,000
Horses to be replaced by electric or mechanical motors in the provinces .....	200,000

## ROSSITER ON RAPID TRANSIT IN BROOKLYN.

Mr. C. L. Rossiter, president of the Brooklyn Rapid Transit Co., in an address before the Broadway Board of Trade, said in part:

The satisfactory handling of suburban traffic in large cities is becoming yearly a more difficult problem. The demand for quick time and frequent through service has made the problem of handling the city business—or what may be termed "short riders"—still more difficult. The existing conditions of social and business life are such as to make the regular operation of traffic of great moment to those who are dependent upon it twice each day to reach their homes and business, and no reasonable expense is too great for a railroad company in order to give such operation.

That the transportation companies of Brooklyn have endeavored to meet their obligations can best be judged by a brief review of the transportation question in this borough from its inception. The first car tracks built extended from Fulton Ferry to Greenpoint, and the first horse cars were operated in 1854. Extensions and branches were built from year to year and new companies formed until in 1890—but 40 years after the first road was constructed—there were in operation in this city, including the suburban lines in Queens county, now a part of the city, 297 miles of surface and elevated tracks, and also 73 miles of steam lines, these latter operated almost exclusively for the three months of summer to Coney Island. During the next 10 years there were added to the system 150 miles of track, consisting almost entirely of new extensions, and the greater part of this mileage has been constructed and put in operation since July 1, 1895, or within a period of five years.

In 1895 the extreme distance that any single line of cars ran was five and a half miles, the terminal being generally located at what was known as the "city line." Beyond these points not only was a change of cars necessary, but an extra fare of 5, 10 and 20 cents was charged. In 1890 the surface, elevated and steam lines, which today form a part of this system, transported 125,600,000 passengers, or approximately 340,000 passengers daily. The length of time taken for a trip from Fulton Ferry to Greenwood was 48 minutes. Today the time is 28 minutes on the surface cars. In 1890 the time taken to go from one end to the other of the Crosstown line was 80 minutes; today it is 58 minutes. During the last fiscal year this company carried upon its entire system 273,450,000 passengers, or an average of over 750,000 passengers per day, and during the past four months this average has increased to over 800,000 passengers, or nearly two and one-half times the number of passengers transported in 1890—an increase of 150 per cent.

The Brooklyn Rapid Transit Co. was organized in 1895 and took over the assets of the old Traction company, then in the hands of a receiver. During the past five years it has acquired control by purchase or lease of 15 different railroads that were operated prior to 1895 by 10 separate and distinct managements.

This company has expended during the past five years in extensions, new equipment, reconstruction of tracks, depots, shops and other facilities, something over \$7,000,000; this amount, in addition to the original cost of changing over the lines from horse and steam to electric operation. Included in the item of equipment are 1,350 large modern electric cars, each with seating capacity nearly double that of the old small cars replaced, the closed cars comfortably heated by electricity, in place of the old stoves. These cars are the longest and widest that can be operated through our city streets. The company has introduced an almost universal fare of 5 cents throughout the system; it has from time to time established added transfer points, as it felt the conditions required, until they now number upward of one hundred. It is carrying daily upon free transfers on the surface cars alone, over 150,000 passengers, and is carrying across the bridge, without payment of extra fare, which prior to 1898, was charged, a total business that last year represented a saving to the public of the enormous sum of \$2,700,000. During the period of 10 years electricity has been substituted for horse and steam power on all of the surface lines, and although serious and unavoidable delays have ensued, yet substantial progress has been made in introducing electricity on the elevated lines.

Brooklyn is peculiar, in that it is probably the only city of any great size in this country that has no large transient population or any considerable number of large hotels, theaters and places of amusement to attract people from outside its own territory, the

greater proportion of the adult population going each day to New York. Upward of 60 per cent of the total business is carried during what are termed the "rush" hours of morning and evening, which represent less than six hours out of the twenty-four.

Our business consists of selling transportation, and when our commodity is wanted by the public we must have it at the street corner, and although the number of passengers handled from one day to another may vary more than 100,000, we must be prepared at all times to furnish it. The large department stores in selling their commodities frequently have occasion to inform you that they have not the desired article on hand, and a delay of even one or two weeks in securing the article is not unusual, but we have no opportunity to send to the depot for a car, but must have it on the street, even though four days out of five its earnings are not sufficient to meet the actual cost of running it.

The growth of any large city is greatly aided by the development of the transportation lines through the suburbs. One who locates a home in the suburbs does it to get away from the crowded streets and noise of the city, and where he may enjoy more freedom and healthier surroundings.

In closing I would simply state what must be known to every intelligent citizen that the company expects a profit only when such safe, reliable and adequate service shall have been furnished to the public as shall meet their reasonable demands. The company's policy has not been niggardly in meeting the various demands made upon it. It has voluntarily reduced its rates of fare; voluntarily introduced transfer points; voluntarily put upon its lines as fine equipment as can be found on any road in this country, and it has voluntarily, and only last year, increased the rates of compensation of its conductors and motormen with a desire to secure from them continuous service with the company, thus keeping a permanent body of employees who would be familiar with the wants of the public and safe and courteous in the discharge of their duties.

The company would therefore urge that the public should realize that the roads are being run for their benefit and that co-operation on their part will bring about many improvements that cannot be secured otherwise. The employees upon the cars and trains who come in contact with the public will, I am sure, appreciate a pleasant word and courteous treatment from the public, and be far more apt to give it in return, and the management in inviting this co-operation will always gladly receive honest criticism and all reasonable suggestions looking to an improvement in its service.

## PITTSBURG AN INTERURBAN CENTER.

The development of interurban electric roads near Pittsburg, Pa., has been very rapid and now, with the exception of a few breaks, the steam railroads in that district are paralleled by electric lines for nearly 30 miles in every direction.

It is not generally known that 10 miles of electric line between Lowellville and New Castle, and about 12 miles between Monaca and the projected terminus of the Neville Island electric road in connection with the electric line from Youngstown to Warren and the Cleveland suburban line, would give nearly 80 miles of electric line now in operation in a distance of 130 miles between Pittsburg & Cleveland and that 35 miles of new line is already projected, which, when completed, will give almost a continuous electric line between the two cities.

From West Carnegie to Greensburg on the Pennsylvania system, a distance of 40 miles, there will be a continuous electric line within two years. They are hauling passengers and freight by electricity now on an electric line, paralleling the Panhandle and the Pennsylvania for 24 miles.

## THE YEAR IN NEW ORLEANS.

The reports of the New Orleans street railways show a very gratifying increase in business as compared with 1899. The total gross receipts for 1900 were \$2,403,780 for the four lines, an increase of \$92,756; this total was distributed as follows: New Orleans & Carrollton, \$700,890; gain, \$80,342. New Orleans City, \$1,369,204; gain, \$9,254. St. Charles, \$223,401; gain, 4,898. Orleans, \$110,285; loss, \$1,738.



## MAKING AND POSTING SCHEDULES.

Through the courtesy of Mr. James Bricker, superintendent of transportation of the Union Traction Co., Philadelphia, we are able to present herewith a method originated by him for making schedules, and posting leaving times at car barns, for the guidance of employees. With this system, as far as the operating department is concerned, no account is taken of the regular numbers painted upon the cars, but each car while it is out on the line bears a number arbitrarily given to it and termed a "block" number, by which the car is known as long as it is in actual service on the street. The car's block number may be changed any time in the day if necessary. By this means is avoided the necessity of shifting cars at the car barn in order to put them on the road in numerical or other stated order, and in addition greater flexibility is secured in the dispatching system, particularly when it is necessary to transfer a car to another division, or to withdraw one from service owing to collision or breakdown, as any car can be sent out on

company are given the customary badge number, even numbers to motormen and odd to conductors, and are assigned to a division. After serving a time as extras they are given regular runs, a run corresponding to a day's work, and comprising a stated number of round trips, the exact number depending upon the length of the division.

Referring to the accompanying schedule, which is the posted time-table for the employees of the Lancaster Division, it will be seen the table is divided into two essential parts—first, a series of block numbers, under each of which is given the leaving time for each car that is to run under that block number during that day; second, a "run guide," from which by reference to the blocks given in the upper division, is found the leaving time for each trip in the run. It will be noticed that the column under each block number is divided by heavy lines into sections, some of the columns having two and some three divisions.

A specific example will serve to illustrate the working of the system. Assume, for instance, that a motorman and conductor

TIME TABLE, *Lancaster* Division. Oct. 22<sup>nd</sup> 1900. 364 trips

Block	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	
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starting at 6:15 p. m. and being completed at 7:31 p. m., when the men have finished their day's work.

The runs are made to average, as nearly as possible, 11 hours and 7 minutes actual work a day, with at least 35 minutes relief for meals, although from necessity several of the runs have longer relief periods. All conductors and motormen for a full day's work are paid \$2.00, equivalent to 11 hours and 7 minutes time at 18 cents an hour. The older employees are given the choice of runs.

### GROOVED RAILS IN ASPHALT PAVING.

An ordinance requiring that all new street railway tracks put down in asphalt paved streets, and also all renewals, be laid with grooved rails, being before the city council of Hartford, Conn., a number of public hearings were given by the committee having the matter under consideration. The Hartford Street Ry. also arranged for a trip of inspection to Boston and New York, and a number of city officials and officers of the company visited those cities.

In a letter to the committee, Mr. N. McD. Crawford, general manager of the street railway, made the following representations: "At a previous public hearing, only 13 persons out of a population of 80,000 had shown their interest in the subject by attending and expressing their views; 10 of these 13 represented teamsters or liverymen.

"It must be a self-evident fact that where the traffic is guided by ever so slight a projection on the rail, the asphalt pavement will be worn out at the junction of the pavement and the rail, due to the fact that the travel is thereby confined to very narrow lines. Your observation in New York may have convinced you of this fact, as the wearing due to the ordinary highway traffic was very apparent in the asphalt on Eighth Ave. where the Metropolitan section was in use. It seems impossible to understand why the use of a long lip, as in the Metropolitan or Trilby section, can in any manner protect the pavement (outside of the lip), or render it more convenient for vehicles to cross the tracks at right angles. The groove in this rail, however, made necessarily narrow in order to prevent the binding of wagon wheels while running parallel to or in the rails, is in fact a very great hindrance to the proper operation of street cars. Actual tests on this device show that it requires from 15 to 30 per cent more power to operate cars over the Metropolitan section than over the ordinary tram head section or T head section. The commissioners of city works in New York have insisted that the lip shall be on a level with the head of the rail, and the railway companies have done all in their power to change this decision and to have the lip lowered. A compromise of 3-16 in. has lately been agreed upon.

"The increased cost of operation is due to the fact that it is impossible to keep the two rails exactly parallel to each other, to maintain a perfect gage. When the track is out of line the wheel flanges have been found to have both inside and outside highly polished, due to abrasion against the rail. The mechanical effort consumed in polishing the flanges accounts for the increase of power required. Every fraction of an inch that the lip is lowered below the head of the rail reduces the amount of additional power required and allows the rail to more readily clean itself.

"The difficulty complained of in the Trilby rail is obviated by using the three-quarter section in Boston, where the brick paved streets were in better condition than Eighth Ave., New York, where sheet asphalt is used in connection with the Trilby section. One objection is common to all types of grooved rails, the fact that the groove fills up in rainy or slushy weather with water which is thrown up in a constant stream by the wheel and causes delays by the burning out of water-soaked armatures and fields. This is a fruitful cause of annoyance to passengers and expense to the company in New York, where the Trilby section is used.

"While willing to do everything within reason, we cannot under any circumstances accept or agree to use an unmodified Trilby section. We would prefer to use a simple T section, as shown in the model, but if advantage can be clearly shown we would probably accept a modification and use either the Brooklyn Heights section or the three-quarter grooved section."

The Grand Rapids Consolidated Street Railway Co. February 1st, declared a quarterly dividend of  $1\frac{1}{4}$  per cent on preferred stock.

### NEW ENGLAND CLUB BANQUET.

The New England Street Railway Club, which was organized in July last, held its first banquet January 24th at the United States Hotel, in Boston. One hundred and sixteen out of a total membership of 145 were present, Mr. H. E. Bradford, general manager of the Worcester & Marlboro Street Ry., presiding. After the elaborate dinner, officers were elected as follows: President, H. E. Bradford, of Marlboro; vice-presidents, L. H. McLain, of Newton, Mass.; C. A. Bodwell, Street Railway Commissioner of Maine; W. G. Mellon, of Portsmouth, N. H., and F. G. Daniels, of New Haven, Conn.; secretary, Louis Schleon, of the Massachusetts Electric Co., and treasurer, Fred W. Teele, of the Boston Elevated Ry.

Mr. R. S. Brown, of the Westinghouse company, performed the duties of toastmaster. Brief addresses were made by Pres. J. W. French, of the Wellesley & Boston Street Railway Co.; F. G. L. Henderson, superintendent of the Newton Street Railway Co.; Paul Winsor, of the Boston Elevated Railroad Co.; Louis Pfingst, formerly master mechanic of the West End Street Railway Co.; Francis G. Daniels, electrical engineer of the Fair Haven & Westville Street Railway Co., of New Haven; Thomas H. Bibber, of Boston; Senator Edward F. Blodgett, of Leominster, president of the Marlboro & Worcester Street Railroad Co.; Frank Ridlon; J. S. Thornton, of the People's Tramway Co., Putnam, Conn.; Henry Grover, superintendent of the Chelsea Division of the Lynn & Boston R. R.; Marcus A. Coolidge, of Fitchburg, a contractor; A. J. Crosby, of Springfield, Vt., and Robert H. Derrah, the first secretary of the club.

### THROUGH TICKETS OVER BROKEN ROUTES.

There is an interesting point brought up by the agreement recently made between the Glens Falls (N. Y.), Sandy Hill and Fort Edwards Street Railroad Co., party of the first part, and the Stillwater (N. Y.) & Mechanicsville Street Railway Co., and the Greenwich (N. Y.) & Schuylerville Electric Railroad Co., parties of the second part, whereby through tickets will be sold hereafter from Glens Falls, Sandy Hill and Fort Edward to Albany and Troy over the respective lines.

This agreement is made despite the fact that the line is not continuous and that for a time at least it will be necessary to transfer passengers through the village of Fort Edward in an omnibus or sleigh. Notwithstanding this, it is believed the trolley route with its low fares and frequent service, will be patronized in preference to any other existing line, from which it appears that it is not always necessary to wait until permission has been secured for completing connecting links before giving a through service between two distant points, but by transferring passengers past the breaks in an omnibus or other vehicle, through tickets may be sold with advantage to the public and gain to the companies.

When the breaks are caused by the refusal of a council or a few property owners to give the necessary consent to lay tracks, the institution of the best through service that can be given under the circumstances will tend to arouse public opinion in favor of the company.

### NEW ORLEANS TRACTION EMPLOYES ASSOCIATION.

By courtesy of Mr. H. A. Ferrandon, treasurer of the New Orleans Traction Company Employees Aid Association, we have received a copy of the treasurer's statement rendered Dec. 1, 1900. This shows a cash balance of \$1,624.10 Jan. 9, 1900, and receipts of \$1,000 from the company, \$281.63 from the association ball, and \$2,700.10 from dues and assessments. The disbursements have been: 6 member death payments of 50 cents for each member, \$1.467; 3 wife death payments of \$50 each, \$150; 23 child death payments of \$15 each, \$345; physicians' fees, \$947; druggists' fees, \$664.99; sundry expenses, \$248.70; total, \$4,914.69, leaving a balance of \$691.14 on hand.

In the "Review" for March, 1900, page 141, was given an account of this association from the time of its organization, and the scheme of organization. The membership Jan. 9, 1900, was 426; Dec. 1, 1900, it was 520, showing a very satisfactory growth.



### OIL ON HIGHWAYS.

In the "Review" for December, 1900, page 710, we published an abstract of a paper by Mr. O. W. Longden, describing the results obtained in California by treating highways with petroleum. The United States Department of Agriculture through its office of public road inquiries has also experimented with oil on highways, "as shown by the following extract from the report of Mr. Martin Dodge, director for the office of public road inquiries to the secretary of agriculture, dated Aug. 25, 1900, and forming a part of the report of the department:

"By reason of the numerous inquiries being made in regard to the improvement of roads with oil, we decided to co-operate with the Government officials of the District of Columbia and a dustless roadbed company in testing this new system. Queens Chapel Road, in the District of Columbia, was selected for this purpose on account of it being so near Washington, that the results could be carefully noted from time to time. This road is a typical country thoroughfare of the ordinary width; 4,650 ft. was rounded up, treated with oil, and rolled; the width of the sprinkled portion varied from 9 to 12 ft. The oil used was that which is left of crude petroleum after such volatile substances as naphtha, kerosene, benzine and gasoline have been extracted. It was a residuum oil of 26 gravity, weighing 7.48 lb. per gallon.

"The material of which Queens Chapel Road is composed being a sandy clay and loam, and being quite loose in some places, it took more oil than would be required to treat an ordinary clay or loam road free from sand and in good condition. The amount of oil used was a little over 5,000 gallons, and it was sprinkled on from an ordinary perforated gas-pipe sprinkling wagon. This wagon had been used in sprinkling the roads with water, and the holes were not enlarged for the experiment, thus necessitating the sprinkling of certain portions three or four times, while the looser and more dusty sections were sprinkled as many as six or seven times. The ordinary sprinkling wagon was found quite satisfactory, especially as the weather was warm, so that the oil ran quite fast enough to be gradually taken up by the surface and not so fast that it would flow into the side ditches, as would have been the case had the required amount been applied at once.

"This road was treated several weeks ago, and so far as we are now able to judge the new system is a success as a dust settler. We believe that where roads have so much traffic and dust as to require the use of the sprinkling cart in dry weather, the residue oil, or roadbed oil, as it is called by the dealers, could be used very effectively and economically. The fact that it settles the dust and kills weeds was first recognized and utilized by the West Jersey & Seashore R. R. It is now being applied annually to about 30 of the leading railroads throughout the country, and its use is being gradually extended to the ordinary country roads. It is claimed by some that the application of crude oil will make a surface impervious to water, and consequently comparatively free from frost and mud. If this be the case, oil will supersede gravel and stone in the improvement of country roads. The test of time alone can settle this very much disputed question. It is deemed inexpedient, therefore, to discuss this phase of the subject until after the experiment has been tested by traffic, winter and spring rains, freezes, and thaws."

By courtesy of Mr. M. O. Eldridge, assistant director of the office of public road inquiries, we have received copies of letters from the engineer commissioner of the District of Columbia, Capt. Lansing H. Beach, U. S. A., giving the following data:

The cost of the Queen's Chapel Road experiment was \$50 for shaping the roadway and \$45 for hauling, putting on the oil, and rolling. The oil cost \$282.50, the area treated being 6,200 sq. yds. The road was inspected by Assistant Engineer Hacker and Capt. H. G. Newcomer, Captain Beach's assistant, who reported that they were favorably impressed by the experiment. Mr. Hacker stated that there was no dust found on the road during the summer, and that the oil had undoubtedly formed a coating almost entirely impervious to water, but before giving final opinion in the matter he preferred to see if the use of the oil modified the action of frost upon the road.

Surveys have been completed for the proposed electric line from East Liverpool, O., to Youngstown. Mr. H. C. Foltz is one of the promoters.

### NEAT BRICK PAVING.

The Chicago & Milwaukee Electric Ry. has nearly completed the gap which when filled will give through electric car service between the two cities. During the past year the roadway has been steadily improved, and reflects great credit on the policy of the President A. C. Frost. Ballasting of a permanent character is being done along the entire route, and the grade brought up to as nearly level as possible.

In connection with street improvements in the various towns



BRICK PAVING, WINETKA.

through which the line passes, the company has laid a considerable amount of paving and is using the best quality of vitrified brick. We illustrate a street so paved in Willmette, where property has already been enhanced \$10 and \$15 per front foot by the building of this road. Another view shows where the road crosses the main thoroughfare in Kennelworth, the most exclusive and artistic suburb around Chicago; so exclusive in fact that only one store is allowed and this disguised to resemble a residence building. For a considerable distance the line follows a parkway, and one of the conditions was that the beauty of the street should be interfered



PARKWAY, KENNELWORTH.

with as little as possible. The tracks therefore were placed at one side of the street and the grass plot extended until it touches the outside rail. Our picture shows how faithfully the requirements were carried out and the result has in no measure lessened the beauty of the avenue.

The road is doing a constantly increasing business and recently increased its speed to 30 miles an hour.

Rights of way for projected electric railway from Rockford, Ill., to Janesville, Wis., have been obtained between Rockford and Beloit.

## STREET PAVING IN AUGUSTA, GA.

An effort having been made to secure action on the part of the council of Augusta, Ga., that would greatly increase the burdens of the Augusta Railway & Electric Co., Mr. Boykin Wright, attorney for the company, has prepared a statement of the case for presentation to the council and the general public. Col. D. B. Dyer, president of the company, has sent us a copy of Mr. Wright's statement, of which we give a brief abstract.

In 1890 the old Augusta Railway Co. received a franchise grant which among other conditions provided that the company should pave that portion of the street covered by its tracks and for 3 ft. on each side whenever the city saw fit to order paving. The population at that time was 30,000, including the suburbs, but real population for street transportation was not more than half that number. The company extended its lines, acquired the Augusta and Summerville line and reduced the rate of fare from 15 cents to 5 cents, and in every way endeavored to build up the city, looking to the future and not the present for dividends. In 1894 the company had 25 miles of tracks, more than the business justified, and was losing money. The stockholders continued to advance money until the company was required to pay \$30,000 for paving Broad St.; when it was seen that paving charges might be increased almost indefinitely, the investors refused to put more money into the enterprise, and a receiver was appointed in 1896.

The security holders had decided that the only thing possible was to pocket their losses, take up the non-paying lines and continue the operation of the others. The residents along the poor-paying lines naturally objected, and finally it was suggested if the onerous paving conditions were removed a reorganization could be effected, with the assurance that the new company would not curtail the service.

Accordingly, on April 6, 1896, after a full discussion, the council passed a contract ordinance providing that the company should not be required to do any paving during the remainder of the term of its charter—50 years from 1889. The reorganization committee was then able to secure funds, and the Augusta Railway & Electric Co. took over the property of the railway and of two electric light and power companies. No dividends were paid until 1898, for which year the rate was 3 per cent. The city having in a measure grown up to its railway system, there has recently come a demand that the company be required to pave as required in the original ordinance.

Mr. Wright says in conclusion:

"One sometimes hears it thoughtlessly said, did not the company expect to make money? If these men had not done this work, others would. Would they?

"Of course, investors expect to make money wherever they go, but when men select your city or your place of business in which to make their investments or to spend their money, it is neither gracious, nor civil, nor business-like, nor sensible to so reward their patronage and preference. To do so in your private affairs would be simply to insure your speedy disaster and bankruptcy. It is the same way with cities, and no public-spirited citizen having the good of the city at heart, and no wise business man would pursue such a course.

"It is sometimes urged as a reason why the street railway company, in addition to its taxes, should pave the streets occupied by its tracks, that the railway company monopolizes that portion of the streets occupied by the tracks for its own business, and practically excludes the public from the same.

"Let us see: All public thoroughfares, or highways, or streets, are for travel by the public generally, and hence they are constructed and kept up by the general fund raised by taxation. In cities some of the public—pedestrians—use the sidewalks for walking; others use the roadway on each side for riding or driving; and still others, by far the larger number, use the middle of the streets or the portion occupied by the railway tracks for riding in street cars. Therefore, it is untrue that the public is excluded from the use of this portion of the street; therefore, it is untrue that the railway company takes away from the public the privilege of using for travel this portion of the street.

"On the contrary, the railway company facilitates its use for this purpose, and enables the public most effectually to apply this portion of the street to the very purpose for which streets are created.

"It furnishes the carriage and the motive power, and the rails (the only part subject to wear and tear by the railway company) that enable the public to be transported over its streets with the greatest possible convenience, cheapness and rapidity.

"What propriety, therefore, is there in the pedestrian or the patron of the horse conveyance in assuming that the streets are to be used only by them, and are to be kept up only for their benefit, and that when used by others it must be at an extra cost or burden of building the streets so used?

"I submit that the street railway is the highest development of street transportation, and that this method of transportation best subserves the chief object for which streets are constructed and maintained, viz., to furnish citizens the easiest, best and cheapest mode of being transported from place to place in the city.

"It is, therefore, error to say that the public's use of this portion of the street is denied or in any degree impaired. On the contrary, this portion of the street, as above demonstrated, serves a greater number of the public, and serves them more satisfactorily than any other portion of the street. Besides, the street railway adds nothing to the cost of keeping up the streets. If the tracks had not been put down, or if the tracks were taken up tomorrow, the city would still have to construct and maintain the streets. The operation of a street railway relieves the remainder of the street of many vehicles that would otherwise have to transport the people now using the street cars.

"We hear much said about 'giving away street rights'—street rights 'without one cent of cost to the railway company'; about the injustice to other taxpayers in relieving the railway company from its 'just proportion of the burdens of taxation,' as though the railway company did not pay its full pro rata of taxes, to the last farthing, that is required of any other citizen or corporation of the city of Augusta. Has the city council exempted the railway company or any of its property from taxation? Not one dollar.

"But the city is 'giving away street rights'! What are these 'street rights'? The right to spend hundreds of thousands of dollars in the streets for the purpose of furnishing the public facilities of rapid transit in comfortable conveyances at minimum cost.

"What a horrible piece of robbery is thus conjured up in the mind of the casual reader of today by the term 'giving away street rights'! What a mine of wealth there must be in these streets of Augusta! How precious every foot of this sacred soil, and how zealous we should be to exclude from these streets the invading modern electric cars! Think of the great 'privilege' of permitting foreign capitalists to come to Augusta and secure these 'street rights' without a cent of cost to the railroad company,' when there were so many competitors in the field literally falling over each other to obtain an option on Augusta's streets!

"I wish those who are talking so glibly about 'giving away the streets of Augusta' would stop to consider what the 'streets' of Augusta were when they were given away; that is to say, when Col. Dyer was given the 'privilege' of putting other people's money in electric railway cars to furnish rapid transit for our people.

"The lazy browsing herd of cattle that daily reveled in the luxuriant semi-tropical grasses that fringed our so-called streets and sprang up between the rails of the mule cars, were Col. Dyer's only competitors. The goats and the cattle were disturbed, it is true; the people were not.

"Seriously, street privileges then and now, and for many years to come, would probably convey but one idea to the observing citizen of Augusta, and that is the 'privilege' of filling up the streets with more people, more cars and more carriages, and more of everything else that will give life and animation to our quiet village-looking thoroughfares. Whatever it may be elsewhere, the problem in Augusta, at least for years to come, will be not to guard and protect our streets from such invasions, but to persuade men and capitalists abroad to come in and occupy them.

"It is suggested by some that the city council could have required the railway company against its consent to have continued to run these non-paying lines, and could have fixed the schedules and fares on the same, and that, therefore, there was no legal consideration for the ordinances in question. This suggestion hardly deserves a serious reply. The council may have very large powers, legislative, executive and judicial, but I have yet to be instructed if council has the power to make a private company carry on business at a loss.

"I have refrained from discussing here and now the power in



law of the council to repudiate these ordinances. It will be time enough to discuss this legal question when the council has decided that it can in good faith do so—that it has the moral right to go back upon its solemn agreement. We prefer to believe that the occasion for deciding the legal question of the city's right to abrogate its solemn compact with this company will never arise. We are sure it will not if the council, as a body, is governed by that high sense of honor which would control each individual member in his private dealings with his neighbor."

## ANNUAL REPORTS OF CHICAGO ROADS.

### CHICAGO CITY RY.

The annual meeting of the Chicago City Railway Co. was held January 16th and the old board of directors re-elected. The annual report showed the gross earnings for 1900 to have been larger than for any year except 1893. The gain in gross passenger receipts was \$343,648, or 6.6 per cent. Expenses increased \$329,324, dividend charges were \$75,003 greater than in 1899, so that the surplus was \$55,586 less than the previous year.

An increase of \$5,000,000 in stock was authorized to take up bonds maturing July 1, 1901.

Concerning the traffic and earnings President Hamilton said: "The traffic of the year has responded to the efforts of the company to please its patrons, the large increase in the number of cars in service and the careful attention to the running of the same. Notwithstanding large increases in operating expenses, owing to the wages of additional train men, as well as the increased cost of coal and materials, yet the results cannot but be gratifying. No necessary expense has been spared in the maintenance of the property and to facilitate the best operation of its cars. The roadway, machinery and rolling stock is in first-class condition. The machinery has been thoroughly reconstructed and the joints of the rails welded, cars repaired and put in the best possible condition. A large amount of new paving and repaving has been done, all of which largely increased the operating expenses. We feel that the employees are loyal to the interests of the company, and that between them and the management the best of feelings exist; and knowing that it is the desire of the management to cater to wants of the public, I cannot but predict satisfactory results for the coming year."

Some details of the report are:

	1900	Increase.
Passenger receipts.....	\$5,506,313.67	\$343,648.67
Receipts from other sources.....	36,866.51	5,092.11
Total receipts .....	\$5,543,180.18	\$348,740.78
Total expenses .....	\$3,655,001.64	\$329,324.37
Interest on bonds.....	207,877.50	.....
Net income .....	1,680,301.04	19,416.41
Dividends paid 12 per cent.....	1,575,000.00	75,003.00
Surplus for the year.....	105,301.04	*55,586.59

\*Decrease.

	Cable.	Electric.	Horse.	Total.
Miles of track .....	34.8	173.2	1.9	209.8
Car-miles run .....	13,425,020	15,702,380	104,960	29,232,360
Fare passengers carried.....	43,228,849	67,170,980	443,373	110,843,202
Proportion of business				
done, per cent.....	39.00	60.60	.40	100.00

The number of transfer passengers carried was 46,118,004, making the total number of passengers 156,961,206; the increase in fare passengers was 6,954,895, and in transfer passengers, 4,562,681.

### METROPOLITAN ELEVATED,

At the annual meeting of the Metropolitan West Side Elevated Railway Co., of Chicago, held January 4th, President MacAllister presented a report for the first nine months of the current fiscal year (which ends February 28th). Gross earnings were \$1,199,975; operating expenses, \$518,041; surplus earnings, \$681,934; other credits to income account, \$2,982; total income, \$684,916; interest, taxes, and other charges except dividends, \$468,262; balance to credit of profit and loss, Nov. 30, 1900, \$216,654. A dividend of 2 per cent, amounting to \$174,162, was paid Sept. 1, 1900.

The report continues: "The number of passengers carried for the ten months of the fiscal year up to Dec. 31, was 26,141,858. For the corresponding period last year it was 24,211,848, showing an increase of 1,930,010, or 8 per cent, in 1900. This increase is fairly satisfactory, and especially so when you consider the heavy traffic of the 1899 fall festival and the loss of the Suburban Railroad connection in October, 1900, together with the industrial complications in this city, which caused an almost entire cessation of all building and a consequent loss to the working population of a large sum in wages, and which has also helped to check the growth of other traffic, both by the loss of passengers to and from work and in our shopping trade.

"The increase in our equipment enabled us to establish an increased car service, beginning Oct. 1, 1900, which is already showing good results in both the number of passengers carried and in the good feeling toward the road for its efforts in relieving the congested service of the rush hours. It is contemplated, and in fact steps have already been taken toward the extension of your Douglas Park branch into a settled and paying district, and of your Garfield Park branch to a point where new territories and new connections will be opened."

### NORTHWESTERN ELEVATED.

The annual meeting of the Northwestern Elevated Railroad Co. was held January 9th, the report covering seven months from May 31st to December 31st. Gross earnings were \$525,023; operating expenses, \$180,452; fixed charges, including bond interest, taxes and loop rentals, \$221,553; surplus for stock, \$123,018. This is at the rate of 4.2 per cent per year on the stock. Forty additional cars will be put in service early this year.

The traffic by months has been as follows:

	Whole No. Passengers.	Daily Average.
June .....	1,309,748	42,942
July .....	1,265,296	40,816
August .....	1,363,752	43,992
September .....	1,412,760	47,092
October .....	1,575,017	50,807
November .....	1,602,330	53,411
December .....	1,667,742	53,798
Seven months .....	10,196,645	47,871

### LAKE STREET ELEVATED.

The annual meeting of the Lake Street Elevated Railroad Co. was held January 9th. The report of President Charles E. Yerkes for 1900 showed: Passenger earnings, \$742,594, an increase of \$58,377; miscellaneous earnings, \$15,360, an increase of \$2,064; operating expenses, \$379,293, an increase of \$13,333; fixed charges, including interest, taxes, loop rentals and mileage taxes, \$374,541, an increase of \$12,221; surplus, \$4,752, an increase of \$1,112. The average daily number of passengers was 40,048, an increase of 2,782; the ratio of operating expenses to gross receipts was .4995 as against .4753 in 1899.

President Yerkes announced that the voting trust established June 10, 1896, and controlling a majority of the stock would be terminated. It is also proposed to take over the mileage of the Chicago & Harlem road, organized to build surface extensions in Cicero, thus giving the Lake Street 9 miles of double track.

### SOUTH SIDE ELEVATED.

The annual meeting of the South Side Elevated R. R. was held January 31st. The report of President Carter showed passenger earnings of \$1,249,543.90 and other earnings of \$37,094.73, a total of \$1,286,638.63. The expenses were: maintenance of way and structure, \$44,844.61; maintenance of equipment, \$106,684.78; conducting transportation, \$333,113.63; general expenses, \$100,188.15; loop rental and expenses, \$163,571.60; total, \$748,402.77. After deducting \$33,750 interest on bonds and \$306,765 dividends the surplus for the year was \$197,720.86.

The number of passengers carried was 24,990,878, an increase of 10.4 per cent compared with 1899. The greatest increase for 20.9 per cent for June and least, a decrease of 6.7 per cent for October, this being caused by the abnormal traffic due the fall festival of October, 1899.

The totals and daily averages by months were:

	Total.	Daily average.
January .....	2,154,000	69,504
February .....	1,991,388	70,050
March .....	2,240,175	74,204
April .....	2,149,730	71,058
May .....	2,117,185	68,290
June .....	2,030,740	67,862
July .....	1,800,333	60,978
August .....	1,908,270	61,557
September .....	1,951,854	65,062
October .....	2,133,466	68,821
November .....	2,161,717	72,057
December .....	2,285,393	73,722
Total .....	24,990,878	68,468

### TOBOGGAN SLIDE FOR PLEASURE PARKS.

Street railway managers who are seeking additional and new attractions for their pleasure resorts during the coming season will be interested in the following description of a toboggan slide which has proved its capability as a money earner at parks. The slide was designed by Mr. J. W. Pickens, who for the last two years has been amusement manager for the Columbus Railway Co., of Columbus, O., and was built at Olentangy Park in 1900. The total cost, including 50 toboggans, was between \$1,000 and \$1,100; the net earnings during the season amounted to \$4,725.

The toboggan slide is intended to make bathing attractive and exciting, and consequently a river or lake must be at hand. A large body of water is not required, however, a width of 50 ft. being ample.

Our illustration shows the Olentangy slide and bath house. The bath house is a building 100 ft. long by 13 ft. wide; the building



TOBOGGAN SLIDE AT COLUMBUS, O.

is 9 ft. high at the eaves and 13 ft. high at the comb. The tower is 12 x 13 ft.; it is built of 2 x 4-in. lumber, the platform being 30 ft. above the comb of the roof. As the ground is about 3 ft. above the water, this brings the top of the slide 46 ft. above the water. The central portion of the bath house, a space 12 x 13 ft. under the tower, is used as an office, and access to the platform is had by stairs 3 ft. wide, leading from the office.

On each side of the office are dressing rooms, one end of the building being for men and the other for women. The dressing rooms are 3 x 5 ft., which leaves an aisle 3 ft. wide down the center of the building.

The projected length of the slide is 100 ft., making an average slope of about  $2\frac{1}{2}$  horizontal to 1 vertical. The surface is level at the platform, and at the lower end is tangent to the surface of the water, these two horizontal portions being joined by two reverse curves. On leaving the platform the surface is convex,

giving a sharper drop for the first 40 ft. of the slide; at the lower end is a second sharp drop about 15 ft. long.

The slide is 40½ in. wide, divided into two portions 18 in. wide, by 1½ x 6-in. pieces rounded on top to avoid sharp corners. The left-hand portion, which is the slide proper, is not floored. The right-hand portion is floored and constitutes a footway for the riders to get back to the top; the footway is protected on the outer side by a handrail. The stringers of the slide are 2 x 4 in., supported on posts and held together by ½-in. tie rods spaced 18 in. apart. On the down or toboggan side are iron rollers 1½ in. in diameter and 18 in. long, turned down at the ends to form bearings and supported in small castings screwed to the wooden side pieces; these rollers are spaced 18 in. apart and placed midway between the tie rods mentioned, leaving holes in the "floor" only 9 in. wide. The toboggans used are the standard ice slide toboggans, and are purchased from dealers in such goods; they are 16 in. wide and vary from 3 ft. to 6 ft. in length.

At Olentangy the water is 2 ft. deep at the end of the slide, and the bottom slopes so that the depth increases to 10 ft. at a distance of 30 ft. from the slide. The lake bottom being mud, it was necessary to dump in gravel to make a clean and more agreeable bottom.

The rate charged was 25 cents per hour for each person, this including the use of a toboggan. The expenses of operation are light, only three persons being required in attendance—a man to care for the toboggans, a woman to care for and mend the bathing suits, and a cashier.

This slide has not been patented and no drawings have ever been made showing the details. Mr. Pickens writes us that any carpenter should be able to build a slide from the foregoing general description. This is the second slide built by Mr. Pickens, who is a park manager and promoter with 10 years' experience, having been manager of the Gant Park of the Zanesville Railway Co. in the early 90's. The first slide was built for the Mt. Vernon Electric Ry. in 1896; Mr. Pickens was at that time manager of the Sherman & Heinemann Park at Mansfield, O., but there being no body of water there, he could not try his plan at that place. He was manager of the Idlewild at Newark, O., and for the last two years has been amusement manager for the Columbus Railway Company.

### PARIS METROPOLITAN UNDERGROUND RY.

In the "Review" for July, 1899, page 494, we published a map of the Paris Metropolitan Underground Ry. and some interesting details concerning the methods of construction. The first section of this line, extending from the Place de l'Etoile to the Porte de Vincennes was opened for traffic July 18, 1900, this being a small part of the system of 40 miles of tunnels being built by the city of Paris. The estimated cost of the whole is \$33,000,000, and the expenditures to date have been between \$4,000,000 and \$5,000,000. The area of the city served by the complete system will have an extreme length of 4 miles and an extreme width of 3 miles.

The tunnels are leased for 35 years to a private corporation, which provides the tracks, rolling stock and power stations. At the end of the term all the plant save rolling stock passes to the city without remuneration, and the city has the option of taking the rolling stock at a valuation to be fixed by arbitration. The city may also take over the operation of the road at the end of seven years by paying an annuity to the company equal to the average annual net income for the best five of the seven years next preceding the purchase. These data concerning the terms of the lease and what follows concerning fares are given on the authority of Prof. E. J. James, of the University of Chicago.

The fare is 5 cents for first class, 3 cents for second class tickets and 4 cents for second class round trip tickets available only before 9 a. m. for the first half trip. There is also a rate of 1 cent for school children conducted by a teacher. The company pays the city 1 cent on every 3 or 4-cent fare and 2 cents on every 5-cent fare; in addition to this the company will pay an additional 1-50 of a cent per passenger for each increase of ten millions in the total number of passengers from 140 to 190 millions per annum.

The contract proposed by the city contained the following provisions concerning employees:

1. Wages shall in no case be less than at the rate of 150 francs (\$30) per month



2. The working day shall not exceed 10 hours, and one full day or two half-days of rest shall be allowed each week.
3. An annual vacation of 10 days on full pay shall be allowed.
4. Full wages shall be paid while employees are absent for military instruction.
5. Days of sickness, properly certified, shall be paid for in full during the period of at least one year.
6. In case of temporary disability through accident while on duty the employee shall receive full wages until complete recovery.
7. Lessee shall insure employees against accident at its own expense.
8. The city may prescribe rules in the interest of safety and health.
9. The company must furnish each workman a book in the National Pension Fund and deposit a sum equal to 6 per cent of his wages to his credit, 2 per cent of this may be deducted from the wages paid.
10. When the number of passengers per annum shall exceed 220 millions the company shall deposit 7 per cent to the pension fund, but shall only deduct 1 per cent from the wages paid.
11. The company shall establish a gratuitous medical and drug service.

The council of state struck the first two provisions out of the contract on the ground that these points were covered by general law but the company agreed to consider itself bound by them as if they had not been stricken out. From this we may infer that the minimum wage was higher than that fixed by law.

Associated press reports under date of Jan. 29, 1900, state:

"The strike on the underground railroad followed the company's refusal to accede to the demands of the employees for higher wages and the reinstatement of dismissed men. The strikers are quite orderly, but traffic is entirely stopped."

Under date of January 31st, the press reports state:

"The company made a complete surrender to the men. According to the new agreement men will be attached to the permanent staff after twelve months' service with the company, which guarantees that a 10 per cent increase in wages will be paid during exhibition periods and undertakes that no one will be dismissed for his share in the strike."

### TAXATION OF CORPORATIONS.

At the meeting of the American Economics Association in Detroit, Dec. 27, 1900, Mr. Frederick N. Judson, of the St. Louis bar, discussed the taxation of quasi public corporations, with particular reference to steam railroads. Mr. Judson's conclusion is applicable to all public service corporations and presents an equitable basis for taxation.

"In view of the difficulties, both in the taxation upon value and upon gross earnings, it would seem the most just and fair method of taxation, if the tax upon value is retained, is by capitalizing the entire net income apportioned under the mileage rule, or taxing the state's share of the net earnings so apportioned. Thus, under such form of taxation, the company would pay according to its ability from its income after paying operating expenses, that is, the income available for dividends, interest or surplus, and the public would share in the profits as realized. As the state can compel full returns of the operations of such companies, there seems to be no reason why net earnings cannot be as definitely ascertained as gross earnings. Only operating expenses and the maintenance of the existing road or the improvement of the service thereon for the comfort and safety of the public, with the payments for taxes, should be deducted from the gross earnings to be capitalized as taxable, according to the system adopted. For the purposes of taxation, it should be immaterial whether the capital invested was borrowed or owned by the company. Thus, all of the value represented by the stock and bonds of the company would be taxed, and each state in which the company operated would tax its share of the aggregate value.

"There is a very important practical consideration in the interest of public policy that a definite certain rule of ascertainment of value should be established and as little as possible left to the arbitrary, uncontrolled judgment of a state board of assessors. Under the present system, where such uncontrolled powers are vested in a state board and their judgment as to cash value is final, it will be inevitable that railroads will take an active interest in the election of officials who are charged with such tremendous powers. The

substitution of certainty for the existing uncertainty and confusion would be a far-reaching and most salutary reform in our political system.

"The taxation of earnings has this merit of certainty, and if taxation according to value is preferred in order to conform to the taxation of other property, then that value should be ascertained by a definite standard, to wit, the capitalization of the net earnings at the same percentage of full value as is enforced with regard to other classes of property. This equality should be enforced by the courts.

"It is recognized that the taxation of domestic stockholders in a domestic corporation, when the corporation itself is taxed, is double taxation, and the law usually provides against such taxation. But to avoid double taxation, the same exemption should extend to bondholders, as the value represented by the bonds is taxed when the tangible and intangible property of the corporation is taxed. That is, the value securing the bonds is taxed through the corporation."

### STREET RAILWAY MAIL SERVICE.

From the reports of the general superintendent of the railway mail service for the fiscal years ending June 30, 1899 and 1900, we have compiled tables showing the postal car and pouch service on the street railways of the United States. A similar table giving data for the years 1896, 1897 and 1898 was published in the "Review" for February, 1899, page 86.

#### Street Railway Postal Car Service.

	1899.	1900.
Number of routes .....	39	20
Miles of routes .....	385.36	202.86
Number of cars .....	63	25
Number of round trips with clerks per day .....	384	141
Annual miles of service with clerks....	1,829,160	566,858
Estimated pieces of mail handled daily.	1,255,863	1,880,479
Average number of closed pouches handled daily.....	899	642
Number of crews.....	76	33
Number of clerks.....	103	39

#### Closed Pouch Service on Lines Having No Postal Cars.

	1899.	1900.
Number of routes.....	235	264
Miles of routes.....	1,569.71	1,905.84
Annual miles of service.....	2,974,813	3,397,991
Number of pouches exchanged daily...	4,034	4,541

The great reduction in the number of railway post office routes, cars, and crews, shown in the report for 1900, is because many of these lines have been transferred from the control of the general superintendent of railway mail service to the local postmasters. The superintendent's report for 1900 included only the street railway routes in Boston, Chicago and San Francisco and one at Cleveland, O. The Chicago lines were transferred to the jurisdiction of the local office July 1, 1900.

On the 20 routes in 1900 the annual mileage of cars was only about 31 per cent of that of the 39 routes in 1899, but the average pieces of mail handled daily on the 20 routes was almost 50 per cent greater than on the 39 routes during the preceding year.

The closed pouch routes on street railways, all of which are a part of the railway mail service, also shows a large increase for 1900.

### SENIORITY RATING FOR MOTORMEN.

In the report of the Brooklyn Rapid Transit Co. for the last fiscal year is a paragraph concerning the plan of seniority rating for motormen which was put in effect Jan. 1, 1900. All motormen who on August 1, 1899, had been in the service of the company for two years were given an increase in wages of 5 per cent; three year men were given an increase of 10 per cent and five year men 15 per cent. The various grades were indicated by stripes worn on the sleeve of the uniform. The seniority lists are to be rearranged each year on August 1st.

The directors state that the results for the year are extremely gratifying, showing an increased efficiency of the service and a decrease in the number of avoidable accidents.

## The System of the Sioux City Traction Co.

In many western cities during the period from 1890 to 1892, inclusive, the craze to construct mechanical power tramways ran riot. But perhaps no place, better than Sioux City, offers such an illustration of the unreasonable schemes into which capital was persuaded during those years. Here in a city of 30,000 population, there sprang into existence no less than six distinct street railway systems. Lines were constructed radiating from the center of the city to all quarters, the outer terminals of these roads being on barren hills upon which it was estimated that immense populations would spring up. The cable railway, the elevated railway, the surface dummy railway as well as the horse railway, were represented. The first two of these were constructed at an outlay of over half a million dollars each. It is quite conservative to say that the total amount of capital invested in all street and suburban railways prior to the consolidation of all the systems was not less than two million dollars. It is quite needless to add that interest was paid on but a small portion of this; in fact, of the several systems, not more than one paid even the expense of operation.

Several causes have, however, during the past ten years been active in effecting a change, with the result that out of the wreck of poor investments there has been evolved a system which stands at the very head of railways in cities of approximately the same population. These causes have been first, the natural advan-

has justified the installment of a complete machine and repair shop. Not only have expenses been reduced, but receipts have been augmented through the extension of transfer privileges and through the operation of the cars of the different lines in harmony. For the fiscal year ending May 31, 1900, gross receipts



EXTERIOR VIEW OF SHOPS, KINNEAR DOORS.



ADVERTISING CAR.

tages of Sioux City in location, which have caused its growth during the past decade from 30,000 to 45,000 in population; second, the development of electric railway apparatus until it may now be called positive and therefore economical; third, a consolidation of all the companies into one, and a scaling down of the securities. It is of the consolidated system, the rejuvenated street railways of Sioux City that this article treats.

Prior to May 15, 1899, there existed in Sioux City the following companies:

- Sioux City Traction Co.
- Riverside Park Railway Co.
- Sioux City Transit Co.
- Sioux City & Leeds Electric Railway Co.
- Central Traction Co.

On this date, through the energies of Mr. J. S. Lawrence, of Sioux City, now the president of the Sioux City Traction Co., and after several years of arduous efforts to bring about the result, the four last named companies were absorbed by the first named and thus all the lines in the city were comprised in one, the Sioux City Traction Co.

The fruits of consolidation, as they appear after 18 months of operation of the consolidated company, are beyond even the fondest hopes of the promoters. Five car barns, five repair shops and five managements with their office forces have been reduced to one. One power station now furnishes current for the entire system, whereas two were formerly operated. The purchasing of material has been combined with a resultant saving, and the maintenance of the equipment of all the different roads, now centralized

were \$186,215.21; operating expenses, including taxes and insurance, \$79,164.62; surplus, after deducting interest on bonds, \$41,664.62.

The system comprises 40.55 miles of track exclusive of that in yards and car barns. The lines running to Riverside Park on the west; to Leeds, northeast of the city; to Morningside, southeast of the city; and to South Sioux City and Covington, south of the Missouri river are distinctly suburban lines and upon the first three mentioned double truck cars are operated. All other lines are city lines upon which single truck cars are used. There is no portion of the city that is not furnished with adequate transportation facilities and yet there is not a "drag" line in the whole system.

No one thing improves a city so much as clean paved streets, and in this respect Sioux City is coming to the fore. Every street and alley in the business district is now paved with brick or asphalt, principally the latter, as well as many of the residence streets. Much additional paving work is now in progress. Whenever any street upon which the Traction company has tracks is



SPLICED CAR MADE FROM TWO OPEN TRAILERS.

being paved, its practice is to entirely reconstruct in the most modern and substantial manner the tracks upon that street. No uniformity in construction was established, first, because several different companies were doing the work at different times, and secondly, because the best form of construction had not been decided upon.



Unquestionably, however, the style of construction, shown in the accompanying illustration, which was used on Pearl, Pierce and Sixth Sts., for asphalt pavement, and on West Seventh St. for brick pavement, has proved to be the best, and it will in all probability be the future standard. The construction shown on Jackson St. shows also the abandoned cable conduit. In all the latest and newest work the T-rail has been adopted, in most instances the Shanghai, yet in one place, Fifth St., from Pearl to Jackson, the Illinois Steel Section No. 6001,  $4\frac{1}{4}$  in. high, was used with splendid success. This section has many advantages over the Shanghai; in the first place, a 60-lb.  $4\frac{1}{4}$ -in. rail is in reality a much heavier rail than a 60-lb. 6-in. rail, as the metal is in the head and base rather than in the web; then again, it is not necessary to use so much concrete as in the case of the 6-in. rail, and lastly it is about \$10 per ton cheaper. The only objection urged against the  $4\frac{1}{4}$ -in. rail, is that the toothing on the inside of the rail cannot be made of sufficient depth to keep from being jerked out by wagons turning out of the track. In the instance above, granite block toothing 4 in. in depth, was used, laid in portland cement mortar. This has now been in place one year and not a single instance of the failure of the toothing to keep its place has resulted. A T-rail track, however, while in no way dangerous to vehicle travel, does not offer the same inducement for a driver to follow in the track as does a girder rail, which is in itself a strong point in favor of the T section.

The most notable thing accomplished since the consolidation of all the roads, is the centralization of the plant. The tract of ground covered comprises two quarter blocks, 300 ft. front by 150 ft. deep, located on Water St., between Second and Third Sts. This location is almost a central point for the entire system and possesses, furthermore, a feature seldom seen, the advantage of being located in the business district. Every department of the road is contained within this space, 300 x 150 ft. A private telephone exchange in the office establishes communication with the chief engineer, the master mechanic, the car men's room, the stable with its "hurry up" wagon, and with various points out on the

line. The company intends to erect a new car house, 116 x 150 ft., next summer.

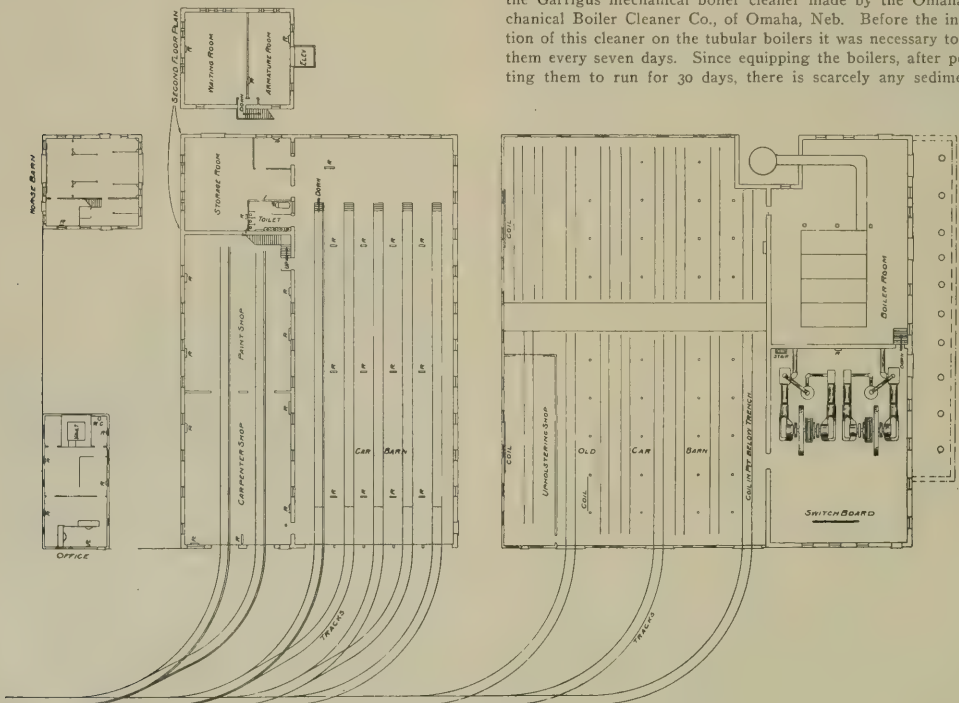
The power station equipment consists of two direct coupled Westinghouse generators of 400 kw. capacity, one driven by a Sioux City corliss cross compound engine, 20 and 36 x 48 in., and the other by an Allis cross compound engine 22 and 40 x 48 in. Either of these units is sufficient to operate the road. Both engines run condensing, the Knowles "Spirojector" condenser being used. The boiler equipment consists of four tubular boilers



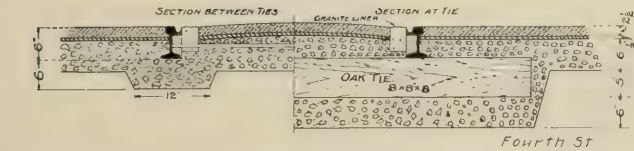
INTERIOR OF MACHINE SHOP.

65 in. x 18 ft., nominally rated at 125 h. p. each, and one Cahall horizontal water tube boiler of 350 h. p.

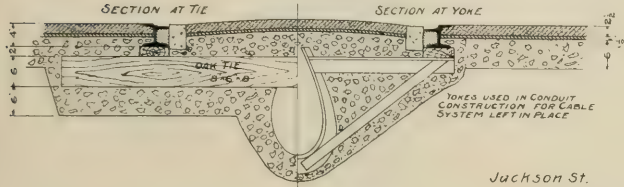
The boilers, both the tubulars and water tube, are equipped with the Garrigus mechanical boiler cleaner made by the Omaha Mechanical Boiler Cleaner Co., of Omaha, Neb. Before the installation of this cleaner on the tubular boilers it was necessary to clean them every seven days. Since equipping the boilers, after permitting them to run for 30 days, there is scarcely any sediment to



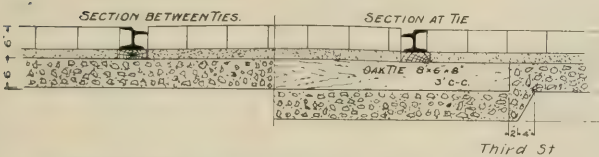
STATION AND SHOPS OF SIOUX CITY TRACTION CO.



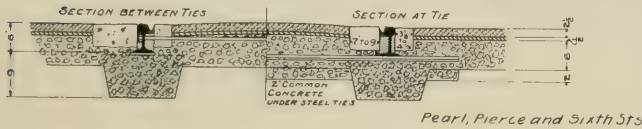
Fourth St



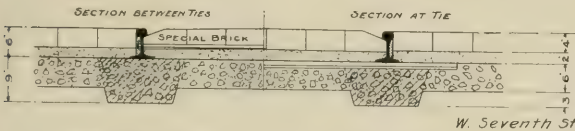
Jackson St.



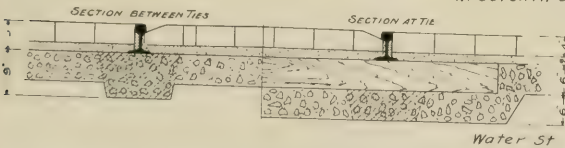
Third St



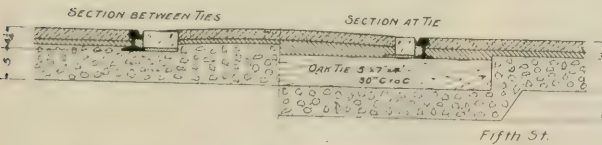
Pearl, Pierce and Sixth Sts



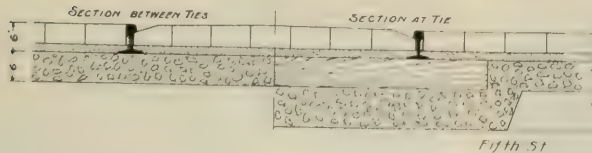
W. Seventh St.



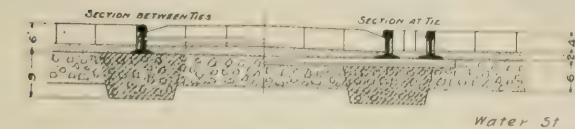
Water St



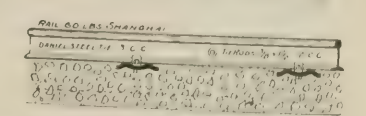
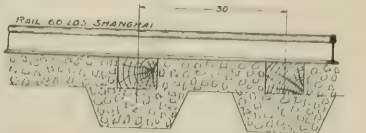
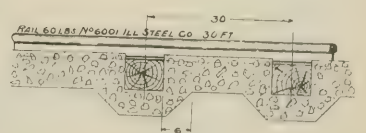
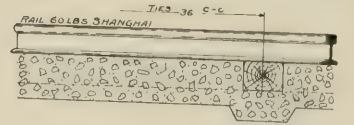
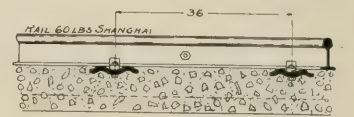
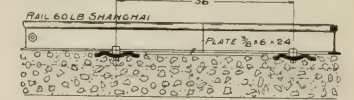
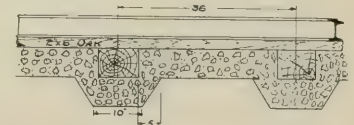
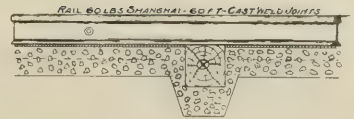
Fifth St.



Fifth St



Water St





be removed. It is stated that no scale is formed, and also that scale already formed disappeared.

The car shops were constructed and equipped with full complement of tools and appliances immediately following the consolidation, and the work accomplished since their completion has fully demonstrated that a road need not be a 50 or 100 car road before it should maintain its own machine shop. The machine, carpenter and paint shop, and electrical repair shops are all separate and commodious. The machine shop is equipped with one 18-in. and one 24-in.—42-in. double spindle lathe, wheel press, drill press, bolt cutter, shaper, two forges, emery wheels, buffers and grindstone. There is also an ample store room with fully classified pigeon holes,



BASEBALL GROUNDS AT RIVERSIDE PARK.

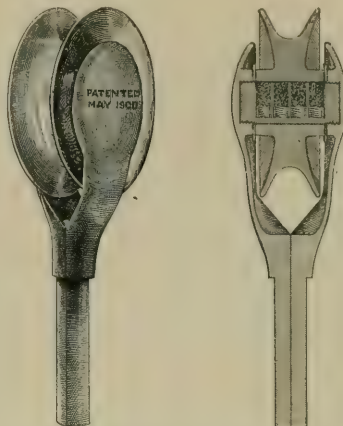
a toilet room including a bath room, a master mechanic's office, and car men's room. There are pits, with concrete floor, well drained, under every track in the general repair room. The main entrance doors of the shops are the Kinnear patent roller steel shutters, and they have given eminent satisfaction.

Some statistics respecting power station results, covering a period of six months, June 1 to Nov. 30, 1899, are given below:

Total output, kilowatts.....	875,236
Total car-miles run .....	732,000
Kw. h. per car-mile.....	1.195
Total cost of motive power (interest on investment, insurance and taxes not included)....	\$8,400.21
Cost per kw. h. (in cents).....	.96
Ratio of motive power expense to total expense.....	.127

During this period slack coal was the principal fuel; it cost \$1.50

some of the open trailers were spliced forming double truck open cars and some of the other trailers were reconstructed into single truck closed cars. The cost of rebuilding the closed cars including rebuilding the trucks, mounting motors, and turning the car out ready for the road was \$665 each, of which \$317.95 was for labor and \$347.05 was for material. The cost of splicing the old grips,



FEIST TROLLEY HEAD.

repairing trucks, and turning out the cars complete was \$624.85 each, \$258.55 for labor and \$366.30 for material.

An interesting portion of the minor equipment is the trolley head used, which was invented by the master mechanic, Mr. Charles M. Feist. This trolley head is shown in the accompanying illustration; lubrication is effected by graphite pencils inserted in holes bored in the pin and pressed against the bore of the wheel by coil springs. The present design is the result of much experimenting with pencils and pins of different dimensions and the result is so satisfactory that Mr. Feist states that the trolleys require absolutely no attention until the wheels are worn out or require returning. The trolleys do not rattle or spark and there is no oil to drip on the car roof. All the double truck cars have two trolleys, and nearly all of them have four 30 h. p. motors. Feist trolley heads have been used for 18 months on all cars and in the period from May 1 to



SIoux CITY BOAT CLUB HOUSE.



THEATER AT RIVERSIDE PARK.

per ton, and the average cost to evaporate 1,000 lb. of water was 12 cents.

After the consolidation the company found it had a large number of old cars, principally old grip and grip trailers. The grips and

Oct. 1, 1900, only 72 new wheels were required for the 59 motor cars, and no pins or lubricating devices were renewed. This head is handled by the W. R. Garton Co., of Chicago, and is reported to be giving the same satisfaction wherever used.

The feature of induced travel is one which has not been overlooked by the Sioux City Traction Co. Its Riverside Park is a tract of 300 acres, located on the banks of the Big Sioux River at its junction with the Missouri. At the head of the park is a large pavilion where, during the season an attempt is made to provide something for everyone. Among the regular attractions are a continuous vaudeville show, orchestra concerts, refreshments of all kinds. In the park are baseball and football fields, golf links, tennis courts, bicycle track and all the dressing rooms for the convenience of those participating in the outdoor sports are provided at the pavilion. Two boat clubs, the Sioux City and the Riverside, have club houses, with private grounds, within the limits of the park; a number of private cottages used for summer residence have also been erected within the park limits.

In advertising its park the Sioux City Traction Co. has issued and distributed throughout the country contiguous to Sioux City a very neat and beautifully illustrated booklet containing a description of the park.

The officers of the company are: President, Joseph L. Lawrence; vice-president and treasurer, Abel Anderson; secretary, J. Henry Ricker; counsel, John S. Goodwin; general manager, E. L. Kirk. An article descriptive of the Sioux City railways would not be complete without mention of Mr. F. H. Fitch who was an active aide to President Lawrence in effecting the consolidation, and who served as general manager of the company until Apr. 28, 1900, when he resigned to promote the Denison & Sherman Railway Co., now building an interurban line between Denison and Sherman, Tex.

### JOINING ALUMINUM CABLES.

One of the chief drawbacks to the use of aluminum for the transmission of electrical energy has been the difficulty of making an effective joint. The white metal possesses a high thermal conductivity, and this, together with the oxides always present on its surface, makes soldering practically an impossible task with the use of the ordinary silver and tin, or lead and zinc solders. However, by carefully cleaning and tinning the surfaces to be joined and using some one of a number of special alloys for the solder, joints are now made which in tensile strength and conductivity exceed the aluminum wire itself. Several solders for this purpose are successfully used, the majority of them having as a basis pure tin with a little phosphor tin added.

Aluminum cables may be cleaned, preparatory to the soldering process, by scratch-brushing, scraping or filing, or by dipping the ends into nitric acid diluted with three times its bulk of hot water, to which has been added just enough hydrofluoric acid to start chemical action on the metal, which action will be denoted by the presence of gas bubbles on the surface. The aluminum, after being cleaned in the acid solution, should be rinsed in hot water and dried in hot sawdust. Either gasoline blow torches or electric appliances may be used for heating the cables in the soldering process.

The Northwestern Elevated Railroad Co., of Chicago, has installed aluminum feeders exclusively for its 25 miles of track, and the statement is made by Mr. J. R. Chapman, the company's engineer, that these cables have given no trouble whatsoever during the year they have been in place.

The joints on the Northwestern feeders were made as follows: The ends of the cables were first covered with fire clay and fluxed with a secret composition, after which they were brought to a temperature of about 650 or 700 degrees F., by means of gasoline torches. A copper sleeve 6 in. long, tinned on the inside and with an inside bore a trifle larger than the cables, was next slipped over the two ends, and through a pour-hole left for the purpose, melted solder was poured into the sleeve, finding its way between the strands of aluminum and making one solid piece of copper, the solder and the aluminum. The secret flux and solder are the inventions of a local chemist.

The American Railways Co. of Philadelphia has made use of aluminum feeders for over a year, with very satisfactory results. On small cables for electric light or high pressure work, this company has used McIntire connectors, which consist of a flattened aluminum tube 9 in. long and 1-16 in. thick, the diameter being sufficient to receive the two line wires. When the joint is made it is given three complete twists by special clamping tools. On seven-strand

cables for railway feeders the company at first made use of a copper sleeve which held the wires partly by the clamping effect of tapered screws and partly by solder, with which the sleeve was filled after tightening the nuts as much as possible. These joints when properly made proved satisfactory, but the contingency of improper application and the possible failure resulting therefrom led to the use of an aluminum joint made by the Pittsburg Reduction Co. in accordance with suggestions from Mr. A. S. Kebbe, engineer of the American Railways Co. In this joint a tapered socket or collar is placed on the end of each cable, the strands of the cable being thereafter wedged apart at the end, and the remaining space in the socket filled with solder, which is run in solely to fill up the space. The outer surfaces of the sockets are threaded, one with right-hand threads and the other with left, and the two are fastened together by screwing them into a sleeve. The soldering may be omitted altogether, or may be done prior to screwing the sleeve on, or a hole may be left in the sleeve and the solder poured in after the final connection has been made. The joints have shown practically ample strength without soldering, but the solder is usually added as an extra precaution.

For capacities equivalent to 400,000 c. m. of copper wire, the company has used aluminum cables composed of 37 strands, and sections are joined by unwinding the strands for several feet and making a spliced joint. With this process, however, a 2-ft. length of each cable is lost at each joint. Mr. Kebbe writes that joints made in this manner show a strength greater than that of the original cable, and a conductivity before erection 25 per cent greater than an unspliced section. The company has not had them in use for a sufficient length of time to determine their permanency, but anticipates no trouble whatever. Mr. Kebbe adds that his company sees no reason why it would not use aluminum if it were doing the same work again.

Mr. F. J. J. Sloat, general manager of the Southern Ohio Traction Co., of Hamilton, O., writes that his road has just put up 33 miles of No. 0000 aluminum feeders, and thus far is well pleased with the results. The sections are joined by unwinding the strands and making an ordinary cable splice about 8 in. long. No solder is applied, but over each splice is placed an ordinary 2 3/4-in. Crosby clip. Mr. Sloat states that joints made in this way show a tensile strength of 7 1/2 tons, as against 4 1/2 tons for various other forms of aluminum joints which he tested.

A method of making joints that has been followed extensively in aluminum transmission work in the West is to roll a thin aluminum sheet about 6 in. wide into two cylinders from opposite edges of the sheet. By inserting the end of a cable in each cylinder and twisting both the wire and the sheet by means of pliers a firm, moisture-proof joint is secured.

Another solution of this difficulty of joining aluminum wires has just recently been suggested by Mr. W. C. Heraeus, of Hanau-on-the-Main, an experienced German manufacturer of platinum ware, who makes the statement that he has succeeded in welding aluminum without the use of any solder, flux or composition of any kind. The process is based on the observations, said not to have previously been made, that aluminum becomes soft at a certain temperature, at which, by hammering, two pieces heated to and kept at the proper degree, can be welded into one piece so thoroughly that the place of joining cannot be detected. It remains to be seen if further experiments will establish the practicability of this method.

### INDIANA'S INTERURBANS.

Indiana will be crossed by a network of interurban electric railways to be constructed and put in operation within the year, if present indications be not misleading. The latest and most important project is that to build an electric line along the Wabash & Erie canal from Fort Wayne to Huntington. This line will connect in the latter city with one running to Wabash. Contracts for ties, bridging and grading for A. N. Dukes' proposed line from Wabash to Peru have been awarded, and the extension of this road to Attica and eventually to Terre Haute is under consideration. Greencastle will be made the center of a system of electric lines for which a franchise was recently granted by the county commissioners to W. B. Vestal, Q. Bradstreet and Isaac S. Peck. The franchise authorizes the construction of electric lines from Greencastle to the Putnam county line in almost



every direction. Satisfactory progress is being made on the interurbans from Indianapolis to Kokomo, a distance of 54 miles, and from Logansport to Kendallville. J. M. Gore, of Bluffton, the principal promoter of the Indiana & Ohio Electric Ry. has secured capital and franchises for that road. Addison Ballard, of Danville, who projects an electric line from Indianapolis to Plainfield has secured a 50-year franchise from the Hendricks County commissioners. The Oil Belt Traction Co., in which C. C. Miller and N. D. Doughman, of Fort Wayne, are interested has a franchise pending in Fort Wayne, and L. B. McIlheny, of Dayton, O., has a franchise for the projected Decatur & Fort Wayne Ry. The Goshen, Wawasee & Southern Electric Railway Co., which J. J. Burns is promoting, is preparing to build. The Indianapolis & Martinsville Traction Co. will complete its extensions through Morgans County before Sept. 1, 1901. Work will be commenced on the Indianapolis Transit Co's. line between Indianapolis and Lebanon by May 1st. The company was recently organized by James N. Manker, A. A. McKain and A. M. Glossbrenner, of Indianapolis. Muncie, Eaton, Redkey, Hartford City, and Dunkirk will be connected by an interurban line which E. G. Brownell, of Muncie, is promoting. The Jeffersonville, New Albany & Sellersburg Rapid Transit Co. has been organized to build an electric interurban between the cities named in the title, and has applied for rights of way. The Terre Haute & Wabash Valley Railroad Co., which was organized last August with J. R. Kendall, president; Henry Miller, treasurer, and W. A. McFarland, secretary, has secured its franchises and is preparing to build an extensive interurban system to connect Terre Haute, Prairieton, Midletown, Fairbanks, Staffordshire, Graysville, Merom, Clinton, Rockville and Vincennes. This road will cost, it is estimated, \$1,100,000. W. P. Ijams, of Terre Haute, is a large stockholder in the company. A subsidiary concern, the Wabash Valley Railway Co., has been organized for the purpose of operating the city passenger terminals of the Terre Haute & Wabash Valley R. R.

### SELF-PAYING SYSTEM FOR TRAINMEN.

The Washington (D. C.) Traction & Electric Co. has had for some time a unique way of paying off motormen and conductors. Instead of the usual practice of making up weekly or fortnightly pay rolls and delivering each man's wages to him in a sealed envelope, the Washington company pays its motormen and conductors each day, or rather the conductors pay themselves and

never taken from the money received as single cash fares. If on any day a conductor does not sell enough tickets to cover his own and his motorman's pay, the superintendent of his division makes up the deficiency to him from the total receipts turned in and notes the fact on the division superintendent's daily report.

The tickets, which are delivered to the conductors every morning by the division superintendents, are numbered consecutively, a record of these numbers being kept at the division stations, and at night each conductor must account for every ticket delivered to him, by turning in cash, the equivalent as "wages paid" or by returning the unsold tickets.

The system of keeping the wage account will be more readily understood from the conductor's daily report blank reproduced herewith. There are two registers in each car, one for cash fares and one for tickets received, and the readings of both registers must be reported separately on the blank. The total cash turned in at night must equal the total cash fares collected, plus the proceeds from the sale of tickets after deducting the daily wages. If for any reason the motorman or conductor does not work the full day, he is paid for the time actually put in and notation of the occurrence is made on the blank.

The chief advantage of this system from the company's standpoint lies in the avoidance of making out pay rolls, and in the saving in bookkeeping, as all the entering and checking incident to the paying of nearly a thousand men is done by the division superintendent and one clerk at the office.

As to the moral effect upon the employees, Mr. W. F. Ham, comptroller of the company, states the daily self-paying system has been more satisfactory than other systems that have been tried. Critics of this practice have argued that it is a bad idea to let the men get into the habit of taking any portion of their receipts for themselves, as it might tend to open the way for taking more than they should. Mr. Ham states that the experience of his company does not support this contention, but on the contrary it is believed that giving the men a stated amount each day makes it easier for them to keep money on hand, and therefore there is much less temptation to take what they should not. It has also been noticed that there are fewer suits to attach salaries brought by petty creditors than when the men were paid weekly.

### NEW TRANSFERS FOR CHICAGO CITY RY.

Taking into consideration the distribution of population and the general layout of the city, there is no municipality in the country having more liberal transfer privileges than Chicago, and there is probably no city where these concessions have been more grossly abused by the public. This abuse has been most painfully evident upon what is known as the South Side, a fan-shaped territory served by the Chicago City Ry., whose system forms a network of lines from the down-town district to 79th St., and from the lake practically to the river, there being to north-and-south lines and 12 east-and-west lines. The Chicago City is now issuing to conductors 250,000 transfers a day and has endeavored to accommodate its patrons to the fullest extent by issuing long-limit slips and permitting passengers to ride from any point on the road to any other for a single fare.

Finding that many of its riders were taking advantage of this liberality, especially by giving or selling their transfers to the newsboys, who in turn gave or sold the slips at intersecting points to new passengers, the company endeavored to abate the abuse by taking the matter into the courts which at once decided it to be a misdemeanor to buy or sell a transfer slip. Later the company secured an injunction against a number of newsboys by name, restraining them from trafficking in transfers. These measures having failed to bring about the desired results, the company on January 1st thoroughly reorganized its transfer arrangements, changed the form of ticket, reduced the time limit from an hour to 20 minutes, and made other restrictions.

The general layout of the trackage requires the use of 22 different forms of slips, the various forms differing only as regards the names of the intersecting lines. The slips are now printed in four colors—mania, for transfers issued in exchange for cash fares or transfers; red, for transfers issued from lines that give transfers in exchange for cash fares only (practically all east-and-west lines); green, for transfers issued from short-trip cars to through cars of the same line; and mandarin, for a special transfer which

Form 1. (REVISED 1900)

CAR NO.	TRIP NO.	DIVISION	MOTORMAN	CONDUCTOR	BADGE NO.	DATE	RUN NO.	TICKETS RECEIVED		TICKETS PAID	TICKETS SOLD	TICKETS REFUSED	TICKETS RETURNED
								By	Other				
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	8												
TOTAL													

CASH REGISTER—MOTOR CAR				TICKET REGISTER—MOTOR CAR				CONDUCTOR'S PAY	
No.				No.				Conductor's Pay	\$
Ending				Ending				Motorman's Pay	\$
Starting				Starting				Total	\$
Difference				Difference					

CASH REGISTER—TRAILER				TICKET REGISTER—TRAILER				NO TRIPS	
No.				No.				To	
Ending				Ending				To	
Starting				Starting				To	
Difference				Difference				To	

CONDUCTOR'S REPORT BLANK.

their motormen out of their daily receipts. The regular fare in Washington is 5 cents, but the conductors are authorized to sell six tickets for 25 cents, and it is from the money received from the sale of tickets that the wages are deducted. The amount is

In addition to the new press mentioned the company has a Babcock cylinder press, two small Gordons and a complete type-setting plant, with which it turns out all the letter-heads, special jobs, and the 500 regular forms required on the entire system.

26th 31st 35th 39th 43rd 47th 61st 63rd  
 From COTTAGE GROVE AVENUE, Linc.  
 Reestablished AT regular point (see indicated) for a continuous strip of person to whom issued. Valid twenty (20) years from date of issue.  
 (A) IF TRANSFERRED, *S. S. Hammett*  
 5 6 7 8 9 10 11 12 1 2 3 4 5  
 Min 0 10 20 30 40 50  
 26th 31st 35th 39th 43rd 47th 61st 63rd  
 From COTTAGE GROVE AVENUE, Linc.  
 Reestablished AT regular point (see indicated) for a continuous strip of person to whom issued. Valid twenty (20) years from date of issue.  
 (A) IF TRANSFERRED, *S. S. Hammett*  
 5 6 7 8 9 10 11 12 1 2 3 4 5  
 Min 0 10 20 30 40 50

The general design of the new tickets will be seen from the sample reproduced in Fig. 1. The principal changes are in the addition of the line to indicate minutes; in the numbering feature; and in the addition of the words, "Void if transferred." The new arrangements also require conductors to turn in an account of all transfers issued and received, which they have not done heretofore.

TRANSFERS RECEIVED FROM OFFICE				
Give letter and number of top transfer in each package.				
F 401	FF 701	O 201		
TRANSFERS RECEIVED FROM CONDUCTORS				
Conductor's Badge No.	5,280			
Transfer Beginning No.	F 922			
Transfer Ending No.	F 972			
TRANSFERS ISSUED TO CONDUCTORS				
Conductor's Badge No.				
Transfer Beginning No.				
Transfer Ending No.				
Transfers Received from Office	300	TOTAL		
Transfers Received from Conductors	50		350	
Transfers Issued to Conductors		0		
Transfers Destroyed - Unfit for use		10		
Transfers Returned - Unused:	F FF O	40 50 50		150
TRANSFERS ISSUED TO PASSENGERS			200	

CITY OWNERSHIP IN LIEGE.

The report of the Louisville Railway Relief Association for the year ending Dec. 31, 1900, sent us by Mr. J. T. Funk, president of the association, shows the present membership to be over 400. During the year the receipts were \$3,522, which sum included donations of \$1,000 from the Louisville Railway Co., and \$500 from Mr. J. B. Speed. Disbursements included \$730.80 paid in sick benefits to 40 members, \$550 paid in death benefits, and \$300.75 for book stationery, etc.



## THE PARSONS-WESTINGHOUSE STEAM TURBINE.

In the "Review" for July, 1897, page 440, we published some data on the Parsons steam turbines, including a short account of the tests on the "Turbinia," a 100-ft. boat which on April 10, 1897, made a speed of 32.75 knots, or 37.75 miles per hour. The first compound steam turbine connected to a dynamo was built in 1884; this unit developed 6 h. p. In 1897 there were said to be 30,000 h. p. of steam turbines installed in England, the largest sizes being 700 h. p.

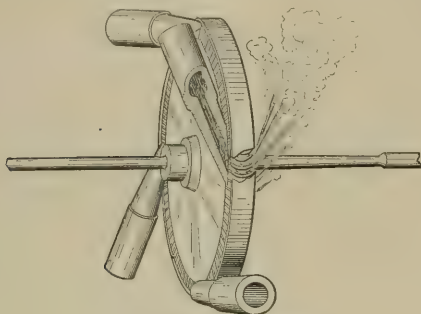


FIG. 1—DELAVAL TURBINE.

Tests of a 200-kw. turbine generating unit when developing 300 h. p. showed a water consumption of about 18.5 lb. of water per hour running condensing.

Since that time there have been important improvements made in the matter of increased capacity and the announcement that a 3,000-h. p. turbine-generator unit is now being installed at the power house of the Hartford (Conn.) Electric Light Co. will doubtless be a surprise to those who have not closely followed the recent developments in this field.

On December 20th, Mr. Francis Hodgkinson read a paper before the Engineers' Society of Western Pennsylvania on "Steam Turbines," in which the history and present state of this type of motor

The following is abstracted from Mr. Hodgkinson's paper:

Steam turbines may be divided into three classes: 1. Reaction, of which Hero's, described about 120 B. C., is an example. Mr. Parsons constructed a turbine of this type which with a steam pressure of 100 lb. per sq. in. at the jets and a 26-in. vacuum ran at 5,000 r. p. m. and developed 20 h. p. on 40 lb. of steam per brake h. p. h.

2. Impact, of which Bianca's, invented in 1629, is an example. This was the forerunner of the de Laval turbine.

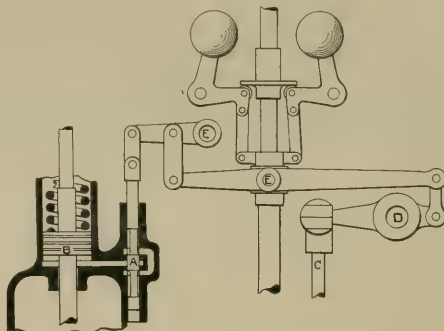


FIG. 3—GOVERNOR LEVERS.

3. A combination of reaction and impact of which the Parsons turbine is an example.

The de Laval and the Parsons turbines are the types that have been developed commercially. The de Laval turbines are essentially of very high speed. The smaller sizes run about 30,000 r. p. m., and are geared down to about 3,000; the larger sizes about 10,000 r. p. m. The peripheral speed of the wheel is usually from 600 to 1,200 ft. per second. The reduction of speed is accomplished by means of a pair of helical spur gears with the angle of helix 45 deg. These gears form by far the biggest part of the apparatus. The remaining portions of these turbines have no remarkable features. The regulation is effected by means of a fly-ball governor which is

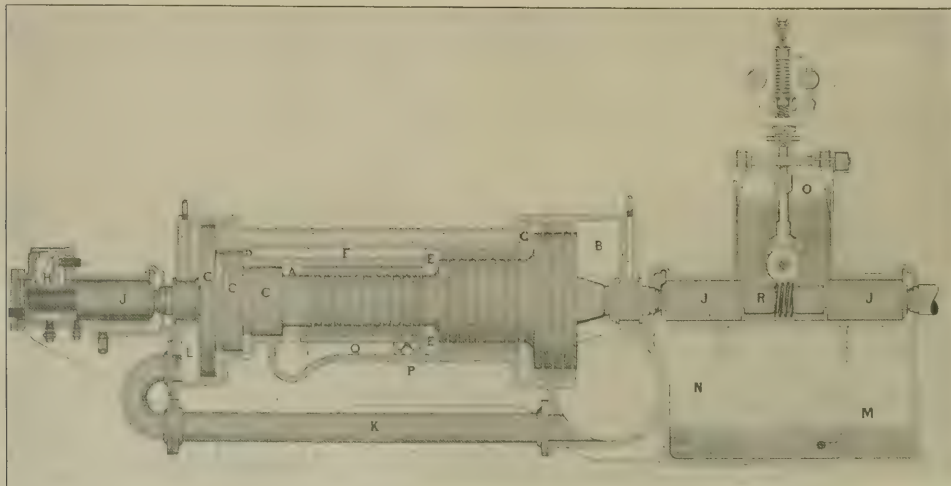


FIG. 2—SECTION OF WESTINGHOUSE-PARSONS STEAM TURBINE.

were reviewed. The want of sufficient space prevents us from giving the whole of Mr. Hodgkinson's paper. The author was associated with the Hon. C. A. Parsons in England, and since 1896 has been with the Westinghouse Machine Co., at Pittsburg.

on the slower running shaft and wire draws the steam at the admission. Some tests of a 10-h. p. turbine were communicated to the American Society of Mechanical Engineers by Professor Goss, in 1895, in which the turbine described had four nozzles of .138 in. di-

meter and one of 157 in. diameter of throat. The nozzles were 2 in. long from throat to outlet. The speed of the turbine was 23,771 r. p. m. reduced by gearing to 2,400, the economy full load, non-condensing, was 47.8 lb. per brake h. p. h. This economy is by no means bad when the small power of the outfit is considered. In December, 1899, some tests were made in France, under the following conditions: 192-lb. boiler pressure; with 69 deg. F. of superheat; mean h. p. 307.8; r. p. m., 772. The consumption of steam was 13.92 lb. per effective h. p. h.

Fig. 2 is a general longitudinal section through a Westinghouse Parsons steam turbine. The steam enters at the governor valve and arrives at the chamber A, and passes out to the right through the

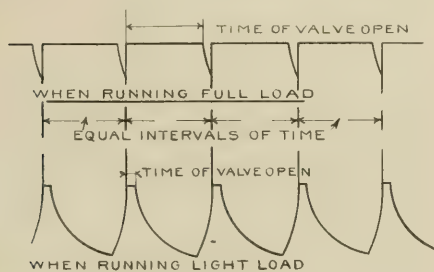


FIG. 4.

turbine blades, eventually arriving at the exhaust chamber B. The blades are shown in Fig. 5, the steam passing first a set of stationary blades and impinging on the moving blades driving them around and so on. The areas of the passages increase progressively, in volume, corresponding with the expansion of the steam. On the left of the steam inlet are shown revolving balance pistons, C, C<sub>1</sub> and C<sub>2</sub>, one corresponding to each of the cylinders in the turbine, which, according to size, may be 1, 2, 3 or 4 in number. The steam at A presses against the turbine and goes through doing work. It also presses in the reverse direction, but cannot pass the piston C; but at the same time the pressure, so far as the steam at A is concerned, is equal and opposite, so that the shaft is not subjected to any end thrust. The pressure D is equal to that at E by reason of the balance port F, so, similarly, so far as the steam pressure at E is concerned, there is no end thrust. This same fact also applies to G. The area of the balance pistons is so arranged that no matter what the load may be, or what the steam pressure or exhaust pressure may be, the correct balance is preserved and the shaft has no end thrust.

At H is shown a thrust bearing, which, however, has no thrust to take care of, but serves to maintain the correct adjustment of the balance pistons.

There is obviously some leakage past the pistons, but it is found to be very small. Centrifugal force seems to have something to do with keeping down this leakage. The particles endeavoring to escape have to pass radially inwards in going through the small clearance. It is supposed then, that the rapidly revolving pistons have the effect of throwing outwards the particles with which they come in contact by reason of skin friction, so that the particles being slung outwards tend to oppose the escape of the particles inwards. This theory, however, is somewhat imaginary, but in view of the economy obtained, the leakage cannot be very great.

At K is a pipe connecting the back of the balance pistons at L with the exhaust chamber to ensure the pressure at this point, being exactly the same as that of the exhaust.

At J are shown the bearings which are unique in construction. The bearing proper is a gun metal sleeve, which is prevented from turning by a loose fitting dowel. Outside of this are three concentric tubes having a small clearance between them. This clearance fills up with oil and permits a vibration of the inner shell, at the same time restraining it. The shaft, therefore, revolves about its axis of gravity instead of the geometric axis as would be the case with the bearings of a conventional function. The journal is thus permitted to run slightly eccentric, according as the shaft may be out of balance. The action of bearing in a very remarkable manner performs the functions of de Laval's slender flexible shaft.

But in this case the shaft is built as rigidly as possible, so is not liable to crystallization which would result in eventual rupture.

The bearings have ample surface, are continuously lubricated under pressure, and it has been found in practice that they do not wear. To provide for adjustment, the bearings are surrounded by an outer cast-iron sleeve, in which are fitted keys which may be shimmed up and permit any adjustment of the position of the shaft relative to the cylinder.

At R, Fig. 2, is a flexible coupling by means of which the power of the turbine is transmitted. In small sizes the two shafts have a square cut on the ends, the coupling itself somewhat loosely fitting over these. In larger sizes it is generally a modification of this arrangement.

The governor gear and oil pumps generally receive their motion by means of a worm wheel, gearing into a worm cut on the outside of the coupling. At N is an oil reservoir into which drains all the oil from the bearings. From there it runs into the pump M to be

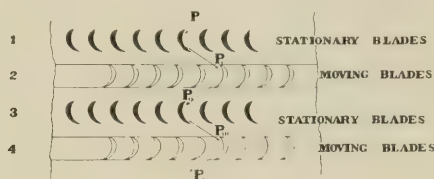


FIG. 5.

pumped up to the chamber O where it forms a static head which gives a continuous pressure of oil to the bearings. The pump is single acting of the simplest possible construction. The oil runs in by gravity.

A by-pass valve is provided, shown at P, which admits high pressure steam by means of port Q to the steam space E. By opening this valve as much as 60 per cent overload may be obtained, and in the case of turbines operating condensing, full load may be obtained should the condenser be at any time inoperative, due to any cause, and the turbine allowed to exhaust into the atmosphere. Naturally the effect of opening the by-pass valve is to reduce the economy.

The glands consist of packing rings set in grooves cut in the shaft. The rings press outward and remain stationary. Any form of frictionless packing necessarily leaks a little. In the case of the turbine exhausting into a vacuum a little live steam is admitted be-

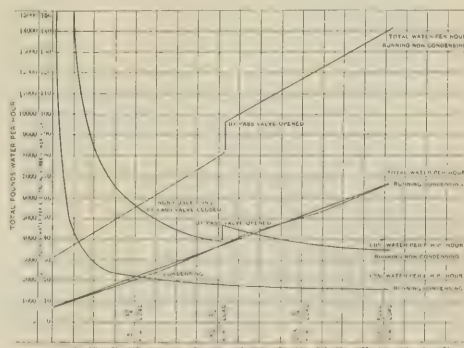


FIG. 6 CURVES SHOWING PERFORMANCE OF PARSONS TURBINE

tween the rings by means of a small reducing valve, so that the leakage consists of a negligible quantity of live steam, instead of air, which would impair the vacuum.

In case of the turbine exhausting against anything above atmospheric pressure, a small ejector is provided which draws the leakage steam from between the packing rings and allows it to drain



through a suitable drain pipe instead of escaping into the engine room.

A fly-ball type of governor is used which has the ball levers swung on knife edges in lieu of pins. The governor works both ways; that is, the midposition of the levers is admitting a full head of steam to the turbine, and a movement from this in either direction is tending to cut off the supply. This serves a useful purpose in the event of a very excessive load coming on the turbine, such as a short circuit, which has the effect of bringing down the speed more than the percentage variation permitted by the adjustment of

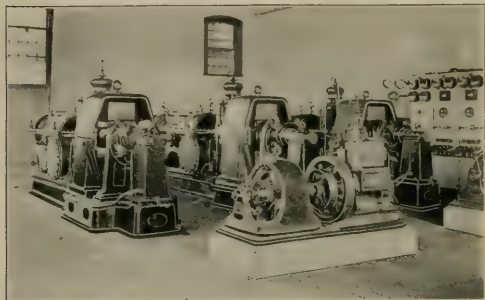


FIG. 7 TURBINE PLANT AT WILMERDING.

the spring when the steam immediately becomes shut off. Again, in such an event as some of the governor driving mechanism becoming broken and the governor balls slowing up independently of the turbine, the steam is shut off before any damage could take place.

The speed of the turbine may be varied within all the limits of the governor spring while the turbine is running. This is particularly useful in bringing alterations in synchronism and adjusting their differences of load when in multiple. This is accomplished by grasping the top knurled head, when by means of a ball bearing shown, the spring and tension nuts remain stationary. Any

crum, points D and E being fixed. Continuous reciprocating motion is thus given to the relay valve. This is in turn transmitted to the admission valve. The function of the governor is to vary the plane of oscillation of the relay valve, which causes the admission valve to remain open for a longer or shorter period according to the position of the governor. The steam, therefore, is admitted to the turbine in puffs, which occur at constant intervals of time. The puffs are either of long or short duration, according to the load. At full load the puffs merge into an almost continuous blast. Diagrams showing the time the valve is open are shown in Fig. 4.

The advantages of this intermittance admission are three-fold. The turbine is at all times using boiler pressure steam, no matter what the load may be. The admission valve is continuously in motion, and consequently has no opportunity to get stuck.

The power to work the relay valve and overcome the inertia of the levers is transmitted through the governor clutch, hence the balls are moved in and out a very small amount at every oscillation of the levers, so that the governor levers in respect to their motion about their points of suspension are never at rest, and consequently when a change of load comes the governor does not have to overcome the friction of rest, and is always ready to go to its new position.

Mr. Parsons has made successful use of an electrical governor.

The essential parts of the turbine are, of course, the blades and buckets. They are made of hard drawn material. They vary in size from 1-2 in. to 7 in. according to where they may be used. Every row of these blades has passages of increased area, corresponding with the volume of the steam. This increase of volume is obtained by increasing the heights of the blades, and when these have reached the desired limit the diameter of the turbine is increased and the steam permitted a higher velocity that enables the blades to recommence another progression.

Referring to diagram, Fig. 5, the steam at pressure P in expanding through row No. 1 to pressure  $P_1$  converts its energy into velocity and impinges upon the moving blades of row No. 2. The steam then performs a second expansion in expanding through row No. 2, again converting its energy into velocity, but this time the energy of the efflux is to react upon the blades from which the steam issues. The same cycle is repeated in No. 3 and No. 4, and so on until exhaust pressure is reached. The moving blades therefore receive motion from two causes, the one due to the impact of steam striking them, the other due to the reaction of the steam

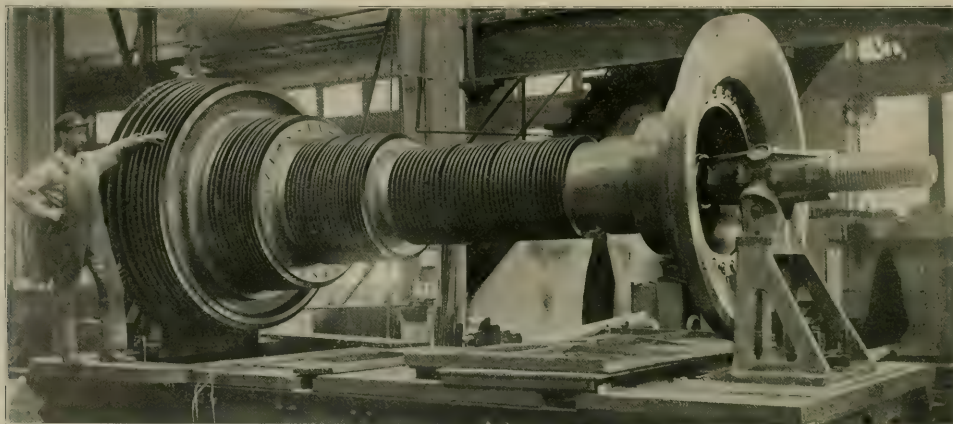


FIG. 8—REVOLVING PARTS OF A 3,000-H. P. TURBINE.

adjustment of the spring nuts may then be made, without in any way disturbing the running of the turbine, other than making the change that may be desired.

The arrangement of the governor levers is shown diagrammatically in Fig. 3. They are attached to a small relay valve A which controls steam below the piston E, which is directly connected to the main admission valve. The levers receive reciprocating motion at C from an eccentric, and use the governor clutch as a ful-

leaving them, and in this respect is this turbine a combination of Bianca's wheel and Hero's engine.

The blades do not wear, as the velocity of steam is not in excess of 500 or 600 ft. per second, and they do not pull out. The smallest blades have 1-8 in. clearance sidewise and the largest ones as much as 1-2 in., so that the danger of blades colliding on the sides is remote. When such accidents do occur the damage is not serious, as at most only two or three rows are ripped out.

In a 300-kw. turbine there are 31,073 blades, of which 16,095 are moving blades. The pressure on each is from .89 to 1.04 ounces.

In Fig. 6 are shown economy curves developed from tests made on a 300-kw. turbine-generator set in operation at the Westinghouse Air Brake Co's. works.

The results may be summarized as follows: Boiler pressure 125 lb. per sq. in. Vacuum, 26 to 27 in. Speed, 3,600 r. p. m. Steam consumption: At full load, 16.4 lb. per e. h. p. h.; at three-fourths load, 17 lb.; at half load, 18.2 lb.; at one-fourth load, 22 lb. per e. h. p. h.

To make a comparison with a reciprocating engine and assume the efficiency of transmission from the steam cylinders to the switch board to be 85 per cent, which is about the very highest attainable, would bring the full load water rate on the turbine just described to 14 lb. per e. h. p. h. The tests were made under ordinary conditions so far as dryness of steam is concerned, the boilers being

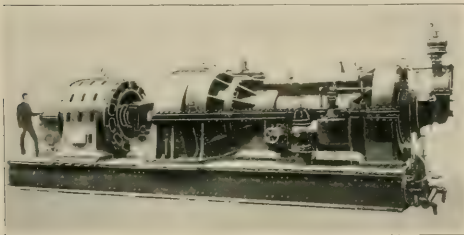


FIG. 9.—3,000-H. P. TURBINE.

some distance away, and no allowance made for wetness of steam.

Superheating may be made use of with considerable gain in economy and without the usual difficulties. There are no internal rubbing surfaces and no packing glands to become injured by the high temperature. From 60 deg. to 70 deg. of superheat improves the economy by some 20 per cent.

Tests of the turbine power plant at the works of the Westinghouse Air Brake Co. showed a coal saving of 36 per cent as compared with engine plant. Fig. 7 is a view of this plant. In the foreground is a 10-h. p. exciter engine and generator, and their size may be compared with the 500-h. p. steam turbines. The three turbines and generators, aggregating 1,500-h. p., together occupy a floor space of 24 ft. square.

Lately a 1,000-kw. unit has been built by C. A. Parsons & Co. for the Elberfeld Corporation, in Germany. At 1,200-kw., 130 lb. boiler pressure, 18 deg. F. superheat, the turbine driving its own air pump, etc., an electrical horse-power-hour was produced for 14.025 lb. of steam. This is probably the highest economy ever attained in any steam engine.

Fig. 8 shows the complete revolving part of a 3,000-h. p. turbine. Its weight is 28,000 lb.; length over all, 19 ft. 8 in.; between bearings, 12 ft. 3 in.; the largest diameter, 6 ft.

The turbine of which this forms a part, is shown in Fig. 9, and is being set up in the power house of the Hartford Electric Light Co. It is direct-connected to a 1,500-kw. generator, the whole unit being 33 ft. 3 in. long, 8 ft. 9 in. wide and weighing 175,000 lb.

## A ROAD WITHOUT ROLLING STOCK.

The Oskaloosa City Street Railway & Land Co., which has been operating a 5-mile horse railway in that town for the last 15 years, now enjoys the unique distinction of owning the only street railway in the country without rolling stock. This state of affairs came about as the unexpected result of a celebration of a victory the company had won. The company sought a franchise for an electric railway with right to do a lighting and power business and met with an active opponent in the Oskaloosa Light, Heat & Power Co. The Railway & Land company agreed to form a bond conditioned upon the building of an electric road within a year, or in lieu thereof to surrender the unexpired term of its horse railway franchise (10 years) and deed the city all its paving along the tracks. The latter alternative was accepted and a franchise voted by the council, and later ratified, after a hard fight, at a special election by

807 majority. January 8th, the night after the election, the young men of the town took the four cars owned by the company out of the barn and made a few trips with men as the motive power. Later the new motive power got to arranging for collisions at the foot of two hills which furnished sport for the onlookers, but proved disastrous to the cars. Finally one of the four cars was discovered to be on fire, when they were all taken to a suitable place and allowed to burn, giving the new road an opportunity to rise "Phoenix-like" out of the ashes, which it will do this spring.

## A FEW LEAKS.

BY G. J. A. P.

Leaks are generally the source of much annoyance, in addition to the money loss occasioned by them. Trifling matters may not be considered as of much importance by some, but, a number of trifling things will soon make the expense of operation increase to a noticeable extent. One source of leakage (which is not so common on large roads) is caused by the neglect to keep the road-bed in proper condition; broken bond wires are allowed to go unrepaired and the splice bars are depended upon for the return circuit; joints are allowed to get low and plates to wear loose.

Experiments with two lines of tracks, one newly overhauled and put in proper order and the other in poor condition, but both equally distant from the power station, and all grade and power conditions being equal, gave the following result:

On the good track the average pressure with the car in motion was 495 volts, and the average current 35 amperes, giving an average of 23 h. p.; the volts and amperes were steady.

On the poor track the pressure came down to an average 467 volts, while the current increased to 56 amperes with both the voltage and current "up and down" as bad joints were passed over. This made average power 37 h. p. or an increase of 14 h. p.

As a car passed over this track twice every 15 minutes, (making eight times an hour) during a day's run we had 128 trips per day, and it can readily be seen, what a leak this made, in waste of energy and consequent loss in coal, etc., at power station.

A poor roadbed does not alone cause waste in the manner mentioned, and the wear and tear on cars and car equipment is also a considerable item. The expense of keeping a track in repair is more than offset, by the saving in power, repairs on cars, etc., not mentioning the loss of passenger business caused by the aversion a great many people have, to riding over a line with a poor roadbed.

Another source of loss to a street railway is in the purchase of cheap repair material, or equipment. A company may have some old, out-of-date motor equipments where it costs as much per year, to keep them in repair, as it would take to buy equipments of a later date. Yet the manager does not realize that the expense caused by making a change in the equipment means a saving in repair bills; that in the course of a year or two will be sufficient to pay for the equipment and at the same time will give him motors when he wants them.

An experiment with oils (where no filter was used) proved that money can be saved by buying the best. However, all machinery does not work alike, consequently, where a poor grade of oil may answer at one station, it would be valueless at another. In the case referred to one barrel of 18-cent engine oil ran the plant one month; changing to a 24-cent oil, better results were obtained and one barrel did the work for 42 days. Here was a gain of 12 days at an increase of \$3 per barrel of oil; this was a small saving perhaps, but one of many "trifles" which go to make up the expense account. Perhaps there are still a few who do not look after the boiler room leakage with sufficient care. Experience teaches, that a boiler kept clean, with fire boxes in good condition and always properly cleaned out, will enable the steam pressure to be kept more nearly uniform and at a considerable saving. To enter a boiler room and hear the hissing of escaping steam from pipe leakage, and then perhaps find the boiler walls, grates, etc., in bad condition, does not make a person feel that economy is being practiced. It may be considered economy to let these go, but the extra amount of coal consumed in a short time, makes up the cost of such repairs and then becomes a dead loss. The money is wasted and the leakage still goes on.

Every "leak" means a loss of money, and an increased expense account.



## THE TROLLEY INSPECTOR.

At a meeting of the Employees' Athletic Association of the Augusta (Ga.) Railway Co., J. W. Trommerhauser made an address to the boys, in the course of which he said:

"It seems natural for my thoughts to drift back through the years to the good old days when your humble servant handled the front end, and among other things possessed the keenest aspirations to become an inspector, for like some of you, I thought it was so nice and easy, with nothing to do, but ride about on the cars and boss the boys. The time came when I received my promotion; it did not take me long to realize that the life of an inspector was not a dream of ease and idleness, but that it was duty stern and rigid; work, hard and unceasing; trouble and worry from dewy morn till late at night. So if you are under the impression that the inspector possesses a position soft and easy and is to be envied, banish the supposition at once, for let me assure you that you are laboring under a sad mistake. When you consider the fact that the responsibility of delayed schedules, dirty cars, incompetent crews or poor service of any kind falls entirely upon the inspector, and that he alone gets the blame, you will perhaps realize that no matter how much it goes against the grain, he is compelled to punish you for violations of the rules in order to maintain strict discipline, for his employers look to him for good service and he must see that it is supplied.

"So when you are punished for shortcomings, be reasonable; don't cloud up with anger and overwhelm the inspector in a storm of abuse; just stop for a moment and consider that he is only doing his duty, and likes you just the same.

"Has the thought ever occurred to you that it takes remarkable force of character, wise discretion and good, sound judgment to perform the duties of inspector and retain the good will and respect of all parties concerned? Many times in the wee small hours of the morning, I have studied the problem of how I could make it lighter for the boys, and yet do my whole duty towards my employers. I have always arrived at this conclusion, that an inspector must possess a deep knowledge of human nature, which will enable him to deal with each individual character in the most suitable manner. He must also be the fortunate possessor of a world of tact, ingenuity good fellowship and patience unlimited, which when coupled with a stern, unwavering disposition makes an ideal inspector, indeed. Even with all these qualifications behind him sometimes if circumstances force him to punish a man, he gets a growl; if he lets his sympathy overcome his sense of duty, he gets a growl from the throne; even if he escapes from both of these growls the public is growling, and so it goes. Thus you see the life of an inspector has its shadows which are sometimes dark, indeed.

"The men have made their reports and departed for their different homes. I must now get to work and examine every car and see that all controllers and lamp circuits are o. k. Then all the commutators in the machines must be cleaned and new brushes inserted if necessary. I must also see that all gates are in good condition; for a faulty gate, in an accident might cost a human life. Then all loose screws in the seats and doors must be tightened, else my lady perhaps would tear a twenty dollar gown in passing in and out of the car. Oft times I get awful lonesome for at this time all the world is hushed in silence and night hangs around me like a pall; but notwithstanding this there is something fascinating in working around the cars, which through all the days are freighted with a precious burden of humanity and I am sure if they could only talk they would whisper many a tale of love and adventure into my ears. By the time I get washed up and out of my overalls, the daylight and split run men are arriving to take out the cars. The roll must be called and all those who are tardy must be marked late and placed on the extra list for three days.

"Many a time I have found myself short of men on account of sickness or disagreeable weather and have taken a car out myself. Then there are the snow storms, freezing rains and countless other hardships.

"Now, let our thoughts go back a few years and review our environments when we operated the old Edison No. 6 machines and the trolley wire was a very small affair and continually breaking down, keeping us forever in a world of worry and hard work. In those days a lazy mule was attached to a wagon which repaired the

lines, and the cars ran over a 35-lb. rail with old cast iron frogs and switches. It was rough riding in those times for the passengers, whenever they were fortunate enough to catch a car with its kerosene headlight and crudely constructed trucks. And the inspector—ah, me! even now I can sometimes feel the effects of those long days of endless toil and unspeakable worry. It was fix breaks all day long. I have worked in the pit until it seemed as if I would perspire my very life away. Up and down the lines I would have to go, with a tool box in hand, and a supply of forcible expressions as a kind of safety valve to my feelings. Breakdowns, such as broken arms; high bars in the commutator, grounded fields, grounded controllers, loose brasses and a world of other difficulties too numerous to mention. Sometimes a bolt would slip, dropping the machine on the ground and block the line for hours. What a contrast when compared with present conditions.

"Through the good management of our present officials, all those conditions of imperfection have been relegated to the rear and today I can truthfully say that Augusta possesses a street railway system up to date in every particular. The old fashioned coffee grinder style of motor has passed into oblivion, and in its stead we find the modern and powerful machine, which runs for months without a breakdown.

"The miniature trolley wire of old days is now replaced with hard drawn copper wire, which never breaks and the old lazy mule with the repair wagon is only a memory, for a special car now repairs the lines. The old trucks which rode so rough are only nightmares of bygone days, for we find today under the cars the improved trucks, which ride as easy as a boat over the waters of a lake on a summer night. Then in past years a snow storm would block the lines and stop travel. Not so at present. We possess a powerful snow sweeper which defies the elements, as far as the snow is concerned.

"The little kerosene headlights which resembled will-o-the-wisps from a distance are now replaced with powerful electric reflectors.

"This evolution has not only benefitted the city in a good service and quick schedules, but it has made our labors lighter and our worries fewer.

"There is another feature of street railway life which sometimes aggravates us considerably. I refer to the car leaving the track, which for some mysterious reason always occurs at the most inopportune time, such as circus day, Fourth of July, or when a large crowd go to the lake. I can recall some very remarkable run-offs in past years. Motorman F. Crook, one evening with car No. 12, was sailing serenely down Greene St. in West End, all unconscious of impending danger, when the car struck the curve at Mill-edge St. It jumped the track, tore down a man's fence, and ran into the back yard. On another occasion it was a cold morning, the same car left the track near the exposition and cut through the woods towards Barney Kerr's, in apparent violation of the law that moving bodies follow the lines of least resistance, when possible. It must have wanted a drink.

"To the unbounded astonishment of Motorman Kilmer his car, one day left the track, for some unaccountable reason, and started into a house, but owing to the laws of gravitation it stopped in the front porch.

"Motorman Cheval, one morning, with car No. 21, was hurrying along Gwinett St., when to his utter amazement the car started across the field to the Summerville line. I won't tell you how far it ran across the field, you might doubt my word, anyway I was undecided which track to carry it to, Monte Sano or Summerville.

"There was another remarkable run-off on the Turpin line. The car knocked down several trees, leveled the fences and, if I am not mistaken, demolished a house. When I hinted to the motorman that the car must have been moving, he smiled blandly, and innocently answered, 'only two points.'

"But instances like these are very rare of late years, owing to the fact that the little 35-lb. rails and the old-time frogs and switches are being rapidly removed and in their place the company is putting down 60-lb. steel rails resting on creosoted ties and equipped with the very latest device in frogs and switches.

"And now in closing, take my advice, boys, and always do your duty, strive to please your employers and give the public first-class service. This is always best in the long run, and don't forget that the pathway of an inspector is sometimes covered with thorns, when a little good will on your part would make it pleasant with roses."

## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### INJURY TO PASSENGER'S ARM ON SILL OR OUT A LITTLE WHEN PASSING CAR ON SWITCH.

Tucker v. Buffalo Railway Co. (N. Y.), 65 N. Y. Supp. 989. July 24, 1900.

The appellate division, fourth department, of the supreme court of New York, affirms a judgment for damages for injuries sustained by a passenger who had his arm fractured while he sat reading a newspaper by an open window with his elbow on the sill, or at any rate not extended more than three inches outside the car, when another car going in an opposite direction passed him on a switch. The court holds that it was a question of fact for the jury whether the passenger was guilty of contributory negligence, and the jury having found that he was not, it declares that it cannot say that it was not justified in its finding. Moreover, it holds that it was gross negligence in the company to run its cars so closely to each other as it did.

### PASSENGER ON FOOTBOARD, KNOWING PROXIMITY OF POLES, TAKES RISK OF LEANING BACK.

Nugent v. Fair Haven & Westville Street Railway Co. (Conn.), 46 Atl. Rep. 875. July 13, 1900.

A passenger who knew that the trolley poles were near the track where a street railway was built along a causeway, and was injured while riding on the footboard, by leaning back to let the conductor pass under his arm after the conductor had asked him if he was not going to get up on the platform and he answered "No, it is all right, George; go ahead," the supreme court of errors of Connecticut holds, was not entitled to recover damages, the space between the cars and poles being adequate for the safe carriage of passengers on the footboard in the exercise of reasonable care, the leaning back being the proximate cause of his injury, and the movement being at his own peril.

### RIGHT TO CONSTRUCT ROAD PREREQUISITE TO HAVING CROSSING QUESTION SETTLED.

Trenton Street Railway Co. v. United New Jersey Railroad & Canal Co. (N. J.), 46 Atl. Rep. 763. June, 1900.

Under the New Jersey act of March 22, 1895, which authorizes the chancellor to define the mode in which one railroad may cross another, it is essential to the jurisdiction of the chancellor, the court of errors and appeals of New Jersey holds, that the lawful route of the petitioning company should cross the line of railroad belonging to the other company. It was therefore incumbent on the petitioner in this case to show, the court holds, that it had legally laid its route over the other company's railroad, and, as one of the steps to that end, that it had lawful power to lay out and construct its proposed extension which was to cross said railroad.

### ABUTTING OWNER CANNOT MAINTAIN EJECTION WHERE RAILS WERE ILLEGALLY LAID ON TURNPIKE.

Becker v. Lebanon & Myerstown Street Railway Co. (Pa.), 46 Atl. Rep. 1009. April 23, 1900.

This was an action of ejection for the land on which the rails of the defendant were laid, which it would seem had been laid upon the turnpike in front of the plaintiff's land, without legal authority, though not in intentional violation of law. But the supreme court of Pennsylvania holds that the action of ejection does not lie in such a case. The defendants, it explains, was not in possession of the land in such sense that ousting it would put the plaintiff in possession, and, even if it were, the plaintiff was not entitled to possession. He had only the fee in the soil subject to possession and use of the turnpike company for public travel. The injury to him was in the illegal or excessive user of an easement of passage and travel, and his remedy for that was an action for trespass, for damages.

### PROJECTION OF FENDER OVER SIDEWALK.

Williamson v. Brooklyn Heights Railroad Co. (N. Y.), 65 N. Y. Supp. 1054. July 17, 1900.

The plaintiff, according to his witnesses, received his injuries by reason of the fact that the fender of the car projected over the sidewalk upon which he was standing, and swept him off his feet. As to this occurrence, the jury was instructed that it was not negligence, in itself, for the company to permit its fender to pass over the top of the curbstone. Certainly, says the appellate division, second department, of the supreme court of New York, this instruction was highly favorable to the defence. And the court holds that a verdict for \$22,500 was not excessive, the plaintiff being 11 years old at the time of the accident and being so badly injured that he was compelled to suffer two amputations—the first removing the lower portion of the left leg at a point about three inches below the knee joint, and the second operation destroying the knee joint and all below it.

### CARE REQUIRED TO AVOID FRIGHTENING TEAMS.

Klatt v. Houston Electric Street Railway Co. (Tex.), 57 S. W. Rep. 1112. June 28, 1900.

A street railway company is charged by the law with the duty, the court of civil appeals of Texas holds, to exercise ordinary care to so handle its cars as to avoid the frightening of teams, and to refrain from adding to its fright after a team has become frightened. If, in the light of the attendant circumstances, the motorman acts as a person of ordinary prudence would act under the circumstances, no damages can be recovered. Moreover, the court does not think that a person can properly ask a more favorable instruction than one to the effect that, although it may ordinarily be rightful and proper to sound the gong for the general purpose of notifying those using the street that a car is approaching, yet, if the motorman knows, or if a person of ordinary prudence would under the circumstances have reason to believe, that the ringing of the gong will result in frightening the team, the company will be liable.

### DUTY TO MAN ON TOWER WAGON.

North American Railway Construction Co. v. Patry (Kan.), 61 Pac. Rep. 871. July 11, 1900.

An employer, in every instance, the court of appeals of Kansas, northern department, holds, is under legal obligation to use ordinary care to prevent injury to its employees while engaged in extra-hazardous work. Applied to this case, the court holds that the construction company, in whose employ a man was working upon a tower wagon about 20 feet high upon a street railway track, was certainly under obligation to use ordinary care in protecting him from injury. The tower wagon, at least, it holds, should have been protected, so that it would not have become necessary to remove the same while the man was occupied in his work, without notice or warning. It thinks it evident, from the very nature of his work, that the man could not have been expected to keep a lookout for the movement of the tower wagon, because if he had given attention to the movement of the cars, which were running every few minutes, he could have accomplished little, if any, service for his principal.

### CONTRIBUTORY NEGLIGENCE OF MOTHER IN CARE OF CHILD IMPUTABLE TO FATHER.

Toner's Administrator v. South Covington & Cincinnati Street Ry. (Ky.), 58 S. W. Rep. 439. Sept. 27, 1900.

This action was brought to recover damages for the loss of the life of the plaintiff's son, a child about 4 years old. Under the statute, a recovery in this case, if had, the court of appeals of Kentucky says, would go to the father and mother, one-half to each. But to bar a recovery it does not consider that there must be concurring negligence on the part of both parents. Every rea-



son that would charge the father with the negligence of a nurse, it holds, would apply with equal force in an action of this character, where the wife had the custody of the child at the time of the injury. Yet if the injury of the child could have been avoided by the motorman after he knew, or could, by the exercise of ordinary care, have known, that there was reasonable ground to believe that the child would go upon the track, then, the court holds the jury was properly instructed, they must find for the plaintiff.

#### NECESSITY ALONE AUTHORIZES CONDEMNATION OF PRIVATE PROPERTY.

Harvey v. Aurora & Geneva Railway Co. (Ill.), 57 N. E. Rep. 857. June 21, 1900.

A street railway, the supreme court of Illinois says, is a road constructed on a street or highway, with the principal object of accommodating street travel, and it can only be a street railway and fulfill that object by following the public street or highway, except in cases of temporary divergence under exceptional conditions. The courts, it adds, will protect the property-owner from an abuse of the power to take private property, delegated to such corporations, in case of necessity. In the case of a street railway, the right to diverge from the street or highway, and go upon private property, depends upon the necessities of construction and operation as a question of fact, and not upon the judgment of any city council. The statute authorizes such a taking of private property in cases of necessity, when the railway may diverge from the street or highway and return thereto when the obstacle or necessity for such divergence has passed or ceases to exist. If, however, the question whether the consent of the city to cross certain streets is a condition precedent to the right of condemnation be considered, the court says that the rule is that it is not such a condition. Paragraph 25 of section 1, article 5, of the act for the incorporation of cities and villages, conferring on city councils and village authorities the power to provide for and change the location, grade and crossings of any railroad, it further holds, relates to general or commercial railroads, while it points out that as to street railways there are other specific provisions. Manifestly, it also says, an ordinance cannot be regarded as the location of a railway, or the provision for such location, unless the railway company may lawfully go upon the proposed route. So, it holds that an ordinance locating a route over and across private property, or prohibiting the location of a street railway over certain private property, and naming another route over other private property, does not authorize the street railway company to follow the designated route or take private property along it.

#### LIABILITY IN LEAVING SIDES OF BRIDGE ACROSS CUT UNGUARDED.

Little Rock Traction & Electric Co. v. Dunlap (Ark.), 57 S. W. Rep. 938. June 16, 1900.

At the point where a street along which a street railway was built crossed a certain other street there was a cut along the latter street some 10 or 15 feet below the grade of the first-mentioned street. The railway was carried on a bridge or trestle above the cross street. This bridge was planked, making a passageway for pedestrians along the center of the first-mentioned street, but was not used for passage of vehicles. The bridge was constructed by the street-car company for its own convenience, but in accordance with plans furnished by the city engineer. The bridge was beyond the stock limits of the city, and a partially blind horse that had been but just that day turned out to graze walked partly across the bridge, became frightened, attempted to turn, fell off the bridge and was killed. The owner obtained judgment for \$25, and this the supreme court of Arkansas affirms. It says that the deep cut across the street, into which the horse fell from the bridge, was, if left unguarded, more or less likely to cause injury; and although the company did not make the ditch, and was not responsible for it, still it was bound to exercise due care not to increase the danger. The bridge, in effect, extended the sides of the cut from which animals could fall, and, on account of its narrowness and unguarded sides, was more or less dangerous. In passing this street, stock would be apt at times to attempt to pass over this narrow bridge, and, if frightened while upon it, would be in danger of falling

from its unguarded sides into the cut below, as the horse fell. Under these circumstances, the supreme court holds that it was a question for the jury to say whether this narrow, unguarded bridge connecting the ends of the street severed by the cut did not add to the danger of the cut, and whether the company was not guilty of negligence in leaving it with unguarded sides. And, though it remarks that the case was not free from doubt, the court is of the opinion that the questions of negligence and contributory negligence were properly submitted to the jury.

#### RIGHT TO CHARGE TWO FARES AFTER CONVERSION OF STREET AND STEAM ROADS INTO TROLLEY LINE.

Barnett v. Brooklyn Heights Railroad Co. (N. Y.), 65 N. Y. Supp. 1068. July 23, 1900.

The question involved in this case was whether the defendant, which was incorporated as a street railroad company in 1887, under the provisions of chapter 252 of the New York Laws of 1884, had a right to collect two fares, of five cents each, for one continuous trip over its entire route, known as the "Third Avenue & Sea Beach Route," and embracing not only two separate and distinct lines of railroad, leased and operated by the defendant, but two separate and distinct kinds of railroad, one known as the "Third Avenue Line," a street surface railroad, and the other known as the "Sea Beach Railroad," a steam railroad constructed in 1879, both being wholly within the present city limits. This question the appellate division, second department, of the supreme court of New York decides in favor of the company. Both the fact that the Sea Beach Railroad was constructed prior to 1884, and the fact that it was a steam railroad, the courts holds, exempted it from the provisions of the New York statutes limiting the charge for fare for continuous trips to five cents. Nor does it think that it made any difference in this connection that the defendant had converted the steam railroad into a trolley road, and had ever since operated its Third Avenue and Sea Beach route over both lines, as one continuous route of travel. And the same reasoning, it holds, applies with equal force to the provisions of section 104 of the railroad law relating to transfers, where passengers are carried over connecting roads operated together under either leases or traffic contracts. In conclusion, it says that no reason can be suggested for such a construction of the railroad law as would permit the defendant to convey its passengers from the Brooklyn Bridge to Coney Island at a charge of two fares, provided the passengers were subjected to the annoyance and inconvenience of alighting at the junction of the two roads, and there purchasing a ticket, and boarding another car, but which would deprive it of the right to charge the second fare merely because it had voluntarily constructed a temporary union of the two roads, in order to promote the comfort of passengers by affording a continuous and uninterrupted transit.

#### EXTENT OF LIABILITY ON ATTORNEY'S LIEN.

Zimmer v. Metropolitan Street Railway Co. (N. Y.), 65 N. Y. Supp. 977. Aug., 1900.

It seems to be quite lost sight of nowadays, says a special term of the supreme court of New York, Kings county, that a plaintiff's attorney can hold the defendant liable under his lien on the cause of action or on the judgment, only when his client is irresponsible, and he cannot get the amount due to him. A defendant stands only as a surety in relation to the plaintiff's attorney under his lien. When his client is sufficiently solvent to be able to pay him, or when, if there be a fund as a result of the litigation, he can enforce his compensation therefrom, the plaintiff's attorney cannot maintain an action or proceeding against the defendant to make him liable under his lien. It is only where the judgment is paid to the client without the attorney's consent, or if the action is settled before judgment, where the consideration agreed upon is paid to the client without the attorney's consent, and the money is got away with and cannot be impounded, and the client is irresponsible, that the attorney may proceed to enforce his lien against the defendant. And even then he must, on well-settled principles and rules of practice in analogous cases, proceed by a suit in equity, making both the plaintiff and the defendant parties defend-

ant, and get a judgment against such plaintiff for the amount owing, and in default of it being collected of him, against the defendant for such amount, or such part thereof as is found to be secured by the lien. The case is no different to the foreclosure of a mechanic's lien and other liens. In reported cases where the lien was foreclosed on motion or petition, the parties consented to that method. The summary method for the court on petition to fix the amount and enforce the lien provided by the last sentence of section 66 of the New York Code of Civil Procedure, is between the attorney and his client. That provision has no reference to the opposite party to the action. He is entitled to a trial. But it is not a case where there is a constitutional right to a jury trial, for in equity there never was and is not a right to a jury trial except as given by statute.

#### REQUIRING PASSENGERS TO TAKE CARS IN STATION HOUSE AND WRONGFULLY EJECTING ONE.

Nashville Street Railway vs. Griffin (Tenn.), 57 S. W. Rep. 153. Jan. 27, 1900.

A rule requiring passengers at a transfer station, whether entering by another car or line, or through the turnstile, to enter the cars while in the station house, being one which it is apparent must greatly facilitate the transfer of passengers and the dispatch of cars, doing away with tickets, etc., the supreme court of Tennessee pronounces a reasonable one. And it holds that it was error to refuse to charge the jury in this case that, if it found, from the evidence, that the street railway had a rule requiring passengers to board the cars in the transfer station proper, and if they failed to do so, and should enter the car after it left the station, they would either have to pay another fare, or leave the car and return to the station and take the next car, such a rule would be reasonable, and should be observed by the passenger.

The court also holds that it was error to charge the jury in this case that the mere starting of the car upon its journey, with the knowledge of the method of the passenger in question in boarding it, he having boarded it between the transfer station and car shed, and that he had paid his fare, he having entered through a turnstile, was an acceptance of him as a passenger, and a waiver of the rule as to him. One reason it gives, is that the starting of the car and demanding fare were so nearly simultaneous that the car progressed only a short distance before the fare was demanded and refused, and the car was stopped for the party's ejection. In the next place, the court says, the conductor may have very well assumed that he would pay the fare, as he had been notified (by the watchman at the station house) he would have to do, and, acting on this assumption, started the car, in order that other passengers might not be delayed.

But while the court holds that the request above mentioned with regard to the reasonableness of the rule should have been charged, it holds that it should have been added to it that, although the rule might be reasonable in itself, it must also be enforced in a reasonable manner, so as to carry out the objects and purposes of the rule. According to the railway's own theory, here was a mere boy, 19 years of age, who had entered the station through the turnstile, paying the regular fare, which entitled him to ride on any of the lines converging in that station. When he entered, he saw that the car of the line which he intended to ride upon had started out of the station house proper, but had stopped immediately beyond the station line, and only a few feet from it, and within the railway's inclosure. He knew, too, that unless he entered that car he would be required to wait 20 minutes, and, seeing it standing waiting, he went beyond the station house proper a few feet and entered it. Now, conceding that the rule was a reasonable one, was it, the court asks, a reasonable enforcement of it to expel this party from the car when it was known to the watchman and conductor that he had paid his fare and entered the station house for the purpose of taking this very car? It seems, the court declares, that there can be only one answer, and it is that the arbitrary enforcement of the rule to the extent of ejecting the passenger from the car, and compelling him, after he had entered one car, in which there was plenty of room, to leave it, and return to the station, and wait for another car, was an unreasonable and arbitrary enforcement of the rule. If the car had not stopped and offered him the opportunity to enter it, he could not have required it to do so to enable him to board it. But, the court con-

tinues, all the purposes of the rule had been met and subserved, and the employees of the company knew it. To arbitrarily enforce the rule in such case could subserve no good purpose, but would make it an instrument of oppression by the mode of its enforcement. Therefore, the court is of the opinion that, while the errors above mentioned existed, they were immaterial under the facts of this case, and that the case should turn upon the manner in which it was attempted unreasonably to apply the rule under these special circumstances, which under ordinary circumstances was reasonable and proper.

Moreover, as the passenger was at best but a weak man, and capable of only limited resistance, and had opposed to him several men, the court says that it would seem that he could have been held and handled in a way that would not have injured him or subjected him to the indignities of being ejected in a rough, rude, insulting and violent manner, and at an unsafe place, even after he got back on the car after being once put off. And it affirms a judgment in his favor for \$2,500, holding that it was a proper case for punitive damages.

#### DAMAGES FOR COLLISION CANNOT BE RECOVERED ON GROUND OF USE OF UNAUTHORIZED MOTIVE POWER.

Chicago General Railway Co. v. Chicago City Railway Co. (Ill.), 57 N. E. Rep. 822. June 21, 1900.

This was an action brought by one company to recover from another damages for a collision of cars. The position of counsel for the plaintiff was that it appeared from the averments that the defendant company was propelling its train of cable cars on a public street without lawful authority so to occupy the street with cable cars, and in so doing was a trespasser and intruder upon the street, and that such unlawful occupation of the street rendered the use thereof at the intersection of a street on which the plaintiff ran its cars hazardous to the plaintiff and others having lawful authority to pass along and across such intersection of streets, and made the defendant company liable to the plaintiff for the special damages shown to have been suffered by it; and that such liability was created by reason of the existence of such alleged nuisance, and wholly independent of the question whether the alleged collision was the result of negligence on the part of the defendant company in the management of the train. But the supreme court of Illinois says that it does not assent to this as the correct legal doctrine. The tracks of the defendant company were rightfully in the street, and it had lawful authority and right to operate street cars on those tracks and across the intersection of streets in question. Whether a proper construction of its charter or of the ordinance under which it was operating its trains limited it to the use of animal power, and prohibited it to use steam-driven cables as a motive power for moving the cars, or whether the adoption of that character of motive power was an abuse of its franchise under its charter or the ordinance mentioned, the supreme court holds, could only be determined in a direct proceeding instituted in behalf of the city or of the public, acting through the attorney general or the state's attorney. As to all others than the state or the municipality, the defendant company, under the circumstances disclosed, the court holds, was to be regarded as rightfully prosecuting the business of operating a line of cable street cars, and answerable to others than the representatives of the public only for negligence in the manner or mode of transacting its business and operating its trains.

#### RIGHT TO CROSS STEAM RAILROADS WITHOUT CONDEMNATION OR PAYING DAMAGES.

Southern Railway Co. v. Atlanta Railway & Power Co. (Ga.), 36 S. E. Rep. 873. Aug. 7, 1900.

The supreme court of Georgia says that it does not think that a street railroad constructed on a public highway, with consent of the proper authorities having jurisdiction over such highways, needs any benefits from the provisions of section 2219 of the Georgia Civil Code regulating the crossing by one railroad of the track of another. Being a public highway, it has, independently of that section, the court says, a right to cross the tracks of a railroad crossing the public road, just as any other vehicle or mode of transportation on such public road might cross the same, pro-



vided it duly obtains a license from the proper authority in charge of the street or road it proposes to use. A railroad corporation which is permitted to construct its tracks across an existing city street or public road does so subject to the condition that it must submit to the increased inconvenience to it which may result from the growth and development of the city or country, and the consequent increase of travel in the usual methods along such street or road. No new burden is imposed upon a public street or highway by constructing and operating therein a street railway for the transportation of passengers, the cars of which are propelled by electric power. That a street railway company has, under its charter, authority to use steam as well as electricity as a motive power, is a matter of no consequence in testing its right in a given instance to cross a railway on a street under a municipal grant restricting the company to the use of electric power, and where it is not seeking to employ steam power. So the court holds that a company owning and operating a street railway of the character above indicated may, under the permission of the proper municipal or county authorities, construct its lines across the track of a steam railroad company, and use the same, without instituting condemnation proceedings, or being required to pay damages. Moreover, even if the provisions of section 2219 above mentioned are applicable to the crossing by a street railroad of any other railroad, the phrase, "heretofore or hereafter chartered by the legislature of this state," the court holds embraces a street railroad company whose charter, though granted by the secretary of state, has been confirmed and made valid by an act of the general assembly. In other words, a company having such a charter, the court holds, may properly be termed one "chartered by the legislature."

#### ORDINANCE AUTHORIZING ACQUISITION OF EXISTING RAILWAYS NOT VOID AS EXTENDING FRANCHISES OR CREATING MONOPOLY.

Wood v. City of Seattle and others (Wash.), 62 Pac. Rep. 135. Aug. 20, 1900.

A city ordinance granting a street railway franchise covering 22 different routes, some of which were covered by existing street railways and providing that the acquisition of any portion of existing street railways, and bringing same under the operation of this franchise, should be equivalent to new construction, the supreme court of Washington holds could not be considered in violation of a provision in the city charter prohibiting it from extending any franchise until within three years from the expiration thereof. It ought not, it says, to require argument to prove that the franchise under which a street railway is operated is separate and distinct from the tangible property used in the operation of that railway. The franchise, while it is property, is in its nature but a permit to use the streets of the municipality in a particular way for a particular purpose. The tangible property—the railway tracks, the cars, and other equipments—is but a part of the means necessary to a successful operation of the railway system, and can no more be a part of the franchise under which the system is being operated than can the labor of the individuals who control and direct its operation. Neither does the city, by the mere grant of a franchise for the operation of a street railway upon its streets, become the owner of the tangible property used in the operation of that railway. Nor, unless the ordinance granting the franchise so expressly provides, can it become such owner by the forfeiture or termination by limitation of the franchise. Wherefore, as none of the ordinances granting the franchises which the 22-route ordinance referred to permits to be surrendered contain such a provision, and the tangible property of the railway systems, if such surrender be made, will continue to be the property of its then owners, the court declares that there can be no more reason for saying that the continued use of this tangible property is the continued use of the franchises, than there can be for saying that the use of any other property of like kind would have that effect. And power in the city council "to authorize or prohibit the locating and constructing of any railroad or street railroad in any street, alley or public place of the city," and "to provide for the alteration, change of grade or removal thereof," the court deems gives the council absolute control of the city's interests in franchises, and is authority enough for the acceptance of the voluntary surrender

of an existing franchise. Nor does the court think that the provision in the state constitution against monopolies and trusts is violated by such an ordinance, even if some of the existing lines that may be absorbed are parallel and competing lines. This provision it does not believe was intended to be a limitation upon the legislative power to authorize such a consolidation whenever it might deem the public interests demanded it.

#### FORESIGHT REQUIRED TO PROTECT PASSENGERS AT ENTRANCES AND EXITS OF CROWDED CARS.

Hansen v. North Jersey Street Railway Co. (N. J.), 46 Atl. Rep. 718. June 25, 1900.

A common carrier of passengers, the court of errors and appeals of New Jersey holds, must use a high degree of care to protect them from dangers that foresight can anticipate. By "foresight," it goes on to explain, is meant, not foreknowledge absolute, nor that exactly such an accident as has happened was expected or apprehended, but, rather, that the characteristics of the accident are such that it can be classified among events that without due care are likely to occur, and that due care would prevent. Under this doctrine, the crowding of a trolley car, and especially of those parts of it that are used for entrance and exit, the court holds, is attended with a liability to danger that the carrier should anticipate, and employ care to avert.

With reference to this particular case, as presented, regard must be had, in defining the right of the plaintiff, the court says, to the habit of the traveling public to sacrifice comfort to time and to seek transportation without a seat, when it cannot be had at the time with a seat. True, she got a seat herself, but she must be taken to have known the existing situation, and to have understood that on the evening of a national holiday (it being Decoration Day), within the limits of a great city, there would probably be other passengers who would not get seats, whose presence might incommode her during her ride, and cause her at least some discomfort when she undertook to leave the car. On the other hand, the obligation of the company toward her, the court holds, was affected by the same consideration. It was bound specifically to use a high degree of care to protect her—not, indeed, from crowding in itself, but from danger likely to arise from crowding. Considerations of public policy require that if common carriers are to be allowed to cram their cars with passengers, to their own profit and the discomfort of the public, they should be held all the more to a strict and active responsibility to use due care to secure safe entrances and exits.

The employees in charge of a trolley car, the court goes on to say, are clothed with what has been called, not inappropriately, a "police power for the protection of passengers." The exercise of this power devolves in most cases upon the conductor. In this instance, the motorman, by opening the front door and right-hand gate, and so inviting passengers to alight at his end of the car, became responsible for the good order of those persons who accepted that invitation, so far as a high degree of care on his part could secure it. Of course, a common carrier is not a censor of manners; but if, under given circumstances, rudeness dangerous to personal safety is to be expected, it must be the duty of a common carrier to guard against it, not because it is unmannerly, but because it is likely to injure persons whom the carrier is bound to protect.

So, in this case, the court holds that there was evidence to go to the jury whether the accident was such that it might have been prevented by the exercise of due care on the part of the company, there being evidence that the motorman did nothing after opening the door and gate but stand and watch the passengers as they came out, while there were acts of rudeness committed toward the plaintiff by a person or persons who stood behind her on the platform, and who must have been in the immediate presence of the motorman, and she lay prostrate and seriously injured on the fender long enough for persons to come to her assistance from the sidewalk and extricate her before the motorman knew anything of this transaction. And if the jury answered the question stated in the affirmative, the court says it need look no further, but might then infer negligence. In such a situation the burden shifts, and the common carrier, in order to exonerate itself, must show, if it can, that due care was exercised.

## CANADIAN NOTES

The Montreal Street Railway Co. has just added to its snow fighting equipments a large rotary plow.

The Levis (Que.) Electric Ry. is applying for incorporation, with power to build a line of electric street railway in that town, and the adjoining counties of Dorchester and Belleclerc.

Application has been made for articles of incorporation for the Bay Shore Railway Co., with a capital of \$250,000, to construct and operate an electric railway between Yarmouth, N. S., and Maitland, a distance of about 12 miles.

Another renewed application is for power to build an electric railway from Port Stanley north toward London and Seaforth. This is under the name of the Talbot & Lake Shore Electric Railway Co., and it is altogether probable that this charter will be granted.

Mr. F. Wanklyn, manager of the Montreal Street Ry.; Mr. J. K. Ross of the Birmingham (England) Tramways Co., and several other gentlemen, directors of the West India Electric Co., have left for Kingston, Jamaica, where they will inspect the road and properties of the company.

An application has been filed by the Rapid Transit Co., of Toronto, asking for incorporation. This concern seeks authority to construct elevated railways in Toronto. The application was denied last session, and it is doubtful whether the promoters will meet with any better success this term.

Application will be made to Parliament next session, by the Harbor Bridge & Railway Co., of St. John, for power to construct a bridge across the harbor at that place, for the use of the electric and steam railways. This will give the St. John Electric Ry. a much-needed connection between West and North St. John.

The Toronto & Scarboro Railway Co. is desirous of extending its line to Little York, and if satisfactory arrangements can be made with the Grand Trunk Ry. for the construction of a bridge over the latter's tracks, the extension will be commenced as soon as weather permits. This will give the company a much better eastern terminal than it has at present.

The Ottawa Electric Railway Co. has decided to increase its capital stock from \$781,800 to \$1,000,000, and the amount of its bonds from \$320,000 to \$500,000. This is done in order to wipe out the present indebtedness caused by the great fire, and to meet the expenditure for the new plant and power house now being constructed.

It is officially announced that Mr. B. W. Folger has accepted the appointment as general superintendent of the elevated railway system of the Brooklyn Heights company. Mr. Folger, who has been connected for some time with the Thousand Islands Steamer Co., is well and favorably known among railway men, and the announcement of his promotion gives general satisfaction.

Arrangements have been made whereby the West Kootenay Electric Light & Power Co., of Rossland, is to furnish the Canadian Pacific Ry. with electric power to run the trains of the latter company over the heavy grade between Rossland and Robson. If the trials (which are to be very thorough) prove satisfactory, there is little doubt but that the system will be adopted at other points on the line.

The Toronto Railway Co. contemplates putting on a line of tourist cars next summer. The cars, which will be of special construction and fitted with a view to the comfort of passengers,

will cover all the principal routes, visit the points of interest in the city and suburbs, and will be accompanied by a guide whose duty it will be to point out the various interesting places as they are passed. The trip will take about two hours, and the fare will be 50 cents. To a stranger who has but a few hours to spend in the city, this is obviously a good way of seeing it; he can cover so much more ground than in a cab, and at a much less cost.

Mr. Robert A. Ross, the consulting electrical engineer of the Canadian Pacific Ry., has left for St. Petersburg, Russia, in the interests of Sir H. Ross. Mr. Ross is well known among the street railroad officials of the country, having formerly been works engineer for the Canadian General Electric Co. Mr. H. R. Lockhart has been appointed consulting engineer for the Canadian Pacific, succeeding Mr. Ross.

The Court of Appeal has confirmed the judgment of the lower court, giving the town of St. Louis power to cancel the franchise now held by the Montreal Park & Island Railway Co. to operate an electric road within that municipality, on the grounds that the conditions of the contract between the parties concerning the price of tickets, the time of service and the granting of transfers for use in the city of Montreal, had not been fulfilled.

A deputation of the employees of the Toronto Railway Co. waited upon the aldermen of that city to complain of the action of the company in laying off 20 conductors for standing inside the cars, the men claiming that the company agreed to allow them this privilege in lieu of putting on vestibuled cars. The company contends that, although it voluntarily gave the men permission to remain inside in stormy or dusty weather, it cannot consent to have the men inside all the time, and declines to allow any interference in its dealing with the conductors in question.

At the annual meeting of the stockholders of the Carillon & Grenville Railroad Co., recently held in Montreal, the advisability of using electrical power on the line in place of steam was discussed, and it is proposed to form a company for the purpose of developing the water power that it is believed can be obtained by utilizing the old Carillon canal. Those chiefly interested in the project claim that a head of 15 ft. can be had at the Carillon dam, which would be more than sufficient to operate the line, and Mr. J. W. Shepherd, Jr., general manager of the road, states that if the power can be obtained, electricity will supplant steam in the operation of his line.

The absorption of the Metropolitan Railway Co. by the Toronto Railway Co., mentioned last month, has now been ratified by the shareholders, and the Toronto Railway is now, in accordance with its general policy, negotiating for the purchase of the Toronto Suburban Ry., which has lines running from Toronto Junction to Weston and Lambton Mills. By obtaining possession of the Suburban the Toronto Railway would control all the principal electric systems in the vicinity of Toronto, which would greatly lessen the probability of any other company entering the field with a view of constructing radial railways. The Suburban Ry., despite efficient management, has had a hard up-hill fight. It offers splendid prospects for extension, however, and can be made to tap a very rich agricultural country.

### PLANS OF NORTHWESTERN ELEVATED.

The Northwestern Elevated R. R., Chicago, has petitioned the council for permission to condemn a right of way for a surface line from its present terminus at Wilson Ave. north to Evanston. The Chicago, Milwaukee & St. Paul Ry. has for years operated a suburban line to Evanston, and the Northwestern Elevated has been negotiating with the company for the privilege of running the elevated trains over the surface lines north of Wilson Ave. The Chicago & Milwaukee Electric Ry. has also sought to secure the use of the St. Paul tracks from Evanston to Wilson Ave., where it would transfer passengers to the elevated road. The plans of the Northwestern, if it secures its own line north, will be to give a 33-minute service from Evanston to the down-town district of Chicago.



## NEW CARS FOR CLEVELAND ELECTRIC RY.

The accompanying illustration shows a car recently delivered to the Cleveland Electric Ry. by the J. G. Brill Co.; it is the last of a 50-car order, and a second order for 25 similar cars has been placed. Hitherto the Cleveland companies have used trucks of the Brill No. 27, type, but the particular car shown here, being the last one completed, was mounted on "Eureka" maximum traction trucks, and its performance in regular service will be carefully watched to determine whether these trucks can be used in fast heavy service.

The Cleveland lines have loops and the cars run one way only; both the maximum traction trucks are arranged so that the pony wheels are trailers. The forward end of the car has an enclosed vestibule, and the rear end an open platform. The left hand sides of both platforms are closed which in effect increases the capacity of the platforms. The trolley pole is placed at the rear of the car which is regarded as an important detail; the rear hood is covered with a grating of light ash strips to protect the hood from the whipping of the trolley pole when it is thrown from the wire. At the high rates of speed common on most of the Cleveland lines, when the trolley pole leaves the wire it strikes the next span wire with such force as to be thrown down with great violence upon the hood, usually breaking through the covering.

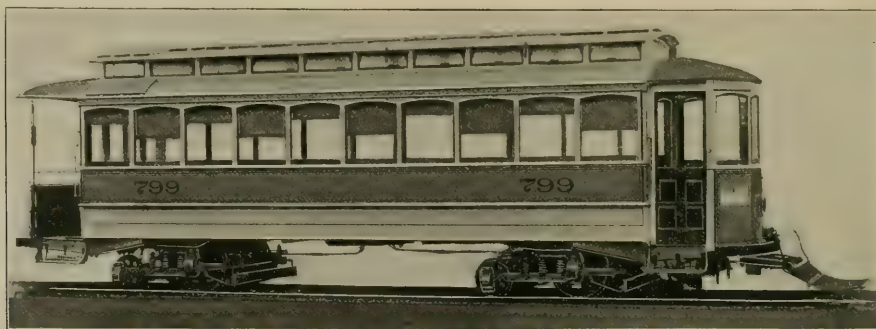
The dimensions of the car are: Length of body, 28 ft.; width at sills, 7 ft. 3½ in.; width over all, 7 ft. 10 in.; length of front plat-

## LARGE ORDER FOR TRANSFORMERS.

The Chambly Manufacturing Co. has recently placed with the Westinghouse Electric & Manufacturing Co. what we believe is the largest single order for transformers ever recorded—twenty 2,750-kw. transformers of the air blast type. The transformers individually are the largest thus far built, each weighing 11 tons and standing 9 ft. high.

Of the 20 units, 10 are used to raise the voltage from 2,200 to 25,000 volts at 8,000 alternations. The input is 2-phase and the output 3-phase. The remaining 10 transformers, for lowering the voltage, receive the 3-phase line current at 22,000 volts and deliver out a 2-phase current at 2,400 or 4,800 volts as required. The blowers for furnishing the air blast for cooling both the raising and lowering transformers are operated by Westinghouse type C induction motors.

The well-known Westinghouse methods of construction are employed in these transformers, both primary and secondary being divided into several flat coils wound with many layers, and few turns per layer, each coil being insulated separately. An advantage of this construction is that it divides the total e. m. f. between the several coils, reducing proportionately the strain on each individual coil, and also divides the e. m. f. in a single coil between many layers, thus reducing the potential between the adjacent layers. The regulation of the transformers is also improved, and the windings may be connected easily in series or multiple, thus giving a wide



NEW CAR FOR CLEVELAND ELECTRIC RY.—J. G. BRILL CO.

form, 4 ft.; length of rear platform, 4 ft. 6 in.; height inside from floor to center of monitor, 8 ft. 4½ in. The total weight with motors is 30,820 lb.

The seats are longitudinal, of spring cane; on one side the seat has a removable section to permit a stove to be installed. The ventilator sash are hinged at the front ends and swing out, the glass being set in putty; the forward sash is stationary, four in the center work together, and all the others may be moved separately. The window sash have solid bronze stiles, the glass being set in rubber pockets; the windows drop into the car side and hinged stops or covers close the openings completely when the sash are down. The truss bars are ¾ x 2½ in. with the ends enlarged to ¾ in. and secured to metal pockets screwed to the posts. Longitudinal tie rods under the window sills and truss planks fastened to both sills and posts greatly strengthen the car. The inside finish is cherry, except the headlining which is three-ply maple veneer. The hand poles are 1¼-in. cherry placed 6 in. inside the base of the monitor deck, bringing the straps further inside the seats than is usual and thus preventing standing passengers from crowding against those occupying seats.

The equipment includes Sterling brakes and Providence fenders. The white space on the vestibule is for destination signs.

The details of the car were very carefully worked out by Mr. C. W. Wason, purchasing agent of the Cleveland Electric Ry., who has for years made the operation and repair of his cars a special study. Mr. Wason comes naturally by his skill, being a son of the founder of the Wason steam car shops at Springfield, Mass.

range of e. m. f. Also, in case of damage to a coil a substitute may be provided with but little trouble, and without sending the transformer to the works.

The iron and copper have been carefully proportioned to secure the minimum losses, and the efficiency of the transformers is very high, being considerably over 98 per cent.

It is, however, not sufficient that the loss in a transformer be low when it is first installed, for, as is now generally known, much of the iron that has been used in transformers when subjected to the conditions prevailing in continued service is subject to a material deterioration, more or less rapid, with the result of a corresponding material increase in the iron losses. In some cases this increase has amounted to a doubling of the loss found in the transformer when first installed. The Westinghouse engineers early discovered this characteristic and at once began a careful and systematic study of the subject, with the ultimate result that there was established a special and thorough process for the manufacture and treatment of transformer iron. Entire success was attained in producing an iron at once capable of high magnetization with comparatively little energy and having a stable character completely resisting the tendency to deteriorate in service and show increased losses.

A peculiar feature of these large transformers is the change effected in them from two to three-phase and from three to two-phase current, the change being secured by means of special windings, invented by C. F. Scott of the Westinghouse company. This greatly increases the flexibility of two and three-phase methods of transmission.

## THE CONSOLIDATED ELECTRIC HEATER.

The Consolidated Car Heating Co. placed its electric heaters on the market in 1893, the idea being to have a simple and compact form in which a large amount of bare wire is supported in a manner to give the least danger of short circuiting and to permit of free circulation of air. The first design proved so satisfactory that the company is today making heaters embodying the identical principles and features of the 1893 heaters; this continued use for a period of eight years without change, speaks volumes for the excellence of the original design and workmanship, and the company believes this to be a unique record.

Fig. 1 shows the Consolidated Car Heating Co.'s electric heater. The heater consists of a porcelain core made up of sections mounted upon a square iron rod which runs through the porcelain core the full length of the heater. The cylindrical surface of the porcelain

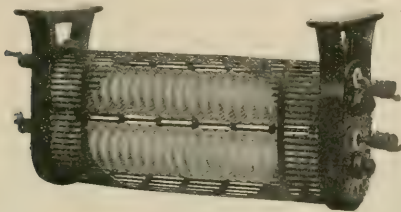


FIG. 1—"CONSOLIDATED" HEATER.

core contains a spiral groove running continuously from one end of the porcelain core to the other. A porcelain disk at either end of the core is mounted upon the rod and has formed in it the porcelain bushings through which the insulating wires pass through the walls of the heater case. The heating wire is wound by a machine in the form of a close spiral coil. The resistance of each coil is properly determined for each kind of heater and the coil after being slightly drawn out is wound in the spiral path which appears on the surface of the heater core. The tension under which the coil is wound separates the neighboring layers of the spiral coil and the grooves in the surface already referred to prevent the adjacent turns on the outside of the porcelain core from making contact with each other.



FIG. 2 REGULATING SWITCH.

It is claimed that the form adopted permits at least 50 per cent more wire in a given space than is possible with other designs. Provision is made for the expansion and contraction of the wire due to changing temperature, and at the same time the wire is prevented from vibrating upon its supports.

Another feature of very great importance is the open construction of the coils on the heater core which results in a free circulation of air through all parts of the heating coils and in this manner the heat is carried freely into the car without danger to the heating wire itself. If this is not fully provided for a high temperature of

the heating wire invariable results which is liable to destroy the wire at any moment. The arrangement is such that the neighboring parts of the heater when in operation are of small difference of potential, that is to say, parts of the wire at the opposite ends of the heater are the parts which have the highest difference of potential and consequently no danger to the heater or to persons sitting near it can come from the accidental dropping of a nail or other conductor upon the heating coil when in operation.

The large heating surface (placed at twice as much as in other types) freely exposed to the air at all parts permits the maximum temperature of the wire to be limited to 425 deg. F.; the low temperature and large surface ensure sufficient heat without endangering the life of the wires, and thus avoid the renewal of heater coils necessary when these conditions do not obtain.

One of the important features of a successful heating system is the switch for regulating the degree of heat. Figs. 2 and 3 show the switch of the Consolidated company, which is peculiar in that it has a large number of contacts and a quick snap action in both directions. It can open a circuit of 40 amperes with 550 volts, and can do this without injurious sparking. The switch is always locked in one of its predetermined positions, and when the handle is turned one-quarter of a revolution in either direction the lock is disengaged and the contact arms move forward in that direction through one-quarter of a turn and are again locked in position. It is impossible to make the switch contacts move slowly at any point in its revolution and the positive locking action prevents the accidental displacement of the contact lever and it is therefore impossible by manipulating the switch to make it produce an injurious sparking.

Two circuits lead out from the switch to the heaters. In the first circuit one coil in each heater is placed, giving the minimum tem-

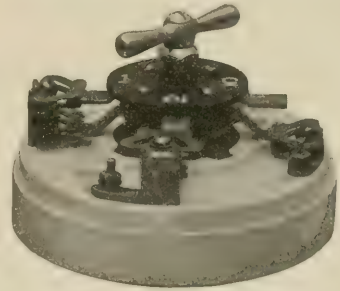


FIG. 3 SWITCH WITH COVER OFF.

perature. In the second circuit is placed the second coil in each heater giving twice as much heat as the first. In the third position of the switch, both circuits are connected, giving three times the minimum amount of heat. Thus three different intensities of heat are obtained which furnish a sufficient variation of temperature for practical purposes. The same care in providing ample insulation is shown in the design and construction of the switch that has always been provided in the electric heaters of this company.

It is a pleasure to note the satisfaction which the switch and electric heaters of this company have given, resulting in a constantly increasing demand year by year since they were first put on the market.

## CHANGE AT COLORADO SPRINGS.

The interest of Mr. A. L. Lawton in the Colorado Springs (Col.) Rapid Transit Railway Co., of which he was general manager, has been acquired by Mr. W. A. Ramsay, Mr. Lawton wishing to devote his whole time to other business. Mr. Frank A. Lawton has resigned as superintendent, his successor being Mr. D. L. MacAffee, formerly assistant superintendent.

The Wheeling (W. Va.) Traction Co. will build a new car house. The structure will be of brick and steel.

# MECHANICAL DEPARTMENT

## PAINTING CAR SIGNS WITH STENCILS.

In Philadelphia the route a car is to take is designated by a plain white board with black letters, carried in iron brackets on the hood. These signs are all painted from stencils made of manila paper, heavy enough to prevent tearing, but thin enough to enable the roller, with which the painting is done, to touch the board through the open spaces. The paper is first cut into strips 4x30 in., the size of the wooden signs, and the letters outlined with pencil, precautions being taken when forming the letters to leave enough paper to properly tie the edges when the letters are cut out. The cutting is then done with a sharp knife, after which both sides of the paper are heavily shellaced. A pattern prepared in this way will last a year, and with it a sign can be painted in 10 minutes that would take two hours to finish by hand. The stencil is cleaned with turpentine before it is laid away after using.

At the shops of the Capital Traction Co., of Washington, paper stencils are employed for marking out fancy designs for panelling work. For this purpose plain manila paper, without shellac or other coating, is utilized, the design being pricked into the paper with a pin or small awl. When decorating a car the stencil is placed over the panel and a tinted powder smudged over the surface with a dry cloth. Enough of this powder sticks to the panel when the stencil is removed to enable the painter to fill in the design with paint and brush.

A convenient method is in vogue at Philadelphia for lettering the end windows in closed cars, cautioning passengers against standing on the platform. The sign adopted reads:

Do Not Lean Against the Gate.  
It Is Dangerous.  
The Hand Rail Must Be Kept  
Free for Use of Passengers.

These signs are obtained from a local firm, printed in a special ink or rather paint, on prepared paper which when dampened separates from the paint, leaving the lettering fastened to the glass. The process is similar to that followed in preparing what are commonly sold in stationery shops under the name of transfer pictures, by which colored pictures can be transferred from a paper backing to the hand.

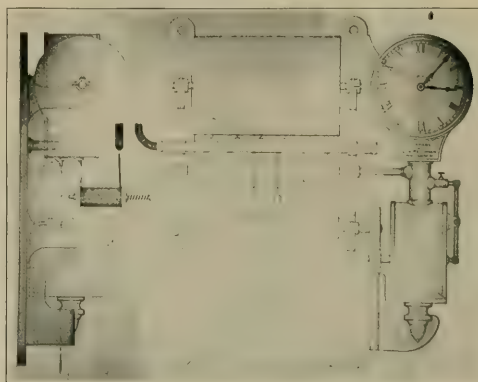
To transfer the notice to the glass, the face of the sign is covered lightly with varnish. The glass is then wet with water, and the transfer sign carefully placed on the window pane in the position it is to occupy and is pressed firmly to the glass by a rubber roller, care being exercised to smooth out any air bubbles that may appear under the paper. When it has remained about five minutes the paper is moistened and can be pulled off, leaving the letters securely affixed upon the glass. The backs of the letters are then given a coat of varnish to prevent them from being scratched or from working off. Signs put on by this process cost but a few cents each and are found to last about as long as when put on with leaf or painted by hand.

## CAR RECORDER.

The accompanying illustration shows a car recording device, which will no doubt prove of interest to superintendents of car service, the device being designed to enable them to ascertain exactly how cars are running on the road, without leaving their office. The clock and attachment are placed in the office, a roll of paper, divided into as many columns as there are lines, and ruled according to the service given, is fed through the rollers, and over a series of magnets. Contacts are arranged at the desired points on the lines, and the cars, when passing their respect-

ive contacts, complete circuits which operate the magnet attachments in the office, and indicate on the paper the exact time at which the cars passed, thus enabling the service to be thoroughly and accurately checked by the office staff at any time.

The clock is also a great help in disposing of complaints made by the public as to irregularity of service, practical experience having demonstrated that the majority of irate citizens who present themselves at the office with the complaint that they have waited 10 or 20 minutes at a certain corner for a car, are inclined to exaggerate, and reference to the recorder will show at once whether the complaint is based on fact. The cost of installing



LOCKHART'S CAR RECORDER.

the necessary appliance is very small, the power being taken from the trolley wire no additional wiring is required on the line, and the clock and attachment form a handsome and decidedly useful addition to the superintendent's office. This apparatus has been thoroughly tested in Montreal, Que., where it is now in use, and has proved itself a very efficient means of timing the cars.

Mr. H. R. Lockhart, superintendent of power stations of the Montreal Street Railway Co., Montreal, Canada, to whom we are indebted for this illustration, is the inventor, and he will be pleased to furnish our readers with any desired information as to the working and uses of this recorder.

## HOME-MADE OVENS FOR BAKING ARMATURES.

The Capital Traction Co., of Washington, D. C., has built in its shops an efficient oven for drying field coils, etc., and baking rewind armatures. The oven (Fig. 1) is 9x3 ft. and 6½ ft. high. It has three doors in front, two which swing out sideways, and one which drops down, forming a runway for the small hand trucks used in these shops for picking up and carrying armatures; the armatures are thus rolled on to the oven floor.

The sheets of steel forming the top and sides of the oven have 2-in. angles along the edge, and also running both ways through the center, which serve as stiffeners. The inner surfaces are covered flush with the edges of the angles with an asbestos paste made of old steam-pipe coverings pulverized under a hammer and mixed with water. To hold this asbestos in place it is covered with sheets of corrugated iron fastened by bolts running through the



outside walls; the bolts are 8 in. between centers both ways. The doors are similarly lined with the asbestos paste.

In the bottom of the oven are six coils of steam pipe, taking exhaust steam from the shop heating plant, and over these pipes is placed a floor of slats on which the armatures rest. The lower door is reinforced on the inside with strips of iron where the wheels of the truck pass when an armature is being placed on the oven floor.

The box will accommodate six armatures at one time, and a rack is placed in the upper half on which to hang field coils or anything else it is wished to dry. A temperature of 200 degrees F. can be maintained in the box for any length of time.

In Fig. 2 is shown a still less expensive oven, but one that will answer the requirements of many small roads. It is in use at the shops of the Washington (D. C.), Alexandria & Mount Vernon Ry. This is made of wood, lined with three  $\frac{1}{8}$ -in. layers of sheet asbestos. It is heated by electric heaters. The oven is 3 ft. 6 in. by 2 ft., and 4 ft. high, and consists of three divisions, the two lower ones being about 15 in. high and the top one 18 in. high. The bottom division contains the heating coils, arranged in three layers of five coils each, controlled by a three-point switch, by which either one, two or three groups may be thrown into circuit. The middle division carries the armature in grooves at the end, as shown in the sketch. The top division or cover is provided with a small window for watching a thermometer within. The three divisions when placed in position form one virtually heat-proof box.

The heating coils are home made, but are giving excellent satisfaction. They consist of ordinary  $\frac{7}{8}$ -in. gas pipe, around which two or three layers of sheet asbestos have been wrapped. On the asbestos is wound a No. 18 iron wire, with the turns about  $\frac{1}{4}$  in. apart, the wire being wound moderately tight, causing it to sink down somewhat into the asbestos, practically insulating the turns from each other.

Armatures are left in the oven at a temperature of 150 to 200 degrees F. for six hours, when additional coils are cut in and the temperature raised to 240 to 250 degrees, the armature remaining in this heat for about 18 hours longer. It is estimated with all coils in circuit the oven requires from five to six amperes at 500 volts. The dimensions as given apply to a box for baking the heavier types of General Electric armatures, but can be changed to accommodate any other make.

The United Railway & Electric Co., of Baltimore, has a very convenient drying oven at its shops, for drying leatheroid and other small material and articles that may require heating. It is a tin box about  $3\frac{1}{2} \times 3$  ft. and 3 ft. high, in the bottom of which is placed a board on which are mounted 15 incandescent

temperature approximating 175 degrees F. They are then given the second taping, dipped as before and again baked for 10 hours, after which they are dipped in paraffine and once more hung in the oven to dry.

As Westinghouse coils require more hammering when being placed upon the armature core, they are treated a little differently. They are dipped but once, and then wound with heavy protective tape.

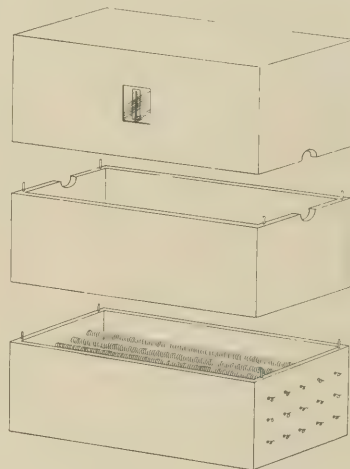


FIG. 2—BOX FOR BAKING ARMATURES.

The oven for baking coils is 25x7 ft. and 7 ft. high, with walls of expanded metal and cork. Rows of  $\frac{3}{4}$ -in. gas pipe, supported from the end walls, run lengthwise of the interior, and on these the coils are hung, there being room for 1,500 armature coils and 60 field coils at one time. The temperature is kept at 175 degrees F. by coils of steam pipe at the side and bottom, taking live steam from the shop boilers. The Union Traction Co. also refills all its commutators at the Kensington shops, and makes its own sheet mica insulation for commutator rings, etc., utilizing scrap mica for this purpose. The shops are equipped with punches and presses for forming rings and other small parts.

### INSPECTION AND CARE OF CAR EQUIPMENTS.

The East Side Electric Railway Co., of Kansas City, Mo., requires its motormen to make a thorough examination of their cars each day before starting on their first runs. Instructions are issued to the men in the following form, each paragraph being lettered for convenience of reference:

- (a) Before starting out in the morning, it is the duty of the motorman to thoroughly inspect his car.
- (b) And immediately report to person in charge any indication of trouble, which he cannot remedy.
- (c) This inspection should be done as follows:
  - (d) Begin at the trolley wheel; see that it is not dangerously wearing, and put a little oil on the wheel pin.
  - (e) See that the rope is secure.
  - (f) Swing the trolley latterly to see that it swings freely upon the base.
  - (g) Then raise the trap doors over the motors.
  - (h) Examine all the grease boxes, to see that they are well filled with grease, and feeding the journal freely.
  - (i) Next examine the motor carbon brushes.
  - (j) Do not remove them unless worn out.
  - (k) See if the commutator is unusually black or shows signs of burning.
  - (l) The bolts holding the various parts of the motor together

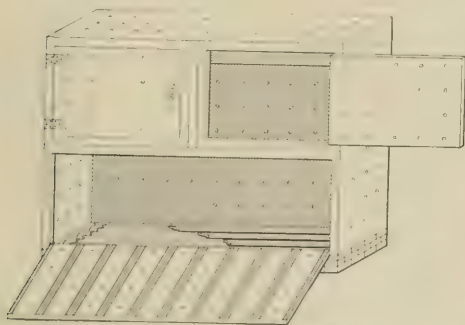


FIG. 1 ARMATURE OVEN, WASHINGTON.

lamps, these lamps enabling a constant temperature of 120 degrees F. to be maintained.

The Union Traction Co., of Philadelphia, does not make a practice of baking rewound armatures, but instead thoroughly bakes the coil before they are wound on the armature core. It makes all the coils used on the system at its Kensington Ave. shops.

Its process for General Electric coils is to put on the first layer of taping after the coil has been formed, dip in M. I. C. insulating compound, and then hang the coil in an oven for 10 hours at a

should next be examined to see that they are secure; especially watch the gear casing bolts.

(m) The brakes should be examined next. See if the shoes and chains are in good condition and in free adjustment.

(n) Next examine the sanding apparatus. No car will leave the barn until it is positively known that the sand boxes are full and that the sand flows freely directly upon the ball of the rail. This is a very important point, owing to the severe grades on the line.

(o) During the day as often as possible the equipment should be inspected as above.

(p) When the cars are brought into the barn at night the trap doors over the motors should be raised.

(r) The dirt carefully swept from about the hinge of the commutator cover.

(s) And the covers raised.

(t) Just before leaving the car after turning it in (either day or night), the motorman will unlock both platform gates, but leave them closed.

(u) Throw off the overhead switch.

(v) Put the gate, sand and controller handles and the bell and fender platform pins in their proper places on the west end of the car.

(w) Leave the brakes off.

(x) And remove the trolley from the wire.

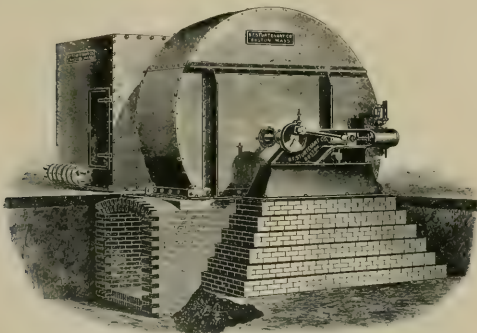
(y) Letting it rest in the wooden trough.

(z) Continue to make a report about everything not exactly right about the car until it is repaired.

## HEATING AND VENTILATING APPARATUS.

The accompanying illustrations show the most modern type of heating and ventilating apparatus built by the B. F. Sturtevant Co. of Boston, Mass. The heater consisting of a series of steel pipes screwed into independent sectional bases, is encased in a fire proof steel plate jacket in connection with the inlet of the fan. The independent bases are clamped together and supplied as a single group from the source of steam supply, the arrangement usually being such that either live or exhaust steam may be used.

The arrangement of the steam pipes in the heater and their relative spacing is such as to cause a breaking up of air currents, and to compel intimate contact between the air and the heating surface with the result that an immense amount of heat is transmitted for a given area. The rapid carrying away of heat in the moving air results in internal condensation fully five times as great as would occur in steam pipes exposed in the ordinary way for direct heating.

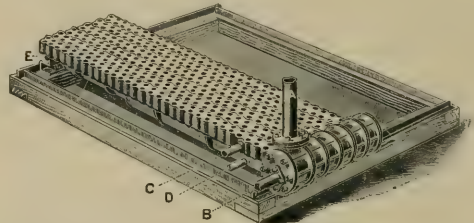


STURTEVANT HEATING PLANT.

According to the pressure of the steam and the number of rows of heating surface across which the air is drawn, it may be heated to different degrees of temperature running up to even 200 degrees F., with high pressure steam and fairly warm entering air. It is possible, however, with the utmost ease, to regulate the temperature to the exact requirements and at the same time to control the volume of air which is thus heated as a rule to temperatures of from 120 to 140 degrees. The fan is of the well-known Sturtevant steel-plate construction, but of the  $\frac{3}{4}$  housing type designed in this

instance for the heating of large buildings and driven by a direct connected horizontal engine. The engine foundation is bonded into the brick foundation of the fan, which is so designed as to form the lower portion of the housing or scroll of the fan, which in turn may be arranged to discharge air horizontally at the bottom or horizontally at the top, according to its position in relation to the duct through which heated air is conveyed. Regulation of the engine speed is, of course, the ready means by which the volume of air supplied to the building may also be regulated, but it is evident that at all times the fan operates with entire independence of the conditions of the weather and that the velocity and temperature of the entering air may be instantly changed.

The essential advantages claimed for this type of heating and ventilating apparatus rest upon the facts that the entire apparatus is enclosed in a fireproof casing and therefore fire risk is reduced



HEADERS AND MANIFOLDS.

to the minimum, that the amount of heating surface in the heater is vastly less than that necessary with any system of direct piping, that absolute control may be had over both the temperature and the volume of the air and that the operation is independent of wind or weather.

## GRINDING FLAT WHEELS.

For many years, in fact ever since the advent of mechanical traction for street cars, the flat wheel has been a great source of annoyance to the railroad management until it has become the bugbear of the business, and numerous means have been devised to remedy the evil, but at the best these are all costly. About two years ago the Wheel Truing Brake Shoe Co., of Detroit, Mich., entered the field with a simple and novel device for truing up flat wheels without taking the car out of service, and its shoes are now a part of the regular equipment on many street railways, abroad as well as in this country. While, like most new undertakings, the company had its trials, it is now on a sound financial footing.

The wheel truing device is a brake shoe, interchangeable with the one in regular use; and is like it in every respect except that it contains pockets filled with a grinding material. When a car wheel becomes flattened it is only necessary to remove the old shoe, replace it with the wheel truing brake shoe, run the car, do the braking as usual (the shoe acting as a brake while in use), and in a few trips the wheel is as true as ever.

The company advises us that one pair of these shoes will true up from 8 to 16 pairs of wheels, the number depending upon the condition of the wheels and the care taken of the shoes. It is further claimed that if wheel truing shoes are kept on hand and used as soon as a small flat spot develops, the life of the wheels is greatly prolonged, because the tendency of flat spots to become larger is thus checked.

An attractive souvenir in the shape of a miniature shoe has been prepared by the company and will be mailed to interested parties on application.



The Joliet (Ill.) Railroad Co. and the Joliet & Chicago Rapid Transit Co. have been merged into one corporation to be called the Joliet & Chicago Railway Co.

## DECALCOMANIA TRANSFERS.

The use of "Decalcomania" transfers for lettering and ornamenting cars is quite extensive among American builders of street cars and the process is also used by a number of street railway companies in their own shops; among these latter are the Nashville Ry., the United Railways & Electric Co., of Baltimore; the Tacoma Railway & Power Co., the Elgin Electric Railway & Power Co.; the Ottawa Electric Railway & Power Co., and the Toronto Railway Co.

The process of making "Decalcomania" transfers is very interesting and notwithstanding that they were used in Germany on a commercial scale over 30 years ago there is but little literature on the subject in the English language. The most comprehensive article in English is that prepared for the Encyclopedia Britannica by Mr. George R. Meyercord, secretary and treasurer of the Meyercord Co., of Chicago, which has for eight years past been developing the process and now has the largest plant engaged in that work in this country.

The transfers may be used for decorating or lettering glass, wood, iron or other substances. In making those used for glass a paper coated with albumen is printed with several coats of varnish covering the entire surface to be transferred; on the varnish are printed the color coats and over all is a coat of sizing. On moistening the surface of the glass with water the sizing sticks to it and when the paper is removed the transfer is left fixed on the glass, the back being covered with varnish which protects the sign from injury when the glass is washed.

For transfers to be used on the outer surfaces of opaque bodies the design is of course inverted in printing. The colors are applied by lithographing.

The Meyercord Co. has prepared directions for applying the transfers, which are as follows:

Coat either the transfer or the article upon which the transfer is to be used with a thin coat of quick drying varnish sizing. This sizing should be the very best varnish obtainable, and should be very thin, so as to flow freely under the brush (when the varnish is too heavy, add enough turpentine to obtain the proper consistency). Great care should be taken to apply this varnish as thin and as uniformly as possible, as the thinner the varnish is applied, the smoother the transfer will lay. Allow the sizing to stand for 10 or 15 minutes until it becomes tacky; after which place the transfer in position, and rub down thoroughly with a damp—not wet—sponge, so as to force the transfer against the surface and remove the stiffness in the paper. Then add more water to the sponge, and apply to the paper; allow it to soak for a few minutes, after which the paper can be lifted, the ornament remaining on the object. Wash over the transfer gently with a soft, wet sponge to remove the chemical matter deposited by the paper, and then with another soft sponge saturated with kerosene, benzine or turpentine mixed with a small amount of water, wash over the transfer again to remove the surplus varnish. Then go over the transfer again immediately with a dry, soft cloth, so that none of the liquid used in cleaning away the varnish remains on the transfer. After this has been done the transfer is ready for a coat of flowing varnish to protect it against rubbing and scratching, although it is best to allow the transfer to stand for two or three hours so as to become perfectly dry before applying this varnish coating. In sizing your transfer it is not necessary to apply the sizing to the transfer only, as it will do no damage to let the varnish get over the edge of the transfer, as all the surplus varnish is removed at the time you clean the transfer with any of the liquids named above. Time can be saved by varnishing over the transfer, and the paper as well, with a wide brush. An important point to bear in mind is that all transfers when just completed, are fresh and delicate, and the colors at such times, not being thoroughly dry, are easily affected by the cleaning substance. The best remedy is to take as many transfers as are needed for immediate use, and place them between a newspaper or catalogue, in an oven or warm place where the heat is about 110° F., leaving them there for from twelve to twenty-four hours, at which time the oil in the colors will be thoroughly dry. Best results are obtained where a paper hanger's rubber seaming roller is used in rolling down the transfers, both before and after water is applied to the paper.

Mr. A. J. Townsend of Barbours O. has secured a franchise

## BOSTON TRANSIT COMMISSION.

The sixth annual report of the Boston Transit Commission for the year ending Aug. 15, 1900, has just been issued. Extracts from the report for the previous year were published in our issue for February, 1900, page 96, and in the article on the Boston Elevated Ry., March, 1900, page 121, we gave some further data on the Charlestown Bridge, built by the commission and formally opened Nov. 27, 1899.

The table shows a summary of the expenditures of the commission from the beginning of the work.

	From beginning of work to Aug. 15, 1899.	Aug. 15, 1899, to Aug. 15, 1900.	Total.
Subway—Subway Commission	\$14,131 16		\$14,131 16
Part of General Expenses	116,464 06	\$843 23	117,307 29
Engineering and Miscellaneous	401,552 06	4,700 41	406,252 47
Section One	240,594 76		240,594 76
Two	364,172 60	60	364,173 20
Three	307,910 63		307,910 63
Three and one-half	9,479 39		9,479 39
Four	475,987 07	123 24	476,110 31
Five	387,438 54		387,438 54
Six	327,047 11	504 50	327,551 61
Seven	235,662 59	823 80	236,486 39
Eight	100,008 69	7 10	100,065 79
Eight and one-half	77,464 64	2 40	77,467 04
Nine	309,673 13	216 89	309,890 02
Ten	256,686 19	672 70	257,358 89
Eleven	258,998 24	10,233 19	269,231 43
Interest	258,575 60		258,575 60
Total	\$4,141,896 46	\$18,128 06	\$4,160,024 52
Alterations—Part of General Expenses	\$13,366 61	\$8,906 26	\$22,272 87
Section Three	2,391 07	137 19	2,528 26
Four		163 42	163 42
Five	87 48	510 30	597 78
Seven	172,609 14	662 15	173,271 29
Nine	3 00		3 00
Ten	439 38	94 66	534 04
Interest	1,905 56		1,905 56
Total	\$190,802 24	\$10,474 18	\$201,276 42
East Boston Tunnel—Part of General Expenses	\$19,148 70	\$15,484 05	\$34,632 75
Engineering Expenses	30,614 79	18,354 22	48,969 01
Section A	855 14	28,899 04	29,754 18
B		732 08	732 08
Total	\$50,648 63	\$64,069 39	\$114,718 02
Bridge—Part of General Expenses	\$40,710 18	\$10,494 75	\$51,204 93
Engineering Expenses	1,054,568 28	347,510 83	1,402,079 11
Total	\$1,095,278 46	\$358,005 58	\$1,453,284 04
Grand Total	\$5,478,625 79	\$450,677 21	\$5,929,303 00

During the year work has progressed rapidly on the East Boston tunnel. The commission after carefully considering the relative costs of two tunnels of 16 ft. diameter and one tunnel 23 ft. wide decided in favor of the latter as being more conducive to the comfort of passengers, though somewhat more costly. In the preliminary plans for this tunnel the use of cast iron segments bolted together as used in the Blackwell tunnel and the London and Glasgow cable and electric railway tunnels, was contemplated, but the advance in the cost of iron led the engineers to consider concrete, and this material will be used to such extent as the conditions developed in building shall warrant.

Section A of the tunnel is in Maverick Sq. and Lewis St., East Boston. The structure is for two electric railway tracks and consists of 139 ft. of open incline and 680 ft. of wide arch subway. The side walls of the incline are of concrete faced with granite and surmounted by a granite coping. Granite also surrounds the portal. The covered portion of the section is a concrete monolith. Nuts and washers are imbedded in the masonry to admit of the use of steel tie-rods for increasing the strength of the roof if deemed desirable. This section is on a grade of 5 per cent and at the deep end the bottom of the masonry invert is 39 ft. below the surface of the street.





INCLINE AND PORTAL, EAST BOSTON TUNNEL.

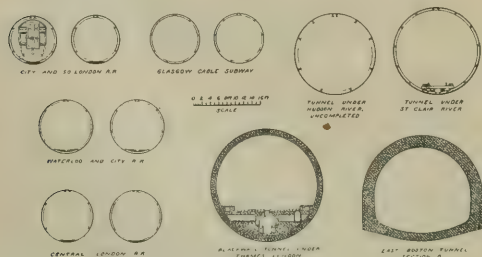
Work was begun May 5, 1900, and completed in the latter part of November.

Section B extends from the end of Section A in East Boston to a little beyond Prince St. in Boston, a distance of about 4,430 ft. Work was begun Aug. 13, 1900, and the section is to be completed June 15, 1903. The tunnel will be an arched structure for two electric railway tracks. The portion under the harbor will be about 20½ ft. high inside and about 23 ft. wide, and about 2,250 ft. long, and has walls of 33 in. and upwards in thickness. The tunnel on the East Boston side has grades of from 4.7 to 5 per cent and at a



CHARLESTOWN BRIDGE FROM CITY SQ., CHARLESTOWN.

point 250 ft. southwesterly from the Harbor Commissioner's line is about 100 ft. lower than in Maverick Sq. A length of about 1,350 ft. in mid harbor is nearly level. Grades of 5 per cent occur on the Boston side but are of short length owing to the intervention of the Commercial St. station. At this point the platform for west-bound cars is immediately above that for the east-bound, their depths below the street being respectively about 50 and 66½ ft. Pump wells and chambers under the harbor and ventilating chambers on each side of the harbor are included in the section. Ventilation of that portion of the tunnel under the harbor will be effected with the aid



RELATIVE SIZES OF VARIOUS TUNNELS.

of a segmental duct of about 45 sq. ft. cross section in the top of the tunnel. Near the middle of the harbor this duct will communicate with the tunnel below by a door. The shore ends of the duct will open into ventilating chambers through which the air can be drawn out.

The members of the Boston Transit Commission are: George G. Crocker, chairman; Charles H. Dalton, Thomas J. Gargan, George F. Swain, Horace G. Allen. Howard A. Carson is chief engineer and B. Leighton Bell, secretary.

### KANSAS CITY-ST. JOSEPH R. R.

Owing to the extremely fine weather which has prevailed thus far during the winter, the work upon the Kansas City & St. Joseph Electric R. R., mentioned in our issue for January, page 55, has progressed very rapidly. The engineers in charge are from the Osborn Engineering Co., of Cleveland, O., and have had a wide experience in interurban work; their views of this enterprise are very flattering.

According to the engineers' survey the maximum grade will be about 1½ per cent. Heavy steel rail construction will be used, alternating direct current system and a portion of the way will probably be double tracked. Plans and specifications for work, such as required by contractors, etc., will be ready for examination at the company's office in Kansas City in the near future.

It is very gratifying for the "Review" to note the rapid development in interurban work, and still more gratifying to know the permanency of the investments in this direction. Almost without a single exception, interurban lines are proving a better financial investment in many ways than any others offered to the public at this time.

The Kansas City & St. Joseph road will traverse a very fertile part of northwest Missouri and have a large territory exclusively to itself, thus being assured of a paying traffic from the start. The cities and towns on the route which include Parkville, Platte City, Dearborn and Faucett as well as the terminals, Kansas City and St. Joseph, are to be congratulated upon the enterprise.

### MOTORMEN AS QUARANTINE OFFICERS.

As a result of the recent smallpox scare, a number of cities and towns, particularly in the South, have been placed under quarantine and intercommunication has been more or less interrupted.

The mayor of Huntsville, Ala., met the situation by appointing all motormen on city and suburban lines as quarantine officers, and persons coming from adjacent infected districts are required to show a health certificate before being allowed to enter the city.

### FRIENDS, NOT ENEMIES.

In his presidential address at the ninth annual meeting of the Northwestern Electrical Association, held in Milwaukee, January 16th to 18th, President Pliny Norcross, speaking of the misunderstandings often existing between municipalities and electric lighting corporations, said: "I sincerely believe that all unpleasant conditions could be very much improved, if the state and municipality would adopt a new method of procedure. Instead of treating us as enemies to the public welfare, we should be treated as men who are engaged in the laudable effort of endeavoring to promote and enlarge one of the most useful industries known in the history of civilization." The remark applies with equal force to street railway companies.

### PROPOSED INTERURBAN.

The Rochester & Eastern Rapid Railway Co., which was recently incorporated with a capital stock of \$500,000, proposes to build a 45-mile electric line from Rochester to Geneva, with a branch from Pittsford to Fairport. The principal offices of the company will be located at Canandaigua. Capitalists of Detroit, Mich., are largely interested. The board of directors comprises: Albert E. F. White, John Winter, A. Dinsley Parker, Frank C. Andrews and Oliver H. Law, of Detroit; Eugene H. Satterlee, of Pittsford; Oscar N. Crane, of Canandaigua; Spencer F. Lincoln, of Naples, and John F. White, of Buffalo.

## SNOW FENCES FOR ELECTRIC RAILWAYS.

A number of roads with long stretches of exposed track have tried with good results, the plan of placing board fences along the right of way, particularly at cuts, to prevent the formation of snow drifts on the tracks. The fences are generally built in self-supporting sections from 12 to 16 ft. long, which may be readily taken down in the spring and stored. The distance the sections are placed from the roadbed is usually about 60 ft. but varies from 75 ft. down to a few yards depending upon the topography and the space available.

In the "Review" for Jan. 15, 1900, page 48, was presented a description of several methods of preventing the formation of drifts and we give herewith several methods that are being used this year.

The Twin City Rapid Transit Co. protects its interurban line between Minneapolis and St. Paul by means of fences constructed as shown in Fig. 1. Each section is 16 ft. long, made up of seven

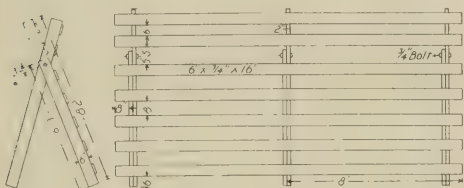


FIG. 1—SNOW FENCE—TWIN CITY RAPID TRANSIT CO.

6 x 3/4 in. boards, nailed or bolted at the center and 8 in. from each end, to scissor-like supporting pieces, the two members of which are held together by a bolt, 6 ft. from the ground, the bolt acting as a pivot. The shorter piece, which is 6 ft. 3 in. high, carries five of the cross boards, and the longer one which is 8 ft. 2 in. high supports the two upper boards. When the sections are placed in position the supporting pieces are spread apart at the base throwing the top cross planks forward, it having been found that the fence catches and holds the drifting snow better with the upper pieces in this position than when all the boards are in the same plane.

Mr. W. J. Hield, general manager of the Twin City company, writes that the sections are usually placed from 50 to 75 ft. away

between. The sections are made by nailing 5 ft. boards of various widths to two cross pieces as shown in Fig. 3, leaving 5 in. of the cross pieces projecting at each end, and every section is hung upon two A-shaped supports (see Fig. 2). The two sides of the supports are 2 x 4-in. pieces, 5 ft. 2 in. long, held together by a 2 x 6-in. cross piece near the bottom and a 2 x 4-in. piece near the top as shown, the total width of the support at the base being 5 ft. The upper ends of the sides are mortised out and the lower cross member is notched at the center to receive the projections on the fence



FIG. 4.

sections. Fig. 4 shows a stretch of fence in place. Mr. Rice states that the picture was taken at the worst spot on the line, but since the fence has been erected the company has had no trouble whatsoever from drifting snow.

The Lynn & Boston Railroad Co. uses a fence which is built of boards 1 in. thick, 6 in. wide, and 16 ft. long, placed one above the other to the height of 4 ft. making a four rail fence. The boards may be nailed to the side of A shaped end pieces or supported in any other way practicable. Mr. E. C. Foster, general manager of the road, writes that the sections are placed about 60 ft. from the track in places where there is no fence or wall alongside the street. Where there is a fence or wall the snow fence is placed 20 ft. beyond.

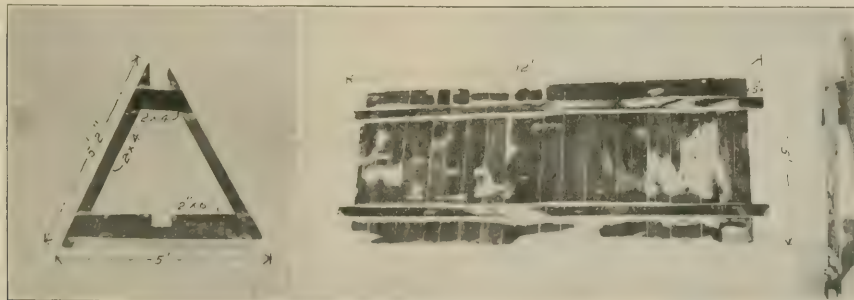


FIG. 2—SNOW FENCE ON BANGOR (ME.) ORONO & OLDTOWN RY. FIG. 3.

from the tracks, the distance depending on local conditions. There are instances where the company would prefer to have them farther away, but for different reasons is unable to do so.

Mr. W. G. Rice, superintendent of the Bangor (Me.) Orono & Oldtown Ry., has sent us photographs which are reproduced in Figs. 2, 3 and 4, showing a snow fence that is used at four different places on his road, the longest single stretch erected being 110 ft. in length.

The individual sections are 12 ft. long, and contrary to the more general practice are constructed to present a solid front to the wind and snow, instead of being built up of cross boards with spaces

## SOUTHERN OHIO IN CINCINNATI.

The Southern Ohio Traction Co. has for some time been negotiating with the Cincinnati Street Ry. to secure a route that would give the interurban line a terminus at Fountain Sq. The Southern Ohio owns a franchise for about 4,000 ft. of track in College Hill and the proposition of the Cincinnati railway is that in return for this franchise it will build cars of its standard pattern, to be painted and lettered as the Southern Ohio shall desire, which it will operate between College Hill and Fountain Sq. by the shortest route. The Southern Ohio would prefer to bring its own cars into the city.

### PHOTOGRAPHS BY ELECTRIC HEADLIGHTS.

The charge is often brought against Americans that they turn night into day. The accompanying views show one way by which they do it. The illustrations were reproduced without retouching



FIG. 2 TAKEN BY LIGHT OF CROUSE-HINDS HEADLIGHT, SANDUSKY, O.

of any kind, direct from photographs taken at night by the light from an electric headlight.

In Fig. 1 is a view obtained along the line of the Southern Ohio Traction Co., of Hamilton, O., by the reflection from a Wagenhals



FIG. 1—SOUTHERN OHIO TRACTION CO.—WAGENHALS HEADLIGHT

arc headlight, attached to a car standing at the foot of a 4-per cent grade. At the top of the hill was a long-radius curve. Mr. Wagenhals writes that with the car in this position objects on the track could be plainly seen over 2,200 ft. away, although the distance from

the car to the beginning of the curve was but 1,800 ft., showing the wide range of the light. At a distance of 3,500 ft. from the lamp the illumination was sufficient to enable one to read a newspaper without difficulty.

For the photograph reproduced in Fig. 2 we are indebted to Mr. J. Percy Clifton, superintendent of the People's Electric Ry., of Sandusky, O., who writes that the picture was taken by the reflection of a Crouse-Hinds electric headlight, shining on a double deck car 40 ft. away. The plate was exposed 35 minutes.

The third picture was sent us by Mr. C. F. Goodrich, superintendent of the Fox River Electric Railway & Power Co., of Green



FIG. 3—FOX RIVER ELECTRIC RY. NIGHT PHOTOGRAPH, CROUSE-HINDS ELECTRIC HEADLIGHT.

Bay, Wis., who states it was obtained after one hour's exposure from the front platform of a car fitted with Crouse-Hinds headlight.

### ELECTRIC RAILWAY VS. CANAL.

It has been suggested that instead of spending \$65,000,000 on a barge or ship-canal from Buffalo to the Hudson River, the state of New York draw the water from the Erie Canal, and build upon the canal bed a double track electric freight railway, to be operated for the greater part of its length by power developed from water falls at Niagara Falls, Lockport, Rochester, Rome, Little Falls, and Mohawk, the electrical transmission not to exceed 50 miles in any one case.

According to carefully prepared estimates such a road would cost no more to maintain than has the Erie Canal; the running time between Buffalo and New York could be reduced anywhere from 50 to 75 per cent; and freight could be moved between the two cities for less than \$1.00 per ton, with proportionately low local rates.

### PRIZES AWARDED EMPLOYEES.

In accordance with its annual custom, on January 15th, the Cincinnati, Newport & Covington Street Railway Co. awarded prizes to the motormen having met with the fewest accidents and the conductors who had kept the cleanest cars during the year. The prizes were divided into four classes, of \$25, \$15, \$10 and \$5 respectively. The first prize was awarded to nine motormen and the second to seven motormen and one conductor; the third prize, to three motormen and eleven conductors, and the fourth to three motormen and seven conductors. Forty-one prizes were thus given, aggregating \$535.



## NOTES ON PILE DRIVING.

Read by James C. Haugh before the Louisiana Engineering Society, and published in the Journal of the Association of Engineering Societies.

The most satisfactory and reliable pile-driving is where the piles are driven a sufficient depth through a material readily penetrated by the piles and overlying rock or other impenetrable material on which the points of the piles may rest. The sustaining power of the piles is then equal to the strength of the material of the piles.

Piles driven as in Fig. 1 would, according to formulas in common use, support the load of trains and locomotives. The penetration of these piles, driven into quicksand, is little or nothing for a number of blows of a 2,200-lb. pile hammer dropped 15 to 20 ft., yet, the result, after trains began running over such pile bents, was a constant settlement of the piles, doubtless caused by the weight of trains and the vibratory motion given to the piles. Had the material overlying the quicksand been of greater depth and firmer, the vibratory motion might not have been communicated to point of piles and settlement would not have occurred.

Fig. 2 shows the conditions for pile-driving in a "pile trestle crossing" on Lake Pontchartrain. The lengths of the piles varied in different portions of the 6-mile trestle, from 45 to 70 ft. Piles showed considerable variation in the material in which they were

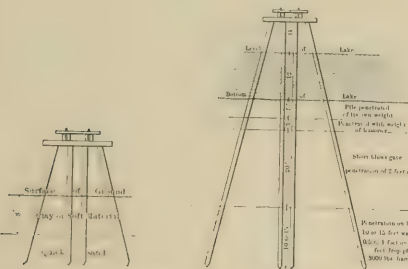


FIG. 1. PILES DRIVEN IN QUICKSAND. FIG. 2. PILES IN LAKE PONTCHARTRAIN.

driven. The shorter lengths were driven into a hard clay, and the longer lengths through material as shown in Fig. 2. The longer lengths gave a very uniformly soft penetration, and for a number of blows the penetration was as great as 1 ft. for a 10 to 15-ft. drop of a 3,000-lb. hammer run by a friction driver and hitting short blows very quickly.

In driving these piles it was observed that if the pile giving this penetration was allowed to stand for a few hours, owing to break-downs or other causes, it required several blows to start it, but after it was started the same penetration resulted as before the stoppage. The quick blows doubtless caused the material through which piles were driven to be displaced, and a cessation of driving allowed the material to resume its normal condition, with the resulting friction around the piles. Although the trestle has been in use for over 15 years, none of the piles have settled.

Test showed that the pile hammer could be so freely dropped as to give eight or nine-tenths of the same penetration as when the line was cut and hammer dropped free of line from a 40-ft. height.

The condition of creosoted longleaf yellow pine piles and creosoted square timber, both of the best quality and close grained, used in the construction of trestle in the lakes and coast water of Louisiana and Mississippi, shows that the lasting quality of the timber is very greatly increased by creosoting, creosoted piles and timber being now sound after 18 or 20 years' service. The piles used are round piles, barked and peeled, and having from 1½ to 2½ in. of sap wood and about 12 in. of heart diameter at the large end. The square timber should preferably have sap angles and surfaces, but larger oil absorption, thus more effectually protecting the heart wood from decay.

In discussing Mr. Haugh's paper Mr. J. W. Hazellmont gave the results of his experience with foundation work where the bearing value of the pile was determined entirely from the frictional resistance between the soil and the sides of the pile. One hundred piles, having 12 in. diameter heads, were driven to a depth of 60 ft. The

individual piles of this cluster were spaced 2 ft. from centers, both longitudinally and laterally. In computing the theoretical ultimate bearing value of each pile the frictional resistance was assumed at one-half ton per lineal foot of timber, reduced by a factor of safety of 5, which gave as the safe theoretical bearing of the cluster 600 tons, or a resistance equal to the weight applied. So far as has been observed, no settlement or other distortion has taken place. The individual bearing value, 6 tons, assumed for each of these piles is approximately the same as would have been obtained from the Rankine formula, where the safe bearing value is equal to the area of the head in inches multiplied by 200. This formula is believed to give very nearly the true bearing value of piling which has no firm underlying stratum to rest upon.

Mr. W. B. Wright also discussed the paper at length, and we take the following extracts from his remarks:

Usually at a bridge site, at every 10 ft., a ½-in. sounding rod was sunk into the ground as far as two or three men could force it. Then piles were biled to extend 10 to 14 ft. deeper, and 2 ft. above cut-off was allowed for brooming. Piles biled in this manner rarely went below the calculated depth, and usually gave some waste. I remember well, however, one bridge site where the sounding rod discovered 5 ft. of gravel with hard bottom, but the pile driver discovered 6 ft. of gravel with a soft stratum below. In this case short piles 10 to 15 ft. long, with square points, were driven and doweled, and the regularly biled piles were driven on top, giving invariably good results.

The sounding rod would not always give satisfaction. Among other deep swamps, I remember one which allowed piles to go 150 ft. without reaching bottom. Such swamps will not bear a high embankment, but can often be crossed on corduroy composed of trees laid with tops lapping on the center line, on which a light embankment is built. This structure quakes when the train passes over, but gives the best of results in maintenance of way and ease on trains. Sometimes an ordinary bank across a swamp will stand a long time without settling, or will at last seem to stop settling; but I know of one instance where a 6-ft. bank that had stood for 30 years suddenly sank out of sight two minutes after the passage of a passenger train. Piling in this bank, although not giving perfect support, would probably have prevented this accident.

Piles driven in frosty ground, where frost has to be cut out before driving, should have the holes made of sufficient size to give some latitude for straightening up, or they may be driven badly and be hard to spring into place, and may throw the bridge out of line in the spring when the frost goes out of the ground. One must be careful in standing near piles driven in frosty weather. I once saw a splinter 6 ft. long split off by the blow of the hammer just graze a man's back and bury itself in the frozen ground, whence it could not be removed. If the contractor fails to properly spring in piles, cap-drift bolts may be sawed off and piles properly resprung.

I have seen cases where an iron shoe, cast with a wrought iron dowl, enabled piles to be driven where otherwise penetration was impossible.

Piles are not usually driven much closer together than 3 ft. centers, for when they are driven closer it is not probable that they will sustain much more, for the whole inclosed space then tends to sink as a solid mass.

In driving test piles (on the drainage work in New Orleans) two of them refused to penetrate the first stratum, 600 blows of the hammer seeming to have no effect. I had just read in an engineering paper that piles driven in sand to refusal, if allowed to rest, after dispersal of strains at the point, could be driven further down. It was decided to leave these two piles 20 ft. above the ground. Redriven the next day, after about 60 blows to remove friction, they started and went down with unexpected ease.

The system of massing piles under heavy weights was preferred in foundations to that of spacing them uniformly over the whole area, even if the concrete base on strong grillage should act as a monolith. Some engineers prefer to drive all piles to a uniform resistance, decided upon beforehand, no matter at what depth it is encountered, but we drove to the greatest resistance we could get, depending on the average for good results. When foundations are large and act as a monolith, this would seem to be the better rule. Theoretically, if pile-driving over portions of a large foundation became harder, it would be economical to calculate on greater sustaining power and omit a portion of the piling.

The steam hammer, with its low fall and rapid blows, is much to

be preferred to the drop hammer, which gives rest between blows and tends to mash the heads. The steam hammer was required on the drainage work, and those used weighed about 9,000 lb., the hammer proper weighing 4,500 lb. The drop measured  $3\frac{1}{2}$  ft. It was calculated not to make any pile bear more than 10 tons, and a resistance more than sufficient to support that amount safely was always obtained from average results.

### RAILWAY FIRE TRUCK AT PEORIA.

The council of Peoria, Ill., has under consideration a novel plan for fighting fires, the idea being to place upon a railroad flat car, which is to be hauled as a trailer over street railway or steam railroad tracks, reels of hose, extension ladders and an ordinary fire engine, thus combining upon one vehicle all the fire-fighting apparatus usually carried on a hose cart, the hook and ladder truck and the steamer.

The fire engine is to be loaded upon the car by means of an adjustable inclined plane at one end, and after proceeding over the tracks to the nearest point to the fire, if necessary the engine may be taken from the car and drawn by hand to an advantageous position from which to fight the flames. If deemed desirable, a stationary boiler and pump, taking the place of the wheeled steamer, may be mounted permanently upon the flat car, in which case lines of hose can be laid to the necessary points.

In addition to the pumping apparatus the car is to carry a reel of hose containing 3,000 ft.; two chemical cylinders and 1,500 ft.



KASJENS FIRE TRUCK.

of chemical hose for use at small fires; a large tool box underneath the car floor for axes, sledges, ropes, nets, etc.; a medicine chest for administering aid to the injured; one or two extension ladders and a permanently mounted "turret" nozzle for service when the fire is adjacent to the tracks. This turret nozzle is fastened to the floor near one side of the car, and is controlled by means of two hand wheels, with which one man can easily throw in any desired direction a stream of water issuing from the nozzle under 350 lb. pressure. The ordinary nozzle at the end of a hose, with this pressure, would require the combined efforts of four men to control it. Couplings are provided at the side of the car for attaching lines of hose, and connection from the steamer or pump to these and to the turret nozzle is made by piping under the car floor. Water may be taken from river, well or fire plug.

This railway fire truck is the suggestion of Alderman J. G. Kasjens, of Peoria, to whom we are indebted for the description. Mr. Kasjens believes that in addition to being a valuable adjunct to a city fire department, a car equipped in this way can be used to great advantage by street railway and steam railroad companies, primarily for protecting their own buildings and property, and he suggests that the car ought to be kept near a junction

where the greatest number of companies or divisions could have readiest access to it. Another possible use that presents itself is in connection with interurban electric roads, as a number of small towns along the route might unite in supporting one efficiently manned fire car, which would be kept at a convenient point, and on receipt of a telephone or other message could be instantly attached to a motor car and drawn with but little loss of time to the place where it was needed.

### FILING CATALOGS AND CIRCULARS.

For the convenience of the manager, heads of departments and the purchasing agent, all circulars, catalogs and price-lists received at the office of the Union Traction Co., of Philadelphia, from street railway supply dealers, are carefully preserved and filed for future reference, a large wooden bookcase with swinging glass doors being used for this purpose. The shelves are placed in the case at varying distances apart to accommodate catalogs of different sizes, and the spaces between the shelves are divided by thin upright partitions into pigeon-holes varying in width from 3 to 6 in., each compartment holding from three to ten or more pamphlets, this arrangement giving facilities for keeping in accessible shape, catalogs ranging from vest-pocket editions to the largest sizes used. Each pigeon-hole is numbered, and catalogs are filed according to size, regardless of the nature of their contents, and all catalogs in a compartment have written upon them the corresponding number. Two card indices are kept, one of firm names arranged alphabetically, and the other of subjects. When it is desired to refer to a particular catalog it is of course necessary, after finding the compartment number from the index, to take down the books filed under that number and look through them for the required pamphlet or book; but this is a simple matter, as the number of catalogs in any one compartment is not large.

### FINE COLOR PICTURES.

The colored landscape in our 10th anniversary number has called out a number of requests for the address of the producer of the picture and we have pleasure in saying the work was done by the American Three-Color Co., Chicago, whose plant is the largest in this country. The company also operates a large plant in New York City. The excellence of its work, which is of the highest character, has secured large orders from England and the continent. By its process any scene or object is reproduced, including all the shades and colors of the original.

In this connection we are glad also to call attention to the excellent quality of the "Review" illustrations which have been made for the past 10 years by the Columbian Engraving Co., of Chicago. This magazine was the first magazine of this company at a time when half-tone engraving was in its early stages. We perhaps can offer no better recognition of its good work than that expressed in a patronage extending over a decade and demanding the best possible production that the engraving art can furnish.

### NEED FOR SCHOOL RATES.

There is now a proposition before the board of supervisors of San Francisco for reducing the street railway fares for school children under 18 years of age. At a meeting of the Municipal League, Mr. E. P. Vining, general manager of the Market Street Ry., spoke on the subject, saying in part:

"I do not believe that the real need is for reduction of fares for school children. They represent, so to speak, a leisure class who have time to walk. In a general way it is also true that a family which is in sufficiently easy circumstances to send its children to school is in a position to pay full fare for them whenever it is necessary to do so by reason of the location of the schools. The last speaker is right in saying that the first reduction should be for workmen, who would thus be enabled to live farther out from the crowded centers than is now possible."

The United Traction Co., of Albany, N. Y., has ordered that all its employees be vaccinated.

## SELF-CHECKING FARE REGISTER.

In the days when the horse and mule constituted the chief motive power for city transportation lines, the collection of fares was not a very complicated detail of the street railway business. The passengers usually deposited their nickels in the ever present "fare box," and all the instructions necessary to employees were, for the driver to keep an eye on the occupants of the car, and to rattle the little sliding "change" door suggestively, if the desired nickel was not forthcoming. At the end of the day the cashiers emptied the box and entered the amount in a blank book. With the advent of electric traction, and particularly of electric suburban and interurban lines, with their graduated fares and complicated trans-

ferred in its supporting brackets, and to ring up any denomination of fare, the rod must be turned to a particular position, the proper position being indicated by means of a pointer attached to the rod, and moving over a dial which bears designating figures. Several dials are placed along the rod, enabling the conductors to register fares from any part of the car, and also affording passengers an opportunity to see that their fares are properly recorded. As additional evidence the kind of fare rung up is indicated by figures on the face of the register each time the cord is pulled. If the rope is not pulled hard enough, or the recording mechanism fails to work, the words "Not Registered" appear. As an aid to inspectors, an indicator at the top gives the number of passengers that have been carried on the trip.



FIG. 1 OHMER REGISTER IN PLACE.

fer systems, this matter of properly collecting and checking fares has come to be an important, and in some respects a troublesome problem.

To relieve conductors of the clerical work incident to making out daily reports; to provide accurate and convenient means for registering fares of different grades and denominations; and to prevent mistakes due to not registering the fares at the time when they are collected, the Ohmer Car Register Co., of Dayton, O.,

The conductors make no report of tickets or money received. The register automatically keeps this record on a printed sheet, as shown in Fig. 2. This record gives the register reading at the end of each trip for the different classes of fares, and it can be removed from the machine, only by an authorized person, who must have a special key. The column at the left indicates the trip number. To determine totals, the last number in each column is deducted from the top number of the same column, and the difference represents the fares registered in each class.

In Fig. 3 is reproduced the only report the conductor is required to make. This involves no labor save the making of two

5 Cent.	Tickets	Transfer	15 Cent.	10 Cent.	3 Cent.	
11 2578	1672	1975	1751	2520	3204	OCT 8
11 2578	1672	1975	1751	2520	3204	OCT 8
10 2539	1651	1948	1725	2507	3178	OCT 8
9 2497	1627	1932	1710	2495	3172	OCT 8
8 2462	1589	1903	1687	2486	3164	OCT 8
7 2440	1572	1887	1676	2475	3156	OCT 8
6 2412	1550	1874	1671	2464	3149	OCT 8
5 2404	1543	1868	1666	2461	3147	OCT 8
4 2374	1513	1853	1656	2453	3142	OCT 8
3 2354	1498	1841	1650	2447	3136	OCT 8
2 2334	1478	1831	1640	2442	3131	OCT 8
1 2309	1453	1816	1625	2432	3121	OCT 8
1 2309	1453	1816	1625	2432	3121	OCT 8
269 219 1347-58 890-158 810-109 299-34 \$43.67						

FIG. 2 RECORD PRINTED BY REGISTER.

has perfected a recording register, which gives at the end of the day, a printed slip showing the total number of passengers carried on each trip, and the number of each kind of fares collected, whether ticket, transfer, 5-cent, 10-cent, 15-cent, or other denomination. The machine is practically automatic in its action. It is hung in one end of the car as shown in Fig. 1, and registration is made by means of a rod and cord running the length of the car. The kind of fare to be rung up is regulated by the rod, and the actual registration is made by pulling the cord. The rod at frequent intervals has projecting handles by which it may be re-

REGISTER & SUBURBAN R. CO.  
 Conductor's Report  
 Car No. 7  
 Date Oct 6  
 Conductor G. Smith  
 Remarks  
 Trip No. 1  
 Trip No. 2  
 Trip No. 3  
 Trip No. 4  
 Trip No. 5  
 Trip No. 6  
 Trip No. 7  
 Trip No. 8  
 Trip No. 9  
 Trip No. 10  
 Trip No. 11  
 Trip No. 12  
 Trip No. 13  
 Trip No. 14  
 Trip No. 15  
 Trip No. 16  
 Trip No. 17  
 Trip No. 18  
 Trip No. 19  
 Trip No. 20  
 Trip No. 21  
 Trip No. 22  
 Trip No. 23  
 Trip No. 24  
 Trip No. 25  
 Trip No. 26  
 Trip No. 27  
 Trip No. 28  
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 Trip No. 53  
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 Trip No. 87  
 Trip No. 88  
 Trip No. 89  
 Trip No. 90  
 Trip No. 91  
 Trip No. 92  
 Trip No. 93  
 Trip No. 94  
 Trip No. 95  
 Trip No. 96  
 Trip No. 97  
 Trip No. 98  
 Trip No. 99  
 Trip No. 100

FIG. 3 CONDUCTOR'S REPORT.

punch marks to indicate number of trips made. The sample given herewith records that Conductor G. Smith, on October 6th, took out car No. 7 at the beginning of trip No. 1, and was relieved at the beginning of trip No. 6, the mark in the "relief" column being the punch of the relieving conductor.

## THE "DAYTON PLAN" IN COLUMBUS.

An arrangement has been effected whereby four interurban companies, the Columbus, Winchester & Lancaster Traction; the Worthington, Clintonville & Columbus Street Railway; the Columbus & Lancaster Traction; and the Columbus, New Albany & Johnstown Traction Cos., will run cars into the city of Columbus over the tracks of the Columbus Railway Co., under the Dayton plan. The terms provide that the interurban companies shall pay 3 cents for each passenger carried within the city limits over the tracks of the Columbus company.



### WELL-KNOWN ELECTRICAL REPAIR AND SUPPLY HOUSE.

The large business now carried on by the Frank Ridlon Co., of Boston, is largely the result of the ingenuity and business sagacity of one man, Mr. Frank Ridlon, whose name is associated with the growth of both the electric lighting and the electric railway industries, particularly in New England and the Eastern States. The business is unique in many respects. In 1891 Mr. Ridlon, who as a representative of the Brush company, had for several years prior to this time, been engaged in installing electric-lighting

ing: Gears, pinions and trolleys made by the R. D. Nuttall Co., of Pittsburg; registers of the International Register Co., of Chicago; drop-forged segments of the Van Wagoner & Williams Hardware Co., of Cleveland; supplies of the Electric Railway Equipment Co., of Cincinnati; the Protected Rail Bond Co., of Philadelphia; the Chicago Mica Co., of Valparaiso, Ind.; the Speer Carbon Co., of St. Mary's, Pa.; the American Electric Heating Corporation, of Cambridgeport, Mass.; the Garton-Daniels Co., of Keokuk, Ia.; and the Steel Hollowware Co., of Pittsburg; the Wilson trolley pole catcher; and the Kilbourn track-sanding device.

The repair shop is probably the largest of its kind in New



ARMATURE WINDING ROOM—FRANK RIDLON CO.

machinery in the East, conceived the idea that the rapid developments which were even then being made in electrical research would soon make possible the establishment of a business devoted to the buying and selling of slightly worn electrical machinery, discarded for larger units, or made obsolete by improved designs. He accordingly took advantage of an opportunity that soon after presented itself and purchased a small repair shop in Boston, where he at once set about buying all the second-hand generators and motors he could secure, making such repairs as were necessary and selling them again at prices that created a ready demand.

The business grew at a rapid rate and in 1894, Mr. Ridlon as-

England, and is fitted with modern devices and appliances for winding and repairing armatures, turning up armature shafts, assembling commutators, baking coils and armatures and testing all this work when it is completed.

The present officers of the company are: President, Frank Ridlon; vice-president, Charles N. Wood, who is one of the best-known supply dealers in New England; treasurer, E. W. Kellogg. The general offices are at 200 Summer St., Boston, and the factory and storerooms are at 251 A St., South Boston.

### OTTAWA ELECTRIC RY. IN 1900.

President Ahearn, of the Ottawa (Can.) Electric Railway Co., submitted his report for the year ending Dec. 31, 1900, at the annual meeting of the stockholders held Jan. 28, 1901. The gross receipts were \$315,022, a gain of \$51,477 over 1899; total expenses, \$213,906, an increase of \$35,541; net earnings, \$101,117, an increase of \$15,937. During the year four dividends of 2 per cent each were paid on the capital stock of \$814,800, \$18,000 carried to the contingent fund and \$17,933 added to the surplus. The number of passengers carried was 7,094,656 as against 5,833,829 in 1899.

In April last the company had one of its power houses destroyed by the fire which swept over Ottawa and Hull; the insurance was sufficient to replace the power station and the damage to the overhead work, track and bridges was provided for out of the contingent fund.

An extension to Britannia-in-the-Bay was opened May 24th and during the summer and fall did a heavy business. In September a line was opened from Rockcliffe to the new rifle range of the Dominion Rifle Association, about two miles; the Association furnished the rails, ties and free right of way as an inducement for the company to build.

The Porto Rico-American Co., of New York and Porto Rico, has secured from the executive council of Porto Rico a 99-year franchise to connect the principal points on the island by a system of electric railways.

An extensive illustrated description of the New Jersey & Hudson River Ry. appeared in a recent issue of the Englewood Press, a local weekly published at Englewood, N. J., the principal town on the route. This is good matter for the paper and good advertising for the road. The New Jersey & Hudson River system was fully described in the "Review" for last December, page 700.



STORE ROOM.

sociated with himself Mr. Edmund W. Kellogg, and a stock company was organized, known as the Frank Ridlon Co., under which title the business is still carried on. Mr. Kellogg had been connected with the Thomson-Houston Co. as engineer and salesman and brought with him a wide acquaintance and a rich fund of experience. From this time the scope of the company's activity has been gradually enlarged and in addition to dealing in second-hand machinery it now makes electrical repairs of every description for electric light and street railway companies, and also acts as territorial agent for a number of specialties, including the follow-

### FOREIGN FACTS.

Proposals for building tramways at Smethwick, Eng., have been accepted.

Several electric lines are to be built by the municipality of Philippopolis, Roumania.

Horse trams at Dunkerque, Nord, France, are to be replaced by electric motor cars.

The steam line between the depot at Sedgley and Wolverhampton, Eng., is to be electrically equipped.

Tenders are invited by the Brighton (Eng.) Town Council for supplying materials for new electric tramways.

The Portsmouth (Eng.) Corporation is awarding contracts for the construction of its electric tramway system.

For the half year ending Sept. 29, 1900, the Sheffield (Eng.) City Tramways earned a net profit of £12,562.

Pietermaritzburg, South Africa, is to build an electric tramway to be owned and operated by the municipality.

According to consular reports there are now 40 cars running on the electric tramway in Madras, India. The line is 10 miles long.

Switzerland is to have another mountain electric railway. The line will be built to the top of the Santis and will reach an elevation of 8,562 ft.

The street railway company at Leon, Guanajuato, Mexico, derives considerable revenue by running freight cars to and from the tanneries near the city.

In spite of rumors to the contrary it is officially stated that work on the Jungfrau Ry. has not been abandoned, but goes on without serious interruption.

Societe Anonyme d' Enterprise de Travaux, Liege, Belgium, is the title of a company that proposes to build an electric tramway from Barcelona (Spain) to San Andes.

Ploeshili, a little town to the north of Bucharest, Roumania, does not intend to be left behind in the march of progress and has granted concessions for electric trams.

Both Norway and Sweden are awakening to the possibilities that lie in the development of their numerous waterfalls as sources of power from which to operate electric tramways.

The River Plate Electric Light & Traction Co., of Rosario, Argentina, S. A., has prepared plans for new electric railway lines and will require machinery, tools and other material.

A concession for an electric tramway between Boisguillaume and Rouen (department of the Seine Inferieure, France) has been made to the Compagnie Generale de Traction, Rouen.

A sub-committee of the Leicester (Eng.) Common Council has recommended that the council reconstruct the existing tramway system and build 20 miles of new overhead trolley lines.

Guadalajara, Mexico, is to have its antiquated horse railway made over into a brand new electric road with American apparatus throughout. Power will be derived from the River Santiago.

The municipality of Kertch, Yenikalae, Russia, is disposed to grant a concession for an electric tramway. Further particulars may be obtained on application to the Azov Don Bank, Kertch.

Electric trams are under construction in Palermo, on the island of Sicily. The existing horse lines are being electrified and a

new line from La Rocca to Monreale is being built for carrying the numerous tourists and visitors to the magnificent Monreale cathedral.

Over £120,000 is to be expended in building an electric railway with overhead trolley system between Bistagno (Italy) and Cortemilia Salicato. The city engineer of Rome, Victorio Rivetta, has charge of the project.

The Street Railway Accountants' Association of America has received communications from the Dublin (Ireland) United Tramway Co. looking to the adoption of a standard system of accounts by a number of English tramways.

Fares on the Madras (India) Electric Tramways have been reduced to a quarter anna, equivalent to less than one-half cent gold. A more frequent service has also been instituted and cars will run on 7½ minutes headway during the day.

A portion of Volk's electric railway at Brighton, Eng., is to be removed, as the borough desires to make improvements along the beach. This is the road having its rails entirely under water and the cars supported above the water on trestle work.

It is said that a windmill has been successfully used for driving a dynamo, by Herr C. P. Neumann, of Wittkiel, a German village near Hamburg. The sail wheel is 39 ft. in diameter and has 326 sq. ft. of wind surface. The dynamo charges a battery of accumulators.

Two engineers, Ferrara and Guerra, of No. 2, Vicolette Berio, Naples, have prepared plans for the construction of an electric railway from Naples to Rome, Italy, a distance of 133 miles. The German consul at Naples reports there is every probability that the road will be built.

The German Post Office officials have determined that where a copper guard wire is suspended above the trolley wire to catch broken telephone or telegraph wires, better results are secured by connecting the guard wire directly to the rails rather than to the poles or an earth plate.

According to a report made by Mr. Hamilton King, consul-general at Bangkok, Siam, a concession for five miles of new electric trams in Bangkok has been granted to Mr. A. Westenholz, of that city. Mr. Westenholz has succeeded in consolidating the present street railway company owning six miles of track, and the electric light company. The two properties will hereafter be operated under the name of the Siam Electricity Co., Ltd. The capital is \$500,000 gold.

Boma, the capital city of the Congo Free State, has a unique railway service, says the New York Sun. Cars, drawn by small steam engines, run at frequent intervals through the busy streets, carrying merchandise between the stores and the freight wharves, and four times a day a passenger car is operated over the line. No charge whatever is made for the transportation of passengers, who put up with this somewhat irregular service for the sake of its unparalleled cheapness.

At the session of the budget committee of the Prussian Diet, in Berlin, January 30th, the statement was made that 2,652 accidents had occurred in the streets of Berlin, during 1900, and it was contended that the dangers of the thoroughfares were largely increased by electric cars. Baron Rheinbaben, Prussian Minister of the Interior, and Herr von Thielen, Prussian Minister of Public Works, are engaged with experiments in the use of fenders, with a view to lessening the danger.

The city council of Amsterdam has voted 6,000,000 guilders (\$2,412,000) for an electric plant, which is to furnish power for street cars, lighting and manufacturing purposes. Mr. Frank D. Hill, United States consul at Amsterdam, reports that prospects seem fair for at least part of the orders for supplies required coming to American dealers, and he advises that every effort be made to secure the contracts. Letters may be addressed to A. W. Resing, director of the municipal electrical works, Amsterdam.





# THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

## FIRE IN KANSAS CITY.

On January 26th, the power house and repair shops of the Metropolitan Street Railway Co., Kansas City, Mo., located at Ninth and Washington Sts., were totally destroyed by fire, with their contents, including machinery, shop tools and 52 cable cars. Of the building nothing was left but the 150-ft. smoke stack, which has since been razed by dynamite, as it was declared unsafe by the superintendent of buildings.

Mr. W. A. Satterlee, superintendent of the company, writes us that the cause of the fire is unknown. It started in the basement while the engineer was up in the office for an incandescent lamp to replace one burned out. The man was gone only a few moments, but on his return discovered flames back of the driving machinery. An alarm was turned in but too late to save anything.

The Ninth & Washington Sts. station will be remembered by delegates to the Kansas City convention, as the plant from which the Washington St. cable was driven, by machinery belted to two 300-kw. General Electric dynamos, running as motors and taking current from the Kaw River power station.

The building was erected in 1884, and was 140 x 144 ft., with two stories and basement. A complete description of the installation will be found in the "Review" for Oct. 15, 1900, page 564.

## AN EXPENSIVE ENGINE FOUNDATION.

Some time since the Cleveland City Railway Co. purchased a piece of land extending from its old electric power station to the Cuyahoga River, about 200 ft., in order that the plant might be enlarged from time to time as the increasing service demanded. The first addition to the old plant was recently completed, and the new generating unit was first operated at full load on January 20th. This unit consists of a Cooper-Corliss cross-compound condensing engine direct connected to a 1,500-kw. Westinghouse generator.

Mr. J. B. Hanna, secretary and treasurer of the company, writes us that the cost of the foundations for this unit was about \$12,000. The masonry, stone and brick, rests on piling, the piles being about 25 ft. long. By reason of the location near the river it was very difficult to secure a firm foundation.

It is said that these foundations were more expensive than any in Cleveland except those for the pumps in the new pumping station for the waterworks.

## NEW POWER HOUSE AT SEATTLE.

The Seattle (Wash.) Electric Co. has completed the foundations for its new central station and contracts for the superstructure will soon be awarded by Stone & Webster, of Boston, who control the company. The building is to be 80x100 ft., a modern steel structure, completely fireproof. The plant will develop 4,000 h. p., furnishing power for the street railway, lighting, elevator and other motors; steam for heating will also be supplied in the business district.

The Milwaukee Electric Railway and Light Co. will abandon the lighting and heating plant in the rear of the general offices on Broadway as soon as the contemplated addition to the River St. power station shall be completed. The company's offices will also be removed to the new building.

## EDUCATION BY CORRESPONDENCE.

At the annual meeting of the Northwestern Electrical Association, held in Milwaukee, January 16th to 18th, a report was submitted by Prof. D. C. Jackson, of the University of Wisconsin, F. A. Copeland, of La Crosse, Wis., and H. L. Doherty, now of Denver, Colo., a committee appointed at the previous meeting to consider the advisability of central station managements encouraging their employees to enroll themselves in courses of correspondence schools.

Speaking of the value of a special practical education in power station work, the committee said:

"The character of the work pertaining to an electric generating station is of such a nature that inefficient employes may cause wastes of greater or less magnitude in almost every operation, from the stoking of the furnaces to the testing of the meters. Not the least proportion of the losses in a central station is to be laid to inferior work in the boiler room. A fireman who has been well informed in regard to the combustion of fuel and the relation between fuel consumption and admission of air to the furnaces may every week save a sum comparable to his wages, as compared with an uninformed or careless fireman. Each fireman, with his hand shovel, will handle coal which has a value in this western country exceeding many times his wages. The difference between judicious and injudicious handling of this coal makes a marked difference in the economy of a station.

"A properly planned correspondence course may put the fireman upon a proper footing with respect to his handling of the coal. The engine runner, the dynamo tender and the wiper may all likewise be made more efficient, through a proper understanding of their business, with a resulting considerable increase in the net earnings of a station. It is particularly important that the chief operating engineer of a station and the superintendent of the company shall be well trained in matters relating to the economical combustion of fuel for the raising of steam, the economical operation of steam engines and auxiliaries, as well as the economical handling of electric machinery and devices, and that they shall be competent to instruct properly all of the station employees."

Referring to the best methods to be used by employers for encouraging their employees to study the requirements of their business, the report continues:

"Prizes, free payments of scholarship fees and other provisions for encouraging the employes to enter correspondence courses do not hold out reasonable advantages except in a few individual cases. Personal encouragement of the ambitious men who are well endowed with common sense, and the provision of a suitably planned and administered course of instruction which such employes may enter upon will bring the greatest advantage to the central-station companies. It is on these lines that the central-station companies must look in large degree for the improvement of their operating conditions."

The committee recommends the following course as meeting the requirements of power station employes:

### COMMITTEE'S COURSE.

1. Arithmetic (for those who need it).
2. A small amount of elementary algebra, geometry and trigonometry.
3. Erection and use of steam boilers.
4. Fuel and its economical combustion.
5. Boiler operation and boiler tests (this should include the methods and reasons for testing flue gases, testing the quality of steam, the use of feed-water heaters, economizers, etc.).
6. Erection and operation of steam engines.



## COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION	MONTH, 1900.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.					Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lb. Water per Lb. Coal.	Lb. Fuel per k.w.h.	Price of Fuel per Ton of 2,000 Lb.	Kind of Fuel
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.	Total.					
1.....	Oct.	2,019,597	.336	.130	.034	.028	.063	.591	2.66	1.50	10.20	2.55	Bituminous
5 Metropolitan Elec. vated, Chicago.	Oct.	1,861,484	.423	.144	.017	.016	.038	.638	....	....	5.99	4.46	"
6.....	May	643,842	.562	.233	.039	....	.085	.919	....	....	....	1.90	"
6.....	June	747,566	.514	.191	.045	....	.084	.834	....	....	....	1.94	Oil
6.....	July	816,428	.676	.196	.034	....	.083	.989	....	....	....	2.13	"
6.....	Aug.	822,602	.647	.193	.052	....	.096	.988	....	....	....	2.08	"
6.....	Sept.	796,912	.706	.200	.047	....	.064	1.017	....	....	....	2.29	"
6.....	Oct.	870,900	.737	.183	.031	....	.064	1.015	....	....	....	2.35	"

\*Cost of Oil per Barrel.

7. Testing of steam engines (this should include use of the indicator, testing to determine friction, the consumption of water per indicated horse power per hour, valve setting, etc.).

8. Condensers, pumps and other auxiliaries.

9. Steam piping and steam-pipe covering.

10. Ohm's law and electromagnetic theory (this should include electrical instruments, flow of currents, etc.).

11. Erection, operation and repairs of direct-current electrical machinery.

12. Elementary theory of alternating currents (single-phase and polyphase).

13. Erection, operation and repairs of alternating-current machinery.

14. Switchboards and switchboard instruments.

15. Electrical transmission and distribution lines and accessories.

16. Construction, testing and repairs of pole-line and underground circuits.

17. Meters and meter repairs.

18. Electric lamps and their proper use.

19. Station economies and station records.

20. Transmission and distribution economies and distribution records.

21. Storage batteries and their uses.

22. Telephones and their accessories. (This does not apply to the larger number of central stations.)

## FROM BUFFALO TO TORONTO.

Arrangements have been made within the past month between the Niagara, St. Catharines & Toronto Railway Co., and the International Traction Co., whereby passengers will hereafter be carried over electric lines of the respective companies from Buffalo, N. Y.,

the street railway service, and for the purpose two new commodious steamboats have been purchased, which will make the 28-mile run across the lake in 90 minutes. The entire journey between Buffalo and Toronto will take 3½ hours, and the round trip fare will be \$1.50, a rate considerably less than the present fare by steam road.

From Buffalo to Niagara Falls, a distance of 23 miles, the route will be over the Niagara Falls division of the International Traction Co., and from Niagara Falls to Port Dalhousie, 19.3 miles, over the recently built Niagara, St. Catharines & Toronto Ry. It is believed the new route will become popular at once, and will undoubtedly be an important factor in transporting visitors to the Pan-American Exposition from the Canadian side.

The electric line of the Niagara, St. Catharines & Toronto Railway Co., forming the connecting link between Niagara Falls and Port Dalhousie on Lake Ontario, is a converted steam road, the present owners having purchased the old St. Catharines & Niagara Central Ry., in April, 1890, and practically rebuilt it for overhead electric traction. Power is taken from the Falls plant of the Niagara Falls Power Co., where three-phase alternating current is generated at 2,200 volts, and stepped up through three 175-kw. transformers, built by the Canadian General Electric Co., to 10,000 volts. This current is transmitted to St. Catharines over the company's own right of way, and there stepped down and transmitted to the line through a rotary converter, built by the Canadian General Electric Co. A rotary converter is also located at the transformer station near Niagara Falls.

The roadbed is built with 56, 60 and 65-lb. rails, laid on cedar and oak ties spaced 2 ft. c to c. The "Continuous" rail joint made by the Continuous Rail Joint Co., of America, was used throughout. The road is single track with turnouts, and to avoid overhead switches, two No. 000 Figure 8 trolley wires were suspended the entire distance. Overhead material was furnished by the Ohio Brass Co.

At present six 50 ft. closed and six 46 ft. open motor cars, mounted on Taylor trucks, and equipped with Westinghouse air brakes and Baker hot water heaters will constitute the rolling stock.

The officers of the company are: President, J. A. Powers; vice-president, John W. Herbert; secretary and treasurer, A. B. Colvin; general manager, F. A. Cheney; chief engineer, J. H. Armstrong.

## COST OF RENEWING TIES.

A committee of the Canadian Roadmasters' Association reports the cost renewing ties in sand ballast at from 5 to 8 cents per tie, and in gravel ballast at from 8 to 13 cents per tie. Discussion of the report brought out the fact that it cost from 1¼ to 1½ cents per tie to peel them.

General Manager Daniels, of the Menominee (Mich.) Electric Railway & Power Co., has complied with the request of the local literary clubs to reduce the fare for Menominee people desiring to attend the meetings at the Chautauqua-grounds. Season tickets will be sold in Menominee, and a canvassing committee has undertaken to secure subscriptions for 500 tickets.



to Port Dalhousie, Ont., where direct connection will be made with a line of steamers, running across the western end of Lake Ontario to Toronto. The steamers will be operated in conjunction with

## PERSONAL.

MR. JAMES H. BRYAN has resigned as president of the Woronoco (Mass.) Street Railway Co.

MR. W. J. CLARK, European manager of the General Electric Co., is making a visit to this country.

MR. H. B. WESTCOTT on Dec. 22, 1900, was appointed general manager of the East Liverpool (O.) Railway Co.

MR. W. O. FINCH has resigned as superintendent of the Kokomo (Ind.) Railway & Light Co., his successor being Mr. T. C. Reynolds.

MR. H. J. VOGEL, assistant general manager of the St. Louis Car Co., has recently returned from a very successful business trip in Europe.

MR. J. BUNTZEN, general manager of the British Columbia Electric Railway Co., Ltd., of Vancouver, B. C., was a "Review" caller last month.

MR. J. C. LUGAR, of Wilmington, Del., has accepted the position of general manager of the Ohio Valley Electric Railway Co., of Huntington, W. Va.

MR. F. V. GREENE, president of the Niagara Gorge Railroad Co., has resigned that office and is succeeded by Mr. Joseph T. Jones, of Niagara Falls.

MR. GEORGE L. DUNBAR has succeeded Mr. H. G. Johnson as superintendent of the gas department of the Fond du Lac (Wis.) Street Railway & Light Co.

MR. FRANK R. GREENE, secretary of the Chicago City Railway Co. has been elected secretary of the Union League Club, one of the leading clubs of Chicago.

MR. GEORGE H. BINKLEY has been appointed engineer and manager of the railway department of Kohler Brothers, succeeding Mr. George W. Knox, resigned.

MR. F. J. SPRAGUE was a speaker at the annual dinner of the American Institute of Electrical Engineers last month. He has recently returned from England.

MR. W. P. COOK, formerly of Louisville, Ky., has been made chief electrician of the St. Louis Transit Co. and will have charge of all power stations on the system.

MR. C. L. HARRY, late of Jackson, Miss., has taken up his residence in Meridian, Miss., where he becomes manager of the Meridian Street Railway & Power Co.

MR. PAUL H. BRANGS has been appointed general eastern agent for the Heine Safety Boiler Co. with headquarters in the Bowling Green Building, New York City.

MR. H. H. WINDSOR will spend the summer at Geneva Lake, Wis., and will make his headquarters for the present at the "Review" office, where personal mail will reach him.

MR. E. H. CHAPIN, for some time with Fiske Bros., of New York, will return to Rochester, N. Y., his former home, where he becomes associated with the Rochester Car Wheel Works, as assistant to the president.

MR. JAMES F. MANN has retired from the presidency of the Utica (N. Y.) & Mohawk Street Railroad Co. On the occasion of his departure he was presented with an ebony gold-headed cane, by the employes of the road.

MR. JOHN W. M'NAMARA, the veteran street railway official of New York and Albany, has been made second vice-president and general manager of the United Traction Co., of Albany. He for-

merly held the title of second vice-president and treasurer. Mr. James McCredie, formerly secretary, has been made treasurer of the company, and Mr. Charles G. Clemminshaw has been appointed secretary.

MR. W. FRANK GITCHELL, for some time past, chief accountant of the Consolidated Street Railway Co., of Grand Rapids, Mich., has recently been appointed comptroller of the Vancouver (B. C.) railway and lighting company.

MR. C. J. HARRINGTON, than whose name none is better known to street railway men in the East, has entered the service of F. H. Lovell & Co., makers of overhead material. He will have his headquarters at 118 John St., New York City.

MR. JOHN GRANT, formerly superintendent of the Detroit Citizens' Street Railway Co., and until recently assistant general manager of the Indianapolis Street Railway Co., has been appointed assistant general manager of the St. Louis Transit Co.

MR. ANTON G. HODENPYL, of Grand Rapids, Mich., president of the Grand Rapids Consolidated Street Railway Co., became a member of the firm of John C. King & Co., of that city, February 1st. The firm will henceforth be known as King, Hodenpyl & Co.

MR. ROBERT B. STEARNS, superintendent of the Northwestern Elevated R. R., Chicago, was on January 1st appointed chief engineer on the resignation of Mr. C. V. Weston, whose assistant he had been for five years. Mr. Stearns will continue to serve as superintendent. Mr. Charles M. Mock has been appointed assistant chief engineer.

MR. HARRY BEESON, assistant auditor of the Columbus (O.) Street Railway Co., has severed his connection with that company, to become general auditor of the Emerson McMillan interests in New York City. Mr. Beeson commenced his career in Columbus as clerk eight years ago, and has attained his present position of importance by successive stages.

MR. CHARLES E. ROEHL has resigned his position as electrical engineer of the St. Joseph (Mo.) Railway, Light, Heat & Power Co., to become electrical engineer of the Brooklyn (N. Y.) Rapid Transit Co., succeeding Mr. R. P. Brown, who has been forced to resign owing to ill-health. Mr. Roehl has had experience in street railway construction work at Portland, Ore., and in Vancouver, B. C.

MR. JOHN M. BRAMLETTE, assistant superintendent and claim agent of the East St. Louis Electric Street Railroad Co., resigned to become general manager of the consolidated lines of the



J. M. BRAMLETTE.

St. Louis & Belleville Traction Co., taking charge February 1st. Mr. Bramlette is 37 years of age, and started railroading about 14 years ago at St. Joseph, Mo., with the Sprague Electric Co. He was transferred from St. Joseph to Denver after which he was sent to St. Louis where he became connected with the Union Depot Line which was then being changed from horse to electric power, remaining on that line about two years. In 1891, at the opening of the East St. Louis line he was sent to East St. Louis as shop foreman, being promoted from time to time until three years ago he was appointed assistant superintendent and claim agent which position he has since filled. Mr. Bramlette was married in 1892 to Miss Louise Swyer of East St. Louis. They have one child, J. M. Bramlette, jr., four years old.

MR. H. E. BEACH has been made traveling salesman for the Consolidated Car Fender Co., of New York and Providence, Mr.

Beach was formerly with the New Haven Car Register Co., and by his genial nature and business-like methods has won for himself a wide circle of business friends. His own popularity, together with that of the fender he now represents, augur for him continued success in the street railway field.

MR. W. S. SILVER, whose name at once suggests "spring," was a "Review" caller recently.

MR. GEORGE WINDSOR, secretary of the Farist Steel Co., of Bridgeport, Conn., spent a short time in Chicago a few days ago.

COL. N. H. HEFT, of New Haven, spent part of last week in Chicago.

MR. R. B. GOODMAN has been made superintendent of the Lawrence (Mass.) & Reading Street Railway Co., succeeding Mr. C. D. Shepard, resigned.

MR. E. F. SEIXAS, general manager of the Amsterdam (N. Y.) Street Railroad Co., has been made general manager of the Niagara, St. Catharines & Toronto Railway Co., and the Niagara Falls, Wesley & Clifton Tramway Co., succeeding Mr. F. A. Cheney, resigned.

MR. JOHN B. BENNETT, business manager of the Street Railway Journal, has severed his connection with that paper to become business manager of the Municipal Journal and Engineer, in which he has acquired an interest. The publishers of the "Review" join with Mr. Bennett's host of friends in the street railway industry, in wishing him the fullest success in his new work.

MR. HENRY WOOD, purchasing agent, Mr. Prentiss Cummings, general counsel, and Mr. R. T. Laffin, division superintendent, of the Boston Elevated Railway Co., have resigned their several offices. Mr. Wood and Mr. Cummings have for some time been engaged in literary labors and will probably devote themselves to writing and editorial work, for which they are both well fitted. Mr. Laffin, it is understood, has accepted a position with the street railway lines in Worcester and will soon be given a responsible office with the Consolidated system of that city.

MR. HARVEY M. LITTELL, who has had a long experience in the street railway field, has become general manager of the Barr Contracting & Construction Co., 30 Broad St., New York City, a corporation formed under the laws of Delaware, to construct, equip, and finance electric and steam railroads, and other private and public works. Mr. Littell began his street railway career in 1874 with the Louisville (Ky.) City Ry. From 1883 to 1885 he was general manager of the St. Paul City Ry. In 1888 he took charge of the Cincinnati Inclined Plane R. R.; during his administration the road was converted for operation by electricity. In January, 1893, he was engaged by the Seligmans, of New York, as general manager of their extensive street railway interests in New Orleans. He resigned this office, to become president and general manager of the Atlantic Avenue Railroad Co., of Brooklyn. In 1897 he was appointed vice-president and general manager of the Metropolitan Street Railway Co., of New York, but resigned the same year to take a vacation trip in Europe. Mr. Littell was president of the American Street Railway Association in 1896, and has been several times appointed member of the executive committee.

#### OBITUARY.

MR. ADNA BROWN, a leading capitalist of Springfield, Vt., and president of the Springfield Electric Railway Co., died suddenly on January 14th.

M. Z. GRAMME, inventor of the well known "Gramme" dynamo, a type now generally adopted throughout the world, died last month at Bois de Colombes, Paris, aged 74. He was a native of Belgium.

MR. DAVID W. GUERNSEY, of St. Louis, who as representative of the Sprague Electric company, was prominently instrumental in introducing electric railways and an electric lighting system in the city of St. Louis, died last month at the age of 62 years.

MR. OTTO W. MYSENBERG, of Chicago, died on February 11th, at his winter home in Almo, Cal. He represented the Johnson Co. for many years in the West and sold thousands of tons of girder rails. He also promoted the Siemens-Halske Co. of America, and was for some time president of the Wells-French Car Co.

SIR FRANCIS SMITH, one of Canada's greatest financiers, died at his home in Toronto, January 17th, aged 78 years. The deceased was born in Armagh, Ireland, and came to Canada at an early age. He accumulated a great fortune in the wholesale grocery business, was one of the principal projectors of the Canadian Pacific R. R., and later acquired a controlling interest in the Toronto Street Ry. He was made a Senator in 1871, a member of the Canadian government in 1882, and was knighted on the Queen's birthday, 1894. Shortly after Sir John Thompson's tragic death, Sir Francis Smith was offered the premiership of Canada, which he refused.

#### UNION STATION FOR CLEVELAND INTER-URBANS.

The business of the electric interurban lines terminating at Cleveland, O., has so grown that the need of a Union station centrally located has become quite apparent, and this fact marks a new era in the history of transportation. One of the Cleveland papers recently published interviews with the managers of the electric interurbans and they were unanimous as to the desirability of the station and in expressing the willingness of their respective companies to co-operate to secure it.

Mr. E. W. Moore, a director of the Northern Ohio Traction Co., and treasurer of the Lorain & Cleveland, said:

"I believe that the suburban business of the city has developed to a point where something in the way of a union station is needed. The need of a freight station for the use of the suburban roads is more pressing so far as the business of the companies is concerned but the convenience of the public demands a passenger station near the Public Square, where passengers can wait for their cars or transfer from one system to another.

"The union station for passengers should be centrally located, and it is not long before the need of such a station will have to be met. Our roads do not need such a station as much as some of the others, perhaps, because our cars go at such frequent intervals that there is never any necessity for a passenger waiting very long, for one of our cars. I am sure, however, that the Painesville, Akron and Lorain companies would be glad to co-operate in the provision of a station for the convenience of the public."

General Manager Palmer, of the Cleveland & Chagrin Falls Ry., is quoted as follows:

"Certainly there ought to be a union station for suburban passengers. Our company would be only too glad to take part in the development of such a plan. Such a station is really a necessity. If there were a central station to which the cars of all the suburban companies ran, passengers could come to the city on one of the lines and leave for points located on other suburban lines with the greatest ease. Their baggage could be transferred from the cars of one line to those of another without being hauled about the streets, and the passengers could make the journeys without any more inconvenience than they would have in changing from one steam railroad to another.

THE NEW CUMBERLAND (PA.) HEAT, LIGHT & POWER CO. has elected M. A. Cumblér, president; G. W. Cumblér, vice-president, and J. D. Landes, secretary and treasurer.

THE LANCASTER (O.) TRACTION CO. has elected Henry B. Peters of Lancaster, president; Andrew Bauman, Lancaster, vice-president, and H. R. Beason, of Columbus, secretary and treasurer.



## LARGE SHIPMENT OF CARS FOR PORTUGAL.

The accompanying illustration was reproduced from a photograph taken in the latter part of January, and shows a train of 36 freight cars carrying 60 car bodies and trucks built by the J. G. Brill Co. for the Companhia Carris de Ferro de Lisboa, Lisbon, Portugal. These were one-half of an order of 120 cars for that road; the other 60 will be shipped in about three months.

To ensure the unloading of the freight and the erection of the cars upon their proper trucks the cars carrying the trucks were sandwiched in between those carrying the bodies.

The cars are of the 8-bench open type, 24 ft. long over the crown pieces; the corner posts are set 4 ft. 4 in. back from the front of the



LARGE SHIPMENT OF BRILL CARS FOR PORTUGAL.

crown pieces. The bodies in most respect conform to American practice. Signal lights are provided at the left hand corner of the monitor and reversible destination signs are placed on the hoods. At the openings are spring roller curtains; the interior is finished with a three-ply maple headlining. Brill draw bars and "Dedenda" gongs are included in the equipment.

The car bodies were taken apart and packed in boxes; the trucks, with their motors mounted upon them, were loaded in pairs. As the boxes containing the floors and roofs were too large to go in ordinary freight cars, the long Brill flat cars were used; after loading the cars were housed in to protect them from the weather. The car on which the sign (which by the way was prepared for the entire shipment) is shown in our engraving, carried two cars.

The Lisbon road, where these cars will be used, has sharp curves,  $36\frac{1}{2}$  ft. radius, and steep grades, the heaviest being 12 per cent. The trucks are of the 21E pattern with a wheel base of 6 ft. 6 in. Because of the steep grades track brakes are provided; the shoe is of oak with the end grain bearing on the track.

## ADVERTISING ATTRACTIONS—IT PAYS.

Readers of the "Review" have noticed in recent numbers of this paper, samples of the advertising matter used by the New Jersey & Hudson River Railway & Ferry Co., in calling attention to the facilities furnished by its lines and to the attractions along the way. The cost of this printed matter is considerable as the company orders the best that can be secured, and the question naturally arises, "Does it pay?" In reply to the query, Mr. Frank R. Ford, second vice-president and general manager of the company, writes that it is not possible to determine definitely what returns this advertising brings, but the company is perfectly sure that it very much more than pays for itself.

One of the posters reproduced in our issue for last month, page 64, called attention to the ice-skating on a pond at the terminus of the Hudson River line. Referring to these skating facilities, Mr. Ford states that the company did not erect any buildings near the ice, as the keeper of a nearby draw-bridge lives on the property and conducts a lunch counter and store at that point. This keeper is an employee of the company and is given charge of the pond, it being his duty to see that the ice is cleaned of snow. The company has installed 8c incandescent lights in strings around the edge of the pond, and on cold nights keeps a large bonfire burning at one end. No admission fee is charged for skating privileges.

## THE STREET RAILWAYS OF PENNSYLVANIA.

The annual report of the Secretary of Internal Affairs of the Commonwealth of Pennsylvania for the year ending June 30, 1900, contains the report of Major I. B. Brown, superintendent of the Bureau of Railways, to whom the "Review" is indebted for a copy of the official document. Following are extracts from this compilation of statistics:

During the year there has been no material change in the financial condition of the street railways in Pennsylvania. There has been a pause in the onward march of the bicycle, which formerly menaced the advancement of electric and especially electric inter-urban roads, and it is probable that today there are not more than

one-half as many wheels in use as there were three or four years ago. As the introduction of the bicycle seemed to encroach upon the receipts of the street railways, so the partial passing of the bicycle seems to inure to their benefit, as indicated by the figures returned for the present year, for it may be assumed that the increased earnings are due in part to the diminution in the use of the wheel. To what extent the automobile will affect the street railways, is, of course, a matter of conjecture.

From the returns received it appears that the total amount of capital stock outstanding of the operating street railways is \$103,176,121. This amount comprises the stock of 94 companies, and is an increase over last year's amount of total outstanding capital stock of \$53,802. The corporations whose capital stock makes up the greater portion of the total are: the Consolidated Traction Co., of Pittsburg, \$27,000,000; the Union Traction Co., of Philadelphia, \$10,499,912, and the United Traction Co., of Pittsburg, \$20,000,000. The funded debt for all the companies reporting for the year, is \$38,975,100. Last year the amount was \$31,309,425.

The total amount of current liabilities reported for the year is \$11,585,004, making the total street railway capitalization of operating companies \$153,736,225. If to this amount be added the capital stock outstanding, amounting to \$68,094,525, and the funded and unfunded indebtedness of the companies whose lines are subsidiary to or operated by other corporations, amounting to \$21,764,354, the total capitalization is found to be \$243,595,104. The total mileage of these corporations is 1,654, making the capitalization per mile of road \$147,276.

The assets of street railways are classified as follows: Total cost of road, cost of equipment, stock owned, bonds owned, cash and current assets, other assets, and total assets. The total cost of roads as reported for the year is \$87,806,026. The companies contributing most largely to this amount are: The Conestoga Traction Co., of Lancaster, \$3,401,100; the Consolidated Traction Co., of Pittsburg, \$3,582,642; the Monongahela Street Railway Co., \$2,079,418; the Pittsburg & Birmingham Traction Co., \$1,372,288; the Pottsville Union Street Railway Co., \$1,498,062; the Scranton Railway Co., \$4,570,535; the United Traction Co., of Pittsburg, \$29,575,641 (the latter amount including the cost of equipment); the Union Traction Co., of Philadelphia, \$1,899,252; the West End Traction Co., of Pittsburg, \$5,266,691; the Wilkensburg & East Pittsburg, \$2,942,414; the Wilkesbarre & Wyoming Valley Traction Co., \$6,645,943. The total cost of road last year was \$87,411,512.

The total cost of equipment is \$12,334,380. Last year the amount

was \$9,128,533 (this does not include Consolidated Traction Co.)

The total of assets is \$156,308,465. Last year the amount was \$149,934,302. Adding the assets of the subsidiary companies, or those whose lines are operated by other corporations, amounting to \$80,186,452, makes the total assets of the street railway corporations of Pennsylvania \$236,554,917.

The total income of all street railways in Pennsylvania for the year was \$24,477,181. The preceding year the amount was \$22,569,256. There are several large steam railroads in the state whose receipts from operations fall considerably below the receipts of some of the street railway companies. Few industries have increased their receipts with the same rapidity as the street railways.

The total amount expended for operations during the year was \$12,114,609 as against \$10,519,810 the preceding year. Of this amount the Consolidated Traction Co., of Pittsburg, paid \$1,341,565, and the Union Traction Co., of Philadelphia, \$5,624,898. The taxes paid during the year amount to \$1,579,284 as against \$1,314,470 last year, the increase being due to the increased valuation of the capital stock, the 5-mill tax being based on the market or appraised value of the stock.

Rentals were paid during the year to the amount of \$5,954,232. Last year the amount was \$6,237,691, the companies paying the heaviest rentals being the Chester Traction Co., \$56,300; the Consolidated Traction Co. of Pittsburg, \$229,080; the Harrisburg Traction Co., \$61,655; the Pittsburg & Birmingham Traction Co., \$35,948; the Union Traction Co. of Philadelphia, \$5,444,953; and the United Traction Co. of Reading, \$104,983.

Under the heading of "Other Expenses" the report includes the amount of \$398,326. Last year the amount was \$279,453.

The total mileage of the street railways of Pennsylvania is 1,898.69 as against 1,812.94 reported the preceding year. The companies having the greatest mileage are the Consolidated Traction Co. of Pittsburg, 126.40 miles; the Harrisburg Traction Co., 46.51 miles; the Lehigh Valley Traction Co., 64.61 miles; the Union Traction Co., of Philadelphia, 444.8 miles; the United Traction Co. of Pittsburg, 117.1 miles; the United Traction Co. of Reading, 48 miles, and the Wilkesbarre & Wyoming Valley Traction Co., 64 miles.

The total number of cars in service was 6,395, as against 5,864 a year previous. The Consolidated Traction Co., of Pittsburg, reported 508; the Harrisburg Traction Co., 103; the Lehigh Valley Traction Co., 86; the Pittsburg & Birmingham Traction Co., 78; the Scranton Railway Co., 145; the Union Traction Co., of Philadelphia, 3,157; the United Traction Co. of Pittsburg, 344, and the Wilkesbarre & Wyoming Valley Traction Co., 160.

The total number of employees reported for the year is 14,798. Last year the number was 12,506; the Consolidated Traction Co. of Pittsburg employing 1,563; the Union Traction Co., of Philadelphia, 7,222; and the United Traction Co., of Pittsburg, 994. The total amount paid to employees during the year was \$8,043,589. Last year the amount was \$6,569,204. The Consolidated Traction Co. of Pittsburg paid \$895,900; the Union Traction Co. of Philadelphia, \$3,934,835; the United Traction Co., of Pittsburg, \$593,763; the United Traction Co., of Reading, \$102,056, and the Wilkesbarre & Wyoming Valley Traction Co., \$178,181.

The total number of passengers carried during the year was 538,194,532. This is an increase of 64,881,274 over the number carried the previous year. The number carried in one year is about seven times greater than the population of the United States.

As the result of the operations of the street railways during the year 28 passengers were killed, as against 17 the year previous. This is at the rate of one passenger to each 19,221,233 carried. There were but six employees killed during the year, one to each 2,499 in the service. Other persons than passengers and employees, to the number of 107 were killed during the year. The total number killed was 141; and the total number injured was 1,441.

The report includes an interesting review of the progress of transportation facilities for the past century, describing the steamboat, invented in the early days of the century as the pioneer of modern means of travel, and following with a brief history of the steam engine, the electric motor, the bicycle and automobile.

The common stockholders of the Schuylkill Traction Co. have been asked to exchange their stock for one quarter of the amount in preferred stock, under the readjustment plan.

## TO CONSTRUCT AND DEVELOP ELECTRICAL PROPERTIES.

Mr. H. S. Cooper, of New York, who has for some time been carrying on an extensive practice as engineering and financial expert in matters pertaining to electric corporations and properties, has found that his work is developing to such proportions as to make it advisable to place the business in the hands of an incorporated company. He has accordingly associated with himself a number of electrical and mechanical engineers, and a company known as the Electrical Engineering & Development Co. has been chartered under the laws of New York state. Offices have been opened at 29 Broadway, New York, where inquiries will be received and visitors cordially welcomed. The company is prepared to examine, test and make reports upon street railway, electric lighting and electric power plants; plan, construct and supervise new plants; reconstruct, extend, consolidate and reorganize existing plants, and organize and develop new properties.

The officers are: President, H. S. Cooper; vice-president, B. Y. Frost; secretary and treasurer, W. S. Gurnee, 3d.

Mr. Cooper, who remains at the head of the business, is a thoroughly practical man, having managed at various times, with unqualified success, two lighting stations at Jacksonville, Fla.; the street railway and electric lighting plants at Schenectady, N. Y., and the street railway property at Ithaca, N. Y. He has been a regular attendant at conventions of the American and New York State street railway associations, and is a frequent contributor to the technical press.

## EMPLOYEES' ENTERTAINMENT AT SYRACUSE.

The Employees' Mutual Benefit Association, of the Syracuse (N. Y.) Rapid Transit Railway Co., gave its first musicale, January 24th, with very gratifying success. The spacious and pleasant association rooms were filled with about 250 members and friends of the organization, and an excellent musical program was rendered by the best of local performers. Later a reception was held and refreshments served. Mr. E. G. Connette, vice-president and general manager of the Syracuse Rapid Transit Railway Co., was the host of the evening. Mr. Connette has found many novel and practical ways of benefiting the employees through the medium of the association, and is to be congratulated upon his success in this direction.

## NORTHERN OHIO CO'S. PROJECTED CONSTRUCTION.

The Northern Ohio Traction Co. has decided to increase its capital stock from \$3,000,000 to \$4,000,000, the increase to be equally divided between common and preferred stock, in order to carry out the proposed extensions of its system consequent upon the recent purchase by the company of the Akron & Cuyahoga Falls Rapid Transit Ry. A six-mile line between Kent and Ravenna will be built at once, and surveys are being made for the 22-mile extension from Akron to Canton. The route of the latter line will include Long Lake and Turkeyfoot Lake, two fine bodies of water. At each lake the company projects the establishment of a summer resort.

## CALENDARS FOR 1901.

The Ajax Metal Co., of Philadelphia, sent out a handsome wall calendar bearing a life-size reproduction, lithographed in brown, of "Ajax," the Greek hero of "great strength" whose deeds are recounted in Homer's Iliad.

The Pennsylvania Iron Works Co., of Philadelphia, has a calendar printed on heavy cardboard and tastefully decorated with half-tone reproductions, showing different views of the Pennsylvania engine.

A calendar for the first quarter in 1901 is sent us by the Columbia Incandescent Lamp Co., of St. Louis, Mo. It is printed in green and yellow and shows samples of "Columbia" incandescent lamps.

The Chase Construction Co., of Detroit, has been awarded the contract for building the overhead work of the Dayton & Northern Traction Co.



## NOVEL CAR IN BROOKLYN.

A car is now in operation on the lines of the Brooklyn Heights R. R., Brooklyn, N. Y., which has a number of novel features. The general dimensions are: length over bumpers, 37 ft.; length of body, 28 ft.; width at sills, 7 ft.; width over all, 8 ft., 1½ in.; height from rail to trolley board, 11 ft., 5 in. The car is mounted on Brill maximum traction trucks, the distance between bolsters being 18 ft., 11 in. The electrical equipment comprises Westinghouse No. 68 motors and K 11 controllers.

The car is intended for both summer and winter service, and in summer the windows are all removed and stored at the barn. The sash are rubber lined to prevent rattling, and are clamped to the window posts by iron strips screwed to the outside, being immovable when in place. To remove or replace the windows is said to require about 40 minutes. The curtains, which are used both sum-



INTERIOR OF BROOKLYN HEIGHTS CAR.

mer and winter, are mounted on fixtures furnished by the Curtain Supply Co., of Chicago.

The most interesting feature of the car is the style of seat, which is a revolving type made by the Heywood Bros. & Wakefield Co., of Wakefield, Mass. The interior of the car is shown in the illustration. The seats are arranged in pairs with one seat of the pair slightly in advance of the other. By pressing a pedal at the base the chair can be turned through a half-revolution, thus permitting parties of four to have their seats facing if so desired. There are nine double revolving seats on each side of the car, and a sofa at one end, giving a seating capacity for 40 persons. The seats are all upholstered in green pantasote. The arrangement of seats has been found very convenient for both passengers and conductor.

The car has electric heaters made by the Consolidated Car Heating Co.

Mr. Eugene Chamberlain, superintendent of equipment is the designer of the new car, and it was built under his supervision at the shops of the Brooklyn Rapid Transit Co.

### PARK ANNOUNCEMENT FOR 1901.

The Youngstown Park & Falls Street Railway Co., of Youngstown, O., which for some years has successfully operated Idora and Mill Creek Parks, has just issued a handsomely illustrated pamphlet announcing its plans for the coming season.

These parks contain about 450 acres, and are located at the terminus of the line, about four miles from the center of Youngstown. To the natural attractions furnished by the streams traversing the park and Lake Cohasset, which offers boating facilities, the company has added a dancing pavilion, an open air theater, an electric merry-go-round, a zoo, swings, etc.

During 1900 there were a great many large excursions from points in eastern Ohio and western Pennsylvania. For the next season the company promises the same good transportation service and that the entertainments will have many new features while preserving the same high moral tone that has heretofore characterized the park.

## OHIO NOTES.

The East Liverpool & Wellsville Electric Ry. will make numerous improvements this spring.

The Columbus, Winchester & Lancaster Traction Co. has been granted a franchise through the villages of Canal, Winchester and Groveport. This company is expected to begin operations in the early spring.

The Mill Creek Valley Street Railway has about completed its line from Cincinnati to the village of Glendale; it is the intention to continue the line to the city of Hamilton as soon as the other portion is complete.

The Northern Ohio Traction Co. will build 60 miles of new track this summer. The A. B. & C. line to Cleveland will be double-tracked the entire distance, and work has been begun on a double track from Akron to Barberton.

The Columbus, Buckeye Lake & Newark Traction Co. has put up \$6,000 as its portion of the cost of bridge work on the National road in Franklin county. As soon as the weather will permit, active operations will be begun on this line.

At a recent meeting of the directors of the Columbus, London & Springfield Electric Railway held in Springfield, it was decided to begin the work of construction in that city at once. So far, the most active operations have been confined to the Columbus end of the line.

The Toledo, Bowling Green & Fremont Electric Railway will be extended from Jerry City to Fostoria, this summer, via Marvel, Bairdstown and Bloomdale, passing through one of the richest agricultural sections of Ohio, as well as the greatest oil section in the state.

The Toledo, Waterville & Southern Electric Railway Co., of Toledo, has been incorporated with a capital stock of \$25,000 by Harry E. King, Theo. H. Tracy, Harry W. Lloyd, Frank W. Coughling and James A. Murphy, to build and operate an electric line between Toledo and Napoleon.

The Cleveland & Mansfield Electric Ry. is a new venture that is being promoted by Cleveland parties. It is proposed to connect these two cities by an electric line. The company has been incorporated with a capital stock of \$10,000 and has ample capital at its disposal. The incorporators are C. V. Hard, T. K. Disette, A. T. Everett, R. M. Parmely and E. J. Kennedy.

Judge Neilan at Hamilton has rendered a decision that is of great interest to Ohio municipalities and traction companies. The Hamilton & Lindenwald Electric Transit Co. resisted the collection of \$2,000 in assessments by the city for paving between the company's double tracks, otherwise known as the "devil's strip." The ordinance provided that the company must pave between its tracks, and the court held that this means only between the rails of the separate tracks and not between the dead area way between the two tracks.

Mr. T. A. Simons, of Columbus, general manager of the Columbus, Worthington & Clintonville Electric Ry., recently visited Delaware, O., with a number of Eastern capitalists, looking over the route of the proposed extension of the line to that city. The road is now in operation from Columbus north through Worthington and Clintonville, a distance of about 14 miles. Mr. Simons has an arrangement with the management of the Columbus Street Railway Co. to bring his cars into the city over the latter's tracks, as soon as its franchise matters are satisfactorily arranged. The extension of this road to Delaware will probably be made this season.

Mr. W. A. Bailey, treasurer of the Worcester & Webster Street Railway Co., is quoted as denying the report that the Worcester & Webster had been purchased by the Peoples Tramway Co., of eastern Connecticut, and as stating that such a sale was never contemplated.



## NEW HIGHWAY BRIDGE AT MIDDLETOWN, CONN.

BY H. G. TYRRELL, BOSTON, MASS.

The new highway bridge across the Connecticut River at Middletown, Conn., is 1,300 ft. long with a 26-ft roadway and provision for two 6-ft. sidewalks; it also carries an electric railway. The bridge consists of two fixed spans 200 ft. c. to c. of piers, two fixed spans of 225 ft. and a draw span of 450 ft. c. to c. of piers. This is believed to be the longest highway draw bridge ever built; other long draw spans are in the following bridges: Macombs, 412 ft.; Cleveland, 279 ft. in two spans; Charlestown, 240 ft. The comparison does not include a number of long span railroad draw bridges that also carry highway traffic.

The superstructure was designed by the writer, acting as engineer for the contractor, the Berlin Iron & Bridge Co.

The trusses are 26 ft. center to center, the floor beams having provision for connecting sidewalk brackets in the future. The floor is designed to carry a live load of 100 lb. per sq. ft., 14-ton electric cars or a 10-ton wagon. The trusses are proportioned for a live load per foot of bridge of 1,500 lb. for chords, and 2,000 lb. for web. Iron was used for eye bars and lateral rods, and medium steel for other members. The allowable unit stresses per sq. in. were: tension iron eye bars, 12,500 lb.; tension iron lateral rods, 15,000 lb.; steel plates and shapes in tension, 15,000 lb.; shapes in compression, 12,000 lb. modified by formula for long columns; fiber stress in steel beams, 16,000 lb.; bearing on pins and rivets, 16,000 lb.; bending on pins and rivets, 22,000 lb.; shearing on pins and rivets, 8,000 lb.

The floor is of wood, two layers of kyanized spruce planks laid on 4x14-in. vulcanized yellow pine joists spaced 30 in. apart; the planking is laid diagonally, the lower planks being 3 in. and the upper 2 in. thick. The stringers for the car track are 15-in. I-beams weighing 42 lb. per ft.

The trusses for the fixed spans have 12 panels each, which are from 21 to 37 ft. in depth. The draw span has twenty panels 21 ft. 3 in. and one 22 ft., which are 21 to 55 ft. in depth. The turntable is entirely on rim bearings. The drum is 4 ft. deep and 31 ft. in diameter, being secured to a center casting by the usual radial braces and spider frame. The center casting is anchored to the pier; it is hollow to provide a passage for electric wires.

The draw is operated by three 25-h. p. electric motors of railroad type, one for turning and the others for blocking up the ends. Besides these there is a fourth motor, and a duplicate set of turning

the services of two gate operators. But on account of an accident to the substructure involving extra expense, the steel gates and some other machinery were omitted.

Blocking up the ends is done by means of a pair of toggles at each corner. These are drawn together by two bronze nuts working on a right and left hand screw, that is turned by bevel gears from the motor. To prevent these nuts from jamming, there are electric signals that tell the operator when to shut off his power. As a general rule, it is intended to simply block the ends up tight. This requires but very little power. But as there is always the liability of the blocks becoming tight from change of temperature or other causes, the end machinery was proportioned to lift 50 tons at each corner, 1½ in. in 10 seconds. This required 10 h. p., but it



MIDDLETOWN DRAW BRIDGE.

was thought best to use the same kind of motor used at the turntable, giving interchangeable parts. To provide for expansion the end toggles rest on cast steel rockers of 17½ in. radius, which in turn bear on cast iron pier plates, blocked up to the right elevation with shims. The floor of fixed span and draw were made to level up, by notching the joist.

To open by electric power takes 30 seconds, and the power required to overcome an unbalanced wind pressure of 5 lb. on one half of bridge is 30 h. p. Ordinarily, however, in calm weather 5 h. p. is sufficient to turn. It was necessary to use about four times the amount of resistance ordinarily used on street car work with the same motors. The reason for this is evident when the relative weight of bridge and car is considered. Both the centre and end sets of machinery are provided with clutches which can be thrown out of gear and the operation performed by hand power. Working on 10-ft. levers the bridge is turned by four men in eight minutes. There is a friction brake applied to a drum on the highest speed turning shaft. This and the other turning machinery including the motor, are placed on the outside of the drum beneath the floor, in a machinery frame that can be sheathed in and protected from snow and ice. The whole bridge is well lighted with incandescent lamps, and has also the usual signal lights required by the Government.

The foundation for this bridge consists of two abutments four river pier and a circular draw pier. The maximum depth of water in the channel at low tide is 16 ft. All of the piers and the Middletown abutment stand on pile foundations. The Portland abutment is built on solid rock found 6 ft. below the natural surface of the ground. The masonry throughout is laid in regular courses varying from 18 to 30 in. in thickness. The stone used is the celebrated Portland brown stone taken from quarries about half a mile above the bridge site. Concrete was prepared, using one part of Portland cement, two parts of sand and four parts of broken stone. The draw pier has a batter of half an inch to the foot and all others, including the abutments, are battered three quarters of an inch per foot. The top of the timber grillage in all cases is a foot and a half below extreme low water line.



VIEW OF DRAW SPAN.

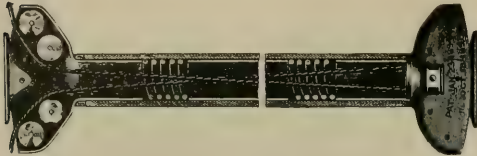
machinery all in place which can be used in case of unbalanced wind pressure, or a break in the other machinery. These two sets can be worked independently, or together at the will of the operator. Power is taken from the Middletown street railway wires, and a cable is laid on the river bottom, and brought up on the center pier. This passes in a groove under the wheel track and up through the centre casting.

It was originally intended that the closing of the gates should be done by the operator in the tower, and in fact the writer made a complete design for electrically worked steel safety gates. While these would cost \$950 for the two gates, they would do away with

A bill has been introduced in the New York Legislature which provides that surface street railways may condemn rights of way outside of cities. A similar bill is pending in Connecticut.

### CURTAIN FIXTURE MATTERS.

The Curtain Supply Co. is now offering to the trade a new style of cable fixtures which has been tested for about two years on several of the large traction companies of the country. The illustration herewith shows a cross section of the tube, from which the method of the working of the fixture is apparent. Heretofore, cable fixtures have depended on the cable passing over the mouth-piece or around pulleys to obtain the necessary friction to prevent the curtain from running up. The Forsyth open car cable fixture uses spring actuated heads with tilting shoes which are thrust



CABLE FIXTURE—CURTAIN SUPPLY CO.

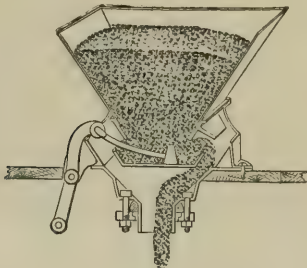
against the bottoms of the grooves by strong springs located at each end of the tube. The squaring band is used for the purpose of preventing the curtain from getting out of line and coming out of the grooves, the friction resulting from the shoes being forced against the bottom of the groove by the springs.

Curtains equipped with these patent fixtures have been in use for two years by the Chicago City Railway Co. and others, and the Curtain Supply Co. reports that it has today a large number of orders on its books for this type of fixture. This fixture in no way conflicts with the regular open car "Acme" or "Climax" fixtures, the patents for which are owned by the Curtain Supply Co., these patents covering broadly the idea of a squaring band as applied to a curtain.

### IMPROVED SAND BOX.

Our illustration shows the latest design of sand box that has been developed by the Ham Sand Box Co., of Troy, N. Y. This is known the "Style 8" and like the company's other designs provides for the economical distribution of the sand without the use of mechanism that will produce wasteful leaks.

The method of operation is readily apparent from the drawing; a double outlet is provided for the sand, and a flow of sand is produced when the foot lever is either pressed or released. But the



STYLE 8 HAM SAND BOX.

lever must be kept in motion to provide a continuous flow of sand, so that no waste results if the motorman should hold the foot-pin down.

There are ventilator openings at both front and back of the box which are always open; these parts connect with the spout and the moisture is kept away from the sand in the hopper. The portion of the hopper below the car floor is of bronze and will not rust. A flexible wire spout is used; this is reported to be vastly more durable than rubber hose. If the end of the tube becomes stopped by the formation of a crust of mud it can easily be cleaned by pulling it up and then permitting it to spring back.

### HEAVY LOSS BY FIRE IN BROOKLYN.

The car house of the Brooklyn Rapid Transit Co., at Flatbush and Vernon Aves., Brooklyn, was totally destroyed by a fire, which broke out at 8:55 p. m. on Saturday, February 9th. Eighty electric cars, four sweepers and five snow plows were consumed, the aggregate loss being variously estimated at from \$250,000 to \$500,000. Among the cars burned were 10 new closed cars, and all the open cars used for summer traffic to Bergen Beach, Brighton Beach and Coney Island. The adjacent repair shop was also burned.

The fire originated in the "supper car," an old car stationed in the sheds, and used by the men as a lunch room, and is believed to be due to the car heater.

President Rossiter and Vice-President Williams, who were on the scene shortly after the alarm was given, succeeded in having the company's books and papers removed to a nearby car and run out of the way of danger. Mr. Rossiter has announced that the fire will not cripple the service, for substitutes for the burned cars will be put on the line at once, and temporary car barns have already been provided.

The Flatbush sheds, which were destroyed, were a landmark in Brooklyn. They were formerly used as horse car barns, and marked the division of Old Flatbush from the new suburb of that name. The Brooklyn company will probably decide to rebuild nearer to Flatlands Bay. The burned sheds were constructed entirely of wood. They were built about 25 years ago, and covered a frontage of 125 ft. on Flatbush Ave., extending to a depth of 600 ft. There were 110 cars in the building at the time of the fire, of which 30 were saved.

### LAWYERS WHO DISGRACE THE PROFESSION.

In speaking before the Candlelight Club, of Oshkosh, on the subject of "John Marshall," Mr. C. W. Felker, of the Oshkosh bar, spoke as follows concerning a certain portion of the profession:

"In the days of Marshall the practice of the law was a profession and not a trade. Members of the bar scorned to rely upon a 'pull' for practice. There were no 'ambulance followers,' no 'drummers' for business, and the peripatetic practitioner, whose stock in trade is a pair of stout legs, a city directory and, much gall, had not yet 'put in an appearance' to vex the courts with his ignorance, betray clients by his incapacity and deceive people by his impertinence and sharp practice.

"The lawyer of Marshall's time was, least of all, no crank. It became and was his duty to aid the court, to uphold the law and to teach the people to obey the law and to respect the courts of justice appointed to administer the law. It is also true that even in the early days a black sheep would sometimes be found in the professional flock. Occasionally a Simon Suggs would sneak into the ranks of the profession and for a time practice the black art of the pettifogger with profit and success. But he was despised by lawyers and frowned upon by the bench.

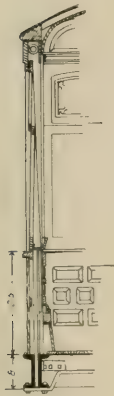
"The avarice, corruption, dishonesty and crime which has waxed great with the mighty growth of cities has created an inexhaustible stratum of filth, which has bred herds of professional microbes called 'shysters,' who practice with impunity the trade of perjury, jury packing and bribery, and carry on that infant but fast increasing industry of blackmail by bringing an infinite variety and number of vexatious and fictitious law suits.

"These gentry find their victims among the poor and ignorant whom they ruthlessly plunder, and their abettors among the crafty, the corrupt and criminal whose villainies and crimes they aid and whose ill-gotten gains they share. Many more of these cormorants grow rich than do the reputable lawyers, and strange as it may seem, many of them are clothed with the shroud of respectability when dead."

The Butte (Mont.) Electric Railway Co. has filed a report showing its assets to be \$1,889,554.13, consisting in real estate, street railway franchises, equipment and supplies. The liabilities are shown to be \$797,037.38 of which \$700,000 is in bonds secured by mortgage.

## NEW CARS FOR CHICAGO CITY RY.

The Chicago City Railway Co. early this month received five new double-truck cars, built by the St. Louis Car Co., after plans proposed by Capt. Robert McCulloch. These embody several novel details of construction, and in point of finish and decoration perhaps make the most handsome rolling stock ever purchased by a street railway company for every-day service. Capt. McCulloch makes the statement that in designing and building the new cars, the end in view has been, not primarily to secure greater economy in operation, but rather to place upon the street rolling stock that will please the people and invite traffic, although he adds it is his belief that the long cars will not materially increase operating expenses. If the five cars received meet with popular approval, a large order will be placed at once; but in substituting these longer for shorter cars, the number of cars on any division will not be decreased, thus giving a much greater seating capacity with the same schedules.



The novelty in construction will be more plainly seen by reference to the sectional sketch. The main side sills consist of two 8x2½-in. channels, between which enough space is left to receive the sash when it is dropped, making the car practically convertible and adapted for summer and winter use. This "convertible" feature

is carried to a greater degree than is usually done in cars of this type, by placing the arm rail but 25 in. above the floor, a detail that it is believed in very warm weather will prove to be an important improvement, as it will give to passengers a sense of greater freedom, and of being more nearly in the open air.

The cars are mounted on No. 23, St. Louis double trucks, and are equipped with four G. E. 67 motors to each car. The length of car body is 34 ft., and of each vestibule 5 ft., inside of dash, giving a total length over all of 46 ft. The greatest width, is 8 ft. 7 in.

The outside side construction is straight panel, tongued and

Each end of the car body has two large double sliding doors, permitting of easy access to the car, and the platforms have double folding doors, so that either side may be closed in bad weather. For summer service these platform doors are removed and channel iron folding gates are substituted in their place. Access to the car is made still more easy by the low step, which comes to within 13 in. of the ground. The prevailing color of the exterior is red, with trimmings in solid bronze, highly polished and of latest patterns and designs. The headlights are placed inside the vestibule over the head of the motorman. On the sides of the cars are window guards mounted in bronze fixtures, from which



INTERIOR OF CAR.

the guards can be easily removed for the purpose of cleaning the windows.

The equipment includes Christensen air brakes and International registers.

The trucks are the type supplied by the St. Louis Car Co. to the Milwaukee Electric Railway & Light Co. and other lines for heavy city and interurban service; the motors are inner hung.

As soon as possible the Chicago City Railway Co. intends to arrange the initial trip of the new cars, and the city authorities and many prominent citizens will be invited to participate in the ceremonies.



DOUBLE TRUCK CAR FOR CHICAGO CITY RY. ST. LOUIS CAR CO.

grooved, and the vestibules are stationary. The interior finish is of the finest mahogany, with embossed and artistic mouldings. All sash are glazed with plate glass; ventilator lights are chipped bevel plate; and in each of the four corner panels are beautiful bevel-edge mirrors. The curtains are made of a handsome design of Pantasote and provided with latest improved pinch fixtures. The ceilings are tastefully decorated in white, and no lights appear on the top headlining, all the lights being distributed along both sides of the car, below the main ventilator rail, giving, with the decorated globes, a dazzling effect when the lamps are lighted, and making reading easy and agreeable. The seats are the St. Louis Car Co's. new "walk-over" style, the total seating capacity being 52. Push-buttons for signalling the conductor are placed in each vestibule.

## CAPITAL TRACTION CO., WASHINGTON.

The annual report of the Capital Traction Co. of Washington, D. C., for the year 1900, has been submitted to Congress, and shows a substantial increase over the business of 1899. The report shows passenger receipts to have been \$1,136,674.46; freight, \$854.60; mail, \$2,855.70; bonds sold, \$1,080,000; advertising, \$9,999.96; track rental, \$200; rent of land and buildings, \$4,115.31; real estate, \$10,500; sale of tickets, \$3,752.54; miscellaneous income, \$3,511.66; total receipt, \$2,252,464.25. Balance, January 1, 1900, \$15,517.80.

The total operating expenses, exclusive of interest and taxes, were \$528,547.14. The ratio of operating expenses to receipts from operation was 46.



## FOR ILLUMINATING CAR SIGNS.

The accompanying illustrations show a device for illuminating the signs on street cars, which is the invention of Mr. F. G. L. Henderson, superintendent of the Newton (Mass.) Street Railway Co. The engraving is from a photograph showing the sign and illuminating device in place on the car hood, and the construction is readily apparent from it.

The standards supporting the sign and reflector are preferably



CAR SIGN ILLUMINATOR.

made of piping. The wires leading to the lamps enter at crosses in the vertical sections of the standards and are thence carried through the piping to lamp sockets on the horizontal pieces under the reflector.

These reflectors are now used on all the cars of the Newton Street Railway Co., and are giving perfect satisfaction.

## ACME OIL FILTER.

The advantages of using efficient oil filters in power plants are quite apparent, and managers and engineers will be interested in the description of the "Acme" oil filter, which is shown in the accompanying engraving. The filter is built of heavy galvanized iron. In the sectional view, A is the receptacle for oil to be filtered. The oil passes down through the central pipe into the lower part of the tank, which is filled with water. The oil rises through the water by virtue of its lesser specific gravity, and then passes through the filtering material located at C. D is a pan for catching the dirt that is precipitated in the water chamber. The medium size filters, having a capacity of from 2 to 16 gallons per 24 hours, have a double bottom forming a steam chamber, E, for heating the water. F is the inlet for steam, the outlet being on the other side of the filter. In larger



sizes, 25 to 35 gallons per 24 hours, a steam coil is placed in the bottom. The steam attachment increases the filtering capacity about 10 per cent.

The advantages claimed for the "Acme" are simplicity of construction, automatic operation, ease with which it can be thoroughly cleaned, and the fact that it costs practically nothing for maintenance. These filters are made by Walter L. Flower & Co., 211 Chemical Bldg., St. Louis.

A conflict between steam railroad and electric railway interests of Connecticut is anticipated at the coming session of the General Assembly at Hartford. Applications for charters have been filed for electric railways in all sections of the state, the number and extent of such projects seriously threatening the business of steam railroads.

## FEBRUARY STORMS.

The severest storm of the season drove over Chicago on a northeast wind at the rate of 56 miles an hour, February 3d, burying the city under 10 in. of snow. The storm indirectly caused the death of two persons, and injuries to 12 others. It is estimated that it cost the Union Traction Co. \$15,000 and the Chicago City Ry. \$5,000 to remove the snow from their tracks. The cost to the city for removing the snow from the down-town district was \$10,000. The snow being moist would stay where it was put and the sweepers easily kept tracks clear, and no serious damage or impediment to traffic on street railways resulted.

On February 8th the second blizzard struck Chicago. Four persons were killed and several injured in collisions and other accidents resulting from the storm. Railroad signal lights, exposed to the sweep of the wind, were either blown out or made invisible under sheets of snow and ice, and the signal service for the space of several hours was entirely demoralized. Switches became clogged, and a number of wrecks were reported. A collision occurred on the South Side Elevated Ry. between a passenger train and a train of empty cars entering the yards, and traffic on that line was impeded for an hour in consequence. The force of the collision threw the three empty cars across the track, but they were only slightly damaged. One truck fell from the structure. The motorman of the empty train was the only person injured; he was thrown to the street.

The covering of soft, sticky snow on the third rail of the elevated lines throughout the city, and especially on the loop, caused a brilliant electrical display. The Lake Street elevated trains were blocked between Austin Ave. and Wisconsin Ave. for two hours.

The cable trains in all parts of the city were obliged to wait on side tracks and switches till the sweepers and snow plows could clear the tracks.

At 63d and Ashland Ave. a collision between the Baltimore & Ohio passenger train leaving Chicago at 8 p. m., and a motor car attached to a snow sweeper on the Chicago City Ry., resulted in tearing the car from the sweeper and piling it up on the fender, where it was carried a block before the train could be stopped. The motorman was severely injured.

Telegraphic reports state that the storm, which swept over Kansas, Iowa, Missouri, Illinois and Michigan, impeded street railway traffic in several of the cities in these states. The street car lines in Burlington, Ia., were crippled. At Des Moines, the snow was eight inches deep, and cars were operated with difficulty. At South Bend, Ind., electric cars were scarcely movable, and business was practically suspended. The storm was at its height on the eastern shore of Lake Michigan. At Benton Harbor the blizzard did more damage than any storm in years. The mercury reached zero, and the snow was 18 in. deep.

## TRACK MATERIAL QUOTATIONS.

There has been absolutely no change in the steel rail market since last month, although the usual rumors of increases in prices are current. We quote: T-rails, heavy sections, \$26, f. o. b. mills; light sections, \$25.50 to \$28; girder sections, \$38. Track supplies, f. o. b., Chicago: splice bars, 1.30 to 1.40; spikes, 1.60 to 1.75; track bolts with hexagon nuts, 2.55 to 2.60, with square nuts, 2.40 to 2.45.

We have received tie quotations as follows: G. S. Baxter & Co., 18 Wall St., New York City, yellow pine, 7 x 9 in. x 8½ ft., 62 cents; 6 x 9 in. x 8 ft., 57 cents; 6 x 8 in. x 8 ft., 50 cents. Perri- zo & Sons, Daggett, Mich., cedar: 5 x 6 in. x 7 ft., 24 cents; 6 x 6 in. x 7 ft., 27 cents; 5 x 6 in. x 8 ft., 27 cents. Lindsley Bros. Co., Menominee, Mich.: cedar, 5 x 5 in. x 7 ft., 22 cents, 6 x 5½ in. x 7 ft., 25 cents; hemlock, 6 x 6 in. x 7 ft., 20 cents.

It is rumored that the New York Central R. R. is seeking to lease the Manhattan Elevated Railway System, in New York. As a result of the circulation of this story, February 4th Manhattan stock took on a tone of aggressive strength and on heavy transactions, 1,000-share blocks coming out at a time, rose rapidly from 117¾ to 120¾ closing at the high point for the day marking a net gain of 3¾ on transactions involving 50,000 shares.

### HALF FARES.

The council of Los Angeles, Cal., will put up for sale to the highest bidder, franchises for five street railway routes. These were asked for by the Los Angeles Traction Co.

The Pittsburg & Birmingham Traction Co. has concluded negotiations for the use of the South 10th St. bridge, agreeing to pay the city \$5,000 a year for the next 20 years for the privilege.

The United Traction Co. of Albany, N. Y., reports receipts from operation for the four weeks ending January 31st, of \$93,405.40 as compared with \$80,067.43 for the corresponding period last year.

The Rochester (N. Y.) Railway Co. is building a number of new cars, 10 of which will be completed and put in commission in May. Some of these are old vestibule cars, which are being reconstructed.

More than 1,000 motormen and conductors on Philadelphia lines are said to have suffered from the gripe, this winter. The prevalence of this disease has proved a serious inconvenience to the management.

The New York Railroad Commissioners will on February 14th-16th give a further hearing on the application of the Buffalo, Rochester & Niagara Falls Ry. for permission to build. The New York Central is opposing the application.

The Detroit & Chicago Traction Co., which was recently organized with W. A. Boland as president, and projects a direct service between the two cities, is negotiating for the purchase of a part of the Michigan Traction Co.'s property.

The Springfield (Mass.) Board of Trade desires to inaugurate a street railway mail service between that city and Northampton. The legislature will be petitioned to extend the Springfield Street Ry.'s charter to include the carrying of mails.

On January 1st, all the property and franchises of the Mason City Electric Co. which owns the electric light and power, gas and hot water heating plants in Mason City, Ia., were purchased by W. E. Brice of that city. During the coming year \$50,000 will be expended in extensions and improvements.

One of the street railways in Washington, D. C., is operating tourist cars which bear the inscription "Seeing Washington." Passengers are given a two-hour ride without stops, for 50 cents. The company employs a guide on each car to call the passengers' attention to the places of interest on the route.

The federal court has ordered the sale of the Sedalia Street Ry. under foreclosure proceedings of the first mortgage bondholders, the Kansas Loan & Trust Co. and the second mortgage bondholders, the Trust Company of America, of New York. The property has been in the hands of a receiver for several months.

The Coates Opera House, of Kansas City, Mo., where the delegates at the last convention of the American Street Railway Association spent a very delightful evening as the guests of the Metropolitan Street Railway Co., was burned to the ground on February 1st, with an aggregate loss of \$150,000 to building and contents.

January 25th, an accident occurred at the power house of the Dayton & Northern Traction Co., near Brookville, O., which resulted in the killing of E. B. Eversole, watchman in the company's employ. His death was caused by the explosion of the boiler of a steam traction engine, which had been used in the construction of a new line.

A movement is on foot in Atlanta, Ga., to impose an occupation tax on each mile of the tracks of the two street railway companies operating in that city, and also to tax each car that is run. The Supreme Court of Georgia in the case of a Savannah company held that such a tax may be imposed; the case has been taken to the federal courts.

April 8th, the stockholders of the Metropolitan Elevated R. R. of Chicago will vote on the question of authorizing an issue of bonds to be used in defraying the cost of extensions and additions to the property. The amount of the proposed bond issue has not been announced, but it will exceed \$1,400,000, which amount will be expended on the Garfield and Douglas Park branches.

Mr. L. H. Griffith has sued the Seattle (Wash.) Traction Co., the Seattle Consolidated Street Railway Co. and the Seattle Electric Co., claiming to be entitled to \$500,000 in securities of these companies. The defense of the Traction company is that Mr. Griffith's claims were only those of a second mortgage bondholder, and were wiped out by foreclosure under the prior mortgage in 1896.

January 30th, the Wayne Circuit Court of Michigan, granted an injunction restraining the Detroit street railway companies from carrying freight on their cars between the hours of 8 a. m. and 8 p. m. The ordinances permit the carrying of freight between the hours of 8 p. m. and 8 a. m. and the roads had received no permission from any authority to carry freight at any other time.

Mr. Frank N. Moore, proprietor of the electric line now building between Joplin and Galena, Mo., may offer a prize for the most appropriate title for that railway. The line is at present called the Mineral Cities Ry., but it is believed a better name can be found. Beside the transportation of passengers the line will do a large business in conveying zinc and coal from the mines in Kansas and Missouri.

The report of the Consolidated Traction Co., of Pittsburg, for December, 1900, issued January 16th, shows: Gross earnings from operation, \$249,445; operating expenses, \$109,069; net earnings from operation, \$140,376; total net income, \$168,370; net income after deducting taxes and rents, \$105,039; surplus after deducting interest and dividends on preferred stock, \$18,563. This is an increase in surplus of \$8,912 over December, 1899; for the nine months ending Dec. 31, 1900, the increase in surplus was \$65,955 over that for the corresponding months of the preceding year.

R. B. Baer, of the Galveston (Tex.) City Railroad Co., has filed his December report as receiver of that company and the Gulf City Street Railway & Real Estate Co. The report shows the total operating expenses for the month of December to be \$12,575.22 and the expenses of maintenance \$954.58, making an aggregate of \$13,529.80. The gross earnings within the same period were \$4,768.40 of which \$3,938.05 were total receipts from the cars and \$830.35 revenues from furnishing power and light and from miscellaneous sources. The totals go to show a deficit of \$8,761.40.

The Parker Engine Co., owner of the Parker steam generator, has issued a very interesting circular descriptive of the apparatus. The principal feature of this boiler, which is of the water-tube type, is that the circulation is positive, in one direction only, and is automatically regulated in velocity to correspond to the demands for steam. The maker claims that this boiler will give an evaporation of 11.5 lb. where 10.5 lb. would ordinarily be specified; that the moisture in the steam in no case will exceed 1 per cent, and that it will stand forcing to overload of 50 per cent without leaks developing. The sales department is under the management of S. C. Delameter, 1041 Drexel Bldg., Philadelphia.

The American Blower Co., of Detroit, has issued a very handsomely illustrated pamphlet, the A. B. C. No. 118, pointing out in a clear, concise and simple manner the advantages of mechanical draft, and describing the apparatus made by the company for service in boiler plants.

### INAUGURAL EXCURSIONS.

To Washington, D. C., via the Baltimore & Ohio Southwestern, will be run from all points March 1st, 2d and 3d. Tickets good returning to March 8th. Special low rates for military and other organizations. Three solid trains daily. Modern day coaches, Pullman drawing room sleepers, observation cars and dining cars. For detailed information call on any agent, or address O. P. McCarty, general passenger agent, Cincinnati, Ohio.

## RELATIONS OF THE STREET RAILWAYS AND THE PUBLIC.

E. G. Connette, in the Syracuse Post-Standard.

Street railroads are quasi public corporations, or, in latter-day phraseology, are "public utility" corporations, and the nature of the enterprise should make the conditions existing between the street railroads and the people of the most cordial nature. There should be a liberal and co-operative spirit on the part of the management and a proper appreciation and responsive sentiment on the part of the public.

The car service should be attractive, convenient and comfortable, and the employees polite, attentive and courteous in the discharge of their duty. The frequency and regularity of the service is what the public most desire, and while the frequency should be extended to the furthest limit, still, like any other business enterprise, it must keep within the bounds of business prudence and discretion, and, therefore, must govern the frequency of its service by the income and increase it from time to time as the patronage may warrant.

Under ordinary conditions a regular schedule can be maintained, and the enterprising and intelligent manager realizes the importance of running cars so that his patrons may rely on the time of cars to pass a given point, and even if the service is not very frequent, if people know "when to catch a car" they are generally satisfied unless the cars are so few in number that they seldom have the pleasure of a seat; but the natural difficulties and impediments to a prompt and regular service are numerous, which the public are loath to consider in forming an opinion of the car service.

It is impossible for cars to always run on time when there are steam railroad grade crossings, canal bridges, wagons loading and unloading alongside of streets so as to obstruct the car tracks; wagons breaking down, cars occasionally becoming disabled, and many other kind of unavoidable obstructions to the maintenance of a regular schedule; but, as a rule, these delays are not frequent, and if the public would appreciate the difficulties and be charitable enough to credit the service when the cars are on time as cheerfully as they are inclined to find fault when they occasionally have to wait a few minutes for a car, they would find that the balance was largely on the credit side of the ledger.

Street railroads inure more to the convenience and wealth of the community than any of the public utility corporations, as well as promote the sanitary conditions. The advent of rapid transit and the extension of lines into the suburbs has been the means of building up large areas of land that would otherwise still be utilized as farms and for garden patches; the development of suburban property has enhanced its value ten fold and more, which has brought into the treasuries of the State, county and city many thousands of dollars in taxes.

The convenience of quick transit makes the possession of a home possible with the workingman and the man of small means; it provides his family with plenty of fresh air instead of being crowded into a disease-breeding tenement house; it makes beautiful lawns and large playgrounds for the children possible and allows the development of esthetic and artistic taste in architecture.

All these and many more are to the credit of our transportation facilities, and yet with all the conveniences and advantages of rapid transit and a full realization that street cars are almost an indispensable commodity, there is sometimes an inclination to deal unfairly with street railways, perhaps because the management does not show a proper disposition to deal fairly with the people, but in most cases because a street railway is a corporation.

People as a rule confound corporations with trusts and monopolies, and the prejudice that exists against corporations per se is unwarranted, unjust and wrong. Corporations are simply an aggregation of individuals who establish an enterprise and become incorporated as a company for the purpose of restricting their individual liability. Street railroads may consolidate and in one sense resemble a trust, but a consolidation is always beneficial to the people, as it can only be done under the law which restricts the charge of one 5-cent fare from one point to any other point within the city limits, which gives the people a longer ride and accessibility to more parts for the same 5-cent fare.

Street railroads are natural monopolies, but they can only charge for their product what the law allows—a 5-cent fare—and they are, therefore, a harmless monopoly.

A mutual good feeling between the public and the street railroad redounds to the interests of all concerned, and a happy, contented and satisfied state of mind produces a natural inclination to see the pleasant things of life.

## COLUMBUS COUNCIL PASSES FRANCHISE.

The blanket franchise of the Columbus (O.) Railway Co., which has been pending for so long a time, was passed in an amended form by the city council, February 4th, by a vote of 12 to 7.

The franchise as passed together with the amendments thereto, had been approved by the Board of Public Works and the mayor has approved the ordinance. The principal provisions of the new franchise are: cash fare, 5 cents; seven tickets for 25 cents; transfers on tickets; owl cars on the principal lines with 10-cent fares; eight tickets for 25 cents when the annual gross receipts of the company reach \$1,750,000; transfers for cash fares to all the interurban lines; no waiver to claims of perpetual franchises on certain lines; no pledge to arbitrate labor troubles; no forfeiture for any cause. The company is willing to put the terms of the ordinance into operation at once, thereby giving the people the advantage of reduced fares, but will not do so until one or two injunction suits are dismissed. Popular approval of the ordinance will, no doubt, bring this about within a short time.

A conference between the officers of the company, the members of the citizens' committee and the city councilmen was held on the afternoon of Monday, February 4th, at which the company agreed to the foregoing concessions, and Pres. R. E. Sheldon announced that the ordinance with such amendments would be accepted and the reduction in fares made effective Wednesday, February 6th, providing the injunction suit to restrain the publication of the ordinance was dismissed.

## WAGES ADVANCED.

Many of the street railways in various parts of the country since the beginning of the year have found that the business was such as to warrant an increase in the wages of employees. In most cases the "raise" has come as a complete surprise to the employees.

The Grand Rapids (Mich.) Consolidated Street Railway Co. authorized the following wage scale, which became effective February 1st: Motormen and conductors in the service of the company six months or less will be paid 15 cents per hour; from six months to one year, 15½ cents per hour; from one to two years, 16 cents per hour; from two to three years, 17 cents per hour; from three to four years, 17½ cents per hour; four years and over, 18 cents. The announcement was made that the increase had been granted by the directors of the company in recognition of the carefulness and efficiency of the older employees, and as an incentive to increased effort on the part of the newer men. The new scale will affect 225 motormen and conductors.

The Union Traction Co. of Indiana has inaugurated a new wage scale by which 200 conductors and motormen on the Anderson lines and the lines radiating from that city to Indianapolis, Marion, Elwood and Muncie will receive 17 cents per hour. Notice of the new wage scale and a short-hour schedule was given out January 21st. The amount of the increase is one cent per hour on city lines, and two cents on interurbans.

The Schuylkill Valley Traction Co., Norristown, Pa., granted an advance in wages to its 50 employees, January 16th. The wages of conductors and motormen alike have been increased from 12 cents to 16 2-3 cents per hour. The men had a banquet to celebrate their unexpected good fortune.

The Lehigh Valley Traction Co., Allentown, Pa., January 13th, announced that the wages of conductors and motormen, 200 in number, would be advanced. The scale gives new men 15 cents per hour and one cent an hour advance per year, five-year men receiving 20 cents.

The Elizabeth, Plainfield & Central Jersey Street Railway Co. has advanced the wages of conductors and motormen on the line between Elizabeth and Plainfield from \$1.75 to \$2.00 per day. On the local lines the men have been raised from \$1.75 to \$1.85 per day. Hereafter, new men will be placed on one of the smaller divisions at the rate of \$1.75 per day for the first six months; at the end of which time their wages will be advanced to cents. All employees are thus affected by the new scale, which went into operation February 4th.



## ELECTRIC TRAMWAYS OF SWANSEA, WALES

Early last August the recently completed electric lines of the Swansea Tramways Co., which is controlled by the British Electric Traction Co., were opened to the public with elaborate ceremonies that included a trip in the cars, a luncheon and a number of speeches by distinguished guests.

The tram lines that have now been converted to electric traction were originally laid down by the Swansea Improvement & Tramway Co. and operated by horses. Just before this company's franchises expired the property was sold to its present owners, who succeeded in obtaining parliamentary powers to equip with electricity and extend to nearby suburbs.

The system consists of an almost complete loop in the city of Swansea, from which there radiate four branches, one to the power station at St. Helens, one to the docks, a third to Cwmbwrla and a fourth to Morriston. The entire length of route is five miles of which three miles are laid with single track. The rails are 87-lb. steel girders, supplied by the Lorain Steel Co., of Lorain, O. The space between the rails is laid with granite blocks or setts as they are called in Europe. The heaviest grade is 1 in 22, and there is a half-mile stretch with an average of 1 in 24. The sharpest curve is one of 40 ft. radius.

Particular interest attaches to the overhead construction owing to the precautions taken to prevent telephone or other wires from falling on to the live trolley wire. To this end two guard wires are suspended above the trolley wire by brackets attached to each pole as shown in one of the illustrations herewith, for which we are indebted to the Electrician, London. Part of the road has side poles and part center poles. The trolley wire is No. 0 S. W. G. (0.324 in. in diameter) and the return circuit through the rails is supplemented on the long sections by two Callender lead-covered cables, which are carried in cast iron pipes at the side of the track, as are also the feeders which are lead-covered cables, feeding into the trolley wire at intervals of half a mile, lightning arresters being installed at the feeding points.

When passing under railway bridges, a somewhat novel arrangement has been adopted to obviate the need of securing permission

The power station includes the engine room, 29 x 65 ft., and a boiler room 37 x 39 ft. There are at present installed two 350-h. p. Ball & Wood compound engines, running at 200 r. p. m. with 150 lb. steam pressure, direct coupled to two 200-kw., 8-pole Westinghouse generators. The engine cylinders are 15½ and 31 in. by 16 in. stroke. The generators are guaranteed to carry 400 amperes at 550 volts.

In the engine room there is also a small motor-generator set, consisting of an Alley & Maclellan engine, operating at 450 r. p. m.,



ARRANGEMENT OF WIRES AT OVERHEAD BRIDGES.

and two 20-kw. dynamos, mounted on the same bed plate, one designed for 500 volts and one for 100 volts. When the main generating units are running, the 500-volt machine takes current from the bus bars and operates as a motor, driving the 100-volt machine for lighting purposes and for operating the feed pumps, etc. At night when the large plant is shut down, the motor-generator plant, by means of a friction clutch is coupled to the small engine, which runs the 500-volt machine as a dynamo, supplying sufficient current to operate a few owl cars and move cars about the yards. The small engine also drives at night the 100-volt machine, which generates current for operating the station lights.

In the boiler room are two Babcock & Wilcox boilers, each capable of evaporating 7,000 lb. of water per hour at 150 lb. pressure from 150° F. The station is also equipped with a Babcock & Wilcox superheater, a Green fuel economizer of 160 tubes, a Wheeler condenser and steam and electric feed pumps. Weighing machines, over which the coal passes from the bunkers to the boiler room enable a daily record of coal consumption to be kept.

The company operates 41 cars, part of which are single truck and part double truck. The long double-truck cars have the doors in the middle of the side, and are each equipped with two 25-h. p. motors.

## NEWSPAPER CAR ON CHICAGO LINE.

The Chicago Union Traction Co. has placed in operation a special newspaper car for the accommodation of the Chicago Tribune. The car is in position at Randolph and State Sts. at 3:30 a. m. daily and starts at about 4 a. m. on a distributing trip, reaching North Evanston, 14 miles, in one hour. Papers are distributed at all the stations between Rogers Park and North Evanston, and at the latter place the papers for Waukegan are transferred to the Chicago & Milwaukee Electric Ry. By this arrangement the Tribune reaches the suburban stations at an earlier hour than it would by the steam trains, and there is the further advantage that if it is desired the paper may be delayed slightly to get in late news without danger of missing the trains, since the Tribune has entire control of the street car. This service has been in operation since the latter part of December.

The directors of the North Chicago Street R. R. Lessor of the Chicago Union Traction Co., have authorized an issue of \$4,800,000 4½ per cent funding bonds, to be used to take up the outstanding bond, bearing higher rates of interest, as they mature.



OVERHEAD CONSTRUCTION.

from the railway company to attach the wires to the bridge. The manner of doing this is made plain in one of the accompanying engravings. The poles from which the wire is suspended are set as near the bridge as possible, and to prevent the trolley wheel from forcing the wire up against the bridge, an inverted wooden trough is supported from the poles, immediately above the wire.

## ECHOES FROM THE TRADE

F. H. LOVELL & CO., makers of overhead material, have moved into a large factory at Arlington, N. J.

CATALOGS AND PRICE LISTS of electrical machinery and supplies, engines, etc., are desired by La Campana Electrica de Regla & Guanabacoa, of which H. H. Rivera de Gray, Regla, Cuba, is electrical engineer.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has established a branch office at St. Louis, Mo., which will be in charge of Mr. R. H. Klauder, formerly of the Philadelphia staff. Mr. Klauder will make his headquarters in the Wainwright Building.

THE MORRIS ELECTRIC CO., 15 Cortlandt St., New York City, has recently made what is said to be the largest single shipment of iron trolley poles ever sent out of the country. The poles, 8,000 in number, were made by the Electric Railway Supply & Equipment Co., and are going to India.

THE SUIT of the General Electric Co. to enjoin the Webster & Dudley Street Ry. from infringing Letters Patent 377,996 (the Eickemeyer winding patent) was decided in favor of the plaintiff by the United States Circuit Court for the District of Massachusetts on December 26th.

THE SWARTS METAL REFINING CO., 20 N. Desplaines St., Chicago, which does an enormous business handling and refining scrap metal, purchased the entire lot of trolley wire used by the City Railroad Co., of Galveston, Tex., and torn down by the storm in September last.

THE STANDARD PAINT CO., of New York, owing to the demands of its increasing business, has taken new offices in the building at 100 William St., New York, where it will occupy about one-half of the fifth floor. The old quarters at 81 and 83 John St. will be retained as a store and shipping room.

THE BURT MANUFACTURING CO., of Akron, O., was recently given an order for two 150-gallon "Cross" oil filters, to be placed in the new power house of the Havana (Cuba) Street Ry. As this station is thoroughly up-to-date in every respect, the order is a strong endorsement of the "Cross" filters.

THE FALK CO., of Milwaukee, has upon its books at this time orders for street railway specialties and supplies from practically every civilized country on the globe, a fact that bears eloquent testimony to the company's enterprise and also to the worth of its products, for several branches of the business have been established at a comparatively recent date.

THE CLAYTON AIR COMPRESSOR WORKS, 26 Cortlandt St., New York, has recently issued its new catalog No. II, illustrating and describing the many types of Clayton air compressors, receivers, vacuum pumps, carbonic acid gas and high pressure compressors and the Clayton air-lift pumping system. This catalog is one of the most complete ever published on this subject.

THE STERLING VARNISH CO., of Pittsburg, has completed a new factory, and in addition to its widely used insulating varnishes will hereafter carry a full line of house, coach, car and furniture varnishes. The Sterling company reports that the sale of its insulating varnishes is constantly increasing, and the company is now filling more orders for these goods than at any time since it started in business.

MR. JOHN S. SPEER, general manager of the Speer Carbon Co., of St. Marys, Pa., recently spent a week in New York and

surrounding territory. The Speer company has a very large trade among the street railways in the East as well as in the West, and Speer carbon brushes are coming to be accepted as standard on many leading systems. Mr. Speer reports that the sale of his new "long life" brush is far beyond expectations.

IT IS SAFE TO SAY the name of George Kissam & Co. is familiar in every country where street cars run, but it may not be generally known that this company enjoys the distinction of being the largest street car advertising concern in the world. The firm is prepared to negotiate for long time leases for advertising space with first class roads everywhere. The general offices are at 253 Broadway, New York, with branch offices in all leading cities.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., of Pittsburg, will supply the electric motors to be used for drawing canal boats on the Miami & Erie canal in Ohio. The contract calls for 200-h. p. motors weighing 25 tons which will be run on a standard gage track with heavy rail. Mr. T. N. Fordyce, of Detroit, who has leased the canal, proposes to have the towpath completely equipped for electric traction in less than two years.

GRAPHITE AS A LUBRICANT. The Joseph Dixon Crucible Co. has just issued the seventh edition of this booklet which treats of the properties of graphite and its usefulness as an accessory for engineers and mechanics. Some new matter has been added, but tests quoted and testimonial letters are the same as in previous additions, the company believing that it was unnecessary to introduce new witnesses, though there were plenty of them to be had.

THE B. F. STURTEVANT CO., of Boston, Mass., has sent us extracts from the report of a committee appointed by the Central Railway Club to determine the "best form of construction and methods of ventilating, heating and general equipment of round houses." The committee decided that, the hot-blast system of heating ought to secure better ventilation in round houses than has ever been accomplished by heating with steam coils in the pit." The Sturtevant hot-blast system has been installed in round houses on a number of leading railroads.

THE BETHLEHEM STEEL CO. sends us the following statement: "It having been brought to our attention that a concern styling itself the Edison-Holzer Steel & Iron Process Co. has been using the name of the Bethlehem Steel Co. in a letter issued by it in which it asks for subscriptions to the stock of the company, we beg to state that this company has no connection whatever with the Edison-Holzer Steel & Iron Process Co., nor do we in any way endorse the merits claimed by it for that process for treating steel."

THE AMERICAN VITRIFIED CONDUIT CO., of New York City, is sending out a very acceptable desk novelty in the shape of a combined paper weight and pen and pencil holder, made from a miniature sample of multiple duct conduit. The company reports the volume of business for the past year as very satisfactory, and its works, both at Perth Amboy, N. J., and Willoughby, O., are running full capacity. The credit for this state of affairs is due to the efforts of Mr. Bleeker S. Barnard, general selling agent, combined with the high standard always maintained by the company in the production of its goods.

THE B. F. STURTEVANT CO., of Boston, Mass., recently received the following unsolicited letter from The Widdicomb Furniture Co., Grand Rapids, Mich., which speaks for itself: "Enclosed we hand you check for exhaust head, which was applied yesterday and found to be the most efficient device for the purpose the writer has ever seen." The condition of the atmosphere this morning is one of extreme moisture, which certainly would display any spray



passing out with the steam, but not a particle of moisture can be found in the air, and that even within 12 in. from the exhaust steam. As we have to purchase our water supply the device will soon pay for itself."

**THE ENGLISH ELECTRIC MANUFACTURING CO., LTD.**, of Preston, Lancashire, England, has sent us a handsomely printed, illustrated pamphlet, describing its extensive works and shops at Preston, from which it appears that this company has succeeded in building up an establishment, which in completeness of equipment, and range of operations, quite properly takes rank with the great electrical manufacturing plants of Germany and America. The company makes everything required in the electrical department of street railways and lighting plants and has installed several of the foremost central stations in Europe. Dick, Kerr & Co., Ltd., 110 Cannon St., London, E. C., are sole selling agents for this house.

**THE STANDARD UNDERGROUND CABLE CO.**, of Pittsburgh, Pa., announces that it has recently completed and put in operation an eastern factory at Perth Amboy, N. J., and can therefore offer eastern territory favorable freight rates and assurance of the prompt filling of orders. The eastern and northeastern sales department has been created and Mr. Charles J. Marsh, formerly officially associated with the lighting companies of New York City, appointed general manager with offices at 36 Liberty St., New York. Mr. George L. Wiley continues as manager of the eastern sales department with offices at 36 Liberty St., New York, and his former assistant, Mr. Atlee B. Saurman, will be manager of the eastern sales department with offices in Boston.

**THE PHILADELPHIA INQUIRER** in its market editorials comments on the disappointment of the stockholders of the Pennsylvania Steel Co., which proposes to "inject \$11,750,000 of water into the company's capitalization, and to give \$11,000,000 of this to a syndicate." While the stockholders have for a long time been assured of accumulating profits, the payment of dividends has been deferred and spent on betterments which are now apparently to pass to new hands. The plants at Sparrow's Point and Steelton are valued at \$20,000,000 against which are bonds and stock of \$13,000,000 leaving an equity belonging to the stockholders of \$7,000,000. This equity would more than be absorbed in the \$11,000,000 bonus offered the syndicate which is the proposed buyer of the concern.

**THE ELECTRIC STORAGE BATTERY CO.**, of Philadelphia, has recently closed a contract with the Camden (N. J.) & Suburban Railway Co., for the installation of an additional battery of "Chloride" accumulators to be located at Pensauken Creek, near Moorestown, N. J. The new battery sub-station is made necessary by the extension of the railway company's lines to Moorestown, a distance of 10 miles from the power house at Camden. The battery will consist of 240 cells having a capacity of 200 kw. h., and is the third order for accumulators received from the Camden company. The Electric Storage Battery Co. has also closed contracts with the Youngstown (O.) & Sharon Street Railway Co. for furnishing two batteries of "Chloride" accumulators, each battery consisting of 288 cells and having a capacity of 191 kw. h.

**MR. A. W. FIELD**, of Boston, reports a number of contracts recently closed including orders for Central Union Brass overhead material and Peckham double trucks, for the Providence & Taunton Street Ry.; overhead material and trucks of the same make, and American cars for the new Boston & Worcester Street Ry.; overhead material and trucks for the Philadelphia & Trenton Street Ry.; American cars and Peckham trucks for the New Bedford & Onset Street Ry. The Boston & Worcester Street Ry. will be 38 miles in length, running from the City Hall in Worcester to the Park Station in Boston. Cars will enter Worcester over the lines of the Consolidated company, and enter Boston over the Boston Elevated Ry. A speed of 40 miles will be attained and the running time between the two cities will be 1 hour and 38 minutes.

**THE W. R. GARTON CO.** has taken the agency for the product of the United States Projectile Co., of New York, and advises us that the opening of trade in this line is very encouraging. Already

large lists have been offered and the prospect for contracts is very pleasing. The United States Projectile Co.'s patent pressed steel pinions are widely known and have a reputation for long life and even texture. The Garton company is also selling large numbers of arc headlamps and 500-volt multiple arc lamps as made by the Lea Electric Manufacturing Co. for which it is agent. Numerous sales are also being made of the De Witt "Common Sense" sand box and Clark track scrapers. The new year opens with very encouraging prospects. Some very nice contracts have lately been secured by the W. R. Garton Co. for poles, brackets and other material from the coast and western states.

## NEW PUBLICATIONS.

**THE ELECTRIC STORAGE BATTERY CO.** has issued its illustrated circular No. 62 containing a reprint of a paper on "The Desirability of Using Storage Batteries in Connection with Stations of Medium Size," read by Mr. L. G. White, superintendent of the Columbus Edison Electric Light Co., before the Ohio Electric Light Association, at Toledo in August, 1900.

**STREET CAR BUILDING.** By Charles Henry Davis, C. E.—This pamphlet is a reprint of the articles on Stephenson practice in street car building by Mr. Davis that have appeared in the Street Railway Journal during the past year, including all the large plates and 61 pages of text. The total number of engravings is 640, illustrating in minute detail the various parts of different styles of street cars. Principal features are 40 tables giving detailed specifications.

**PRICE LIST AND CATALOG** of the Brush Electrical Engineering Co., London, Eng. The Brush company makes alternators, dynamos and motors, engines, direct-connected units, and electrical accessories of all kinds, for electric lighting, electric railways, and electric power plants. The new price list gives short descriptions with price and code word of the leading products of the company for all sizes made. All Brush apparatus is set up and thoroughly tested before shipment, and if the purchaser desires he may be present at these tests.

**THE ENGINEERING MAGAZINE** for January is a special number containing 330 reading pages devoted to articles by eminent authorities on industrial, manufacturing and commercial topics. Among the articles and papers are descriptive studies of the Carnegie, Krupp, Westinghouse and other foremost industrial establishments in Europe and America with biographical sketches of their founders; reviews of progress in steam, electrical and mechanical engineering; and treatises on the management and control of railway and shop employees, including discussions on various piece-rate and premium systems for employees, and the relation of both employer and employee to trade unions and to trusts.

**SCHERZER ROLLING LIFT BRIDGES.** Published by the Scherzer Rolling Lift Bridge Co., Chicago. One of the greatest hindrances to the development of the lake commerce of Chicago has been the obstruction of the river, forming the connection between the lake and the internal harbor, by the center piers of swing bridges. The city has, however, adopted the policy of preventing the erection of new obstructions and of gradually removing the old ones. Of the various designs of movable bridges that have been considered and adopted, that of the late William Scherzer has superior advantages, in the way of efficiency, safety, and economy, and bridge engineers or others who may be interested in this subject will welcome the appearance of this volume. The Scherzer rolling lift bridge was patented Dec. 26, 1893, and since that time a number of them have been constructed. The best known to street railway men is, doubtless, that built by the Metropolitan Elevated, Chicago; others are the Van Buren St. highway bridge, Chicago; North Halsted St. highway bridge, Chicago; a six-track bridge for the N. Y., N. H. & H. R. R. at Fort Point Channel, Boston; one for the Big Four at Cleveland; an eight track railroad bridge over the Chicago Drainage Canal. There are now under construction seven other Scherzer bridges for Chicago and two for Cleveland. The book which has just been issued by the company has been prepared by Mr. Albert H. Scherzer, the president, is very handsomely printed, and in addition to numerous line draw-



ings and black and white illustrations contains 23 photogravures showing different views of completed bridges. The text deals with the history of movable bridges, particularly with the Scherzer bridges, the commerce of Chicago as affected by the city's bridges, and concludes with an essay on "The Tendency of the World in Transportation." Copies may be obtained for \$10.00 each, prepaid, by mail or express.

### CHEAP RATES TO CALIFORNIA.

February 12th and each Tuesday thereafter, until and including April 30th, Special Low Rate Colonist Tickets will be sold via the Southern Pacific Company's Ogden and Sunset Routes to all points in California.

The rate will be: From Chicago \$30.00, from St. Louis, Memphis and New Orleans \$27.50, from Omaha, Kansas City, etc., \$25.00. Corresponding low rates from all other points east and north.

For particulars and detailed information pertaining to the Southern Pacific Company's Routes, and these special rates to California, call upon or address W. G. Neimyer, General Western Agent, Southern Pacific Co., 238 Clark St., Chicago.

### NEWS NOTES.

#### NEW CORPORATIONS.

**READING, MASS.**—The Reading, Wakefield & Lynnfield Street Railway Co. has been organized with a capital stock of \$90,000, to build an electric line between the cities named in the title, connecting at Lynnfield with the Lynn & Boston R. R. The directors of the new company are: Richard Britton, Charles F. Woodward, E. M. Southworth, and Denis Lyons, of Wakefield; Albert Mansfield, of Lynnfield, and A. J. Francis and W. S. Parker, of Reading.

**SOUTH WEYMOUTH, MASS.**—The Weymouth & Scituate Street Railway Co. has been organized to build an eight-mile electric line from South Weymouth to the village of Assinippi, in Hanover. Connections will be made with the proposed Norwell, Scituate & Cohasset Ry.

**GREAT BARRINGTON, MASS.**—William Stanley, F. N. Deland and Charles Giddings, of Great Barrington, have organized the Southern Berkshire Street Railway Co. which will apply to the Legislature for incorporation. It is proposed to build an electric railway from Great Barrington to Sheffield and Egremont.

**CLEVELAND, O.**—The Richmond & Petersburg Electric Railway Co., comprising Cleveland and Akron capitalists, has been organized with Major Corbin Warwick, president, and Judge J. L. Haner, secretary, both of Richmond, and J. J. Nutt, treasurer, of Akron. It is proposed to build a 22-mile electric line between Richmond and Cleveland in the early spring, and to clear 435 acres of timber land between the proposed route and the James River, to be used as picnic grounds. The Cleveland Construction Co., in which Will Crispy, of Akron, is principally interested, and which was noted in the "Review" bulletin November 29th as having been incorporated for the purpose of promoting and financing electric railways, will construct the line. Preliminary work is to be commenced at once.

**DAYTON, O.**—The Dayton & Northwestern Traction Co. has been incorporated by Allen C. McDonald, H. G. Cress, C. J. Hall and David S. Baker to build an electric line from Dayton through Brookville, Lewisburg and New Paris to the Indiana state line.

**WAMPUM, PA.**—A charter has been issued to the Wampum & Ellwood City Street Railway Co., of Wampum, granting it the right to build an electric line between Wampum and Ellwood City. The company is capitalized at \$20,000. R. R. Quay, of Sewickley, president; and Gaylord Thompson, C. C. Robinson, J. M. Walker and Ferdinand Kincaid, of New Castle, directors.

**NEW CASTLE, PA.**—The New Castle & New Brighton Street Railway Co. has secured a charter for an electric line from New Castle to Wampum, a distance of seven miles, where connections will be made with the proposed Wampum & Ellwood City line. The company is incorporated with \$40,000. Gaylord Thompson, of New Castle, director of the Wampum & Ellwood City Street Railway Co., may be addressed.

**CONNERSVILLE, IND.**—The Connorsville Traction Co. has been incorporated with a present capitalization of \$25,000, to build an electric railway in Connorsville. The directors are: James E. McFarlan, Mart Meyer, and Richard N. Elliott.

**GREENSBURG, IND.**—The Greensburg & Versailles Railway Co. has been organized with J. M. Gore and G. W. Bryson, of Indianapolis, as directors, and proposes to build an electric line between the cities named in the title. Elections have already been called in Decatur and Ripley Counties for the voting of subsidies.

**AUBURN, CAL.**—The Auburn Electric Railroad Co. has been incorporated with \$50,000 capital stock to build a system of electric railways in Auburn. A part of the stock is already subscribed. The directors of the company are: A. S. Moore, of Stockton; B. F. Hartley and J. H. Willis, of Auburn; P. C. Moore, of San Francisco, and F. G. Flanagan, of St. Louis, Mo.

**BALTIMORE, MD.**—The Dundalk, Sparrows Point & North Point Railway Co., in which Nelson Perrin, Edward Bartlett and George C. Jenkins of the United Railway & Electric Co., of Baltimore, are principally interested, has been incorporated with \$250,000 capital stock, to build a five-mile electric line from Dundalk to North Point, via Sparrows Point.

**GREENVILLE, PA.**—The Greenville Street Railway Co. has been chartered with a capital stock of \$50,000 to build a five-mile electric line through that city. J. H. McCaffarty, president; J. S. Matson, T. Reiss, A. S. Heese and T. F. Wasser, directors, all of Greenville.

**LANSING, MICH.**—The Lansing & Southeastern Railway Co. has been incorporated to build an electric line between Lansing and Chelsea to connect with other roads now under construction which will eventually give an electric railway service between Lansing, Chelsea, Jackson and Detroit. The promoters are George P. Glazier and H. S. Holmes, of Chelsea.

**BATTLE CREEK, MICH.**—A company has been organized to build an electric railway from Battle Creek to Detroit, a distance of 145 miles, those principally interested being William A. Boland, who is building a line between Jackson and Ann Arbor and P. H. Flynn, of New York. The capital stock of the company is reported to be \$4,000,000, and it is said that bonds to the same amount will be issued. It is the project of the company to ultimately put in operation a trolley line between Detroit and Chicago, and such links as shall be necessary to complete a direct route will be constructed. Surveyors are at work between Detroit and Ann Arbor. The Boland route will parallel the line already in operation between these cities.

**CHICAGO HEIGHTS, ILL.**—The Chicago Heights Street Railway Co. has been incorporated with a capital stock of \$100,000, with Charles H. Wacker, president; and Leo Fox, Leo Brand, Leo Fox, George Beale and Francis Lackner, directors. Application for franchises through the principal streets of Chicago Heights will be made within 10 days.

**BELOIT, WIS.**—The Rock River Electric Co., of Beloit, has been incorporated with a capital stock of \$50,000 to build an electric line from Beloit to Rockford. The promoters have secured franchises from Rockford to Belvidere, and have petitioned the council of Beloit for a franchise. T. F. Rawly, J. T. Barber and S. G. Moffatt of the Western Lumber Co., of Eau Claire, Wis., are principally interested.

**CANANDAIGUA, N. Y.**—Articles of incorporation for the Rochester & Eastern Rapid Railroad Co. have been filed, Detroit, Mich., capitalists holding 4,821 of the 5,000 shares. The company proposes to build an electric line 45 miles long, consisting of Geneva, Geneva, and intermediate cities, and will locate its headquarters in Canandaigua. John Winters, McClelland Bldg., Detroit, may be addressed.

**TOLEDO, O.**—The Toledo, Waterville & Southern Railway Co., of Toledo, has been incorporated with a capital stock of \$25,000 and proposes to build an electric line between Toledo and Napoleon. The Toledo, Napoleon & Defiance Railroad Co. has been incorporated to build between Toledo and Defiance, through Lucas, Henry and Defiance Counties.

**CINCINNATI, O.**—The Hamilton, Glendale & Cincinnati Traction Co., of Cincinnati, has been incorporated with a capital stock of \$250,000.

**LAPORTE, IND.**—The Laporte & South Bend Railway Co., capitalized at \$1,000,000, has applied for incorporation and proposes to build an electric line between Laporte and South Bend so soon as franchises can be secured. When this road is completed a direct trolley route between Goshen and Michigan City will be afforded.

**SHARON, PA.**—The Sharon & New Castle Electric Street Railway Co. has applied for incorporation with a capital stock of \$10,000. The incorporators are: W. J. Thompson, Youngstown; H. J. Dahlinger and V. V. A. Powell, Pittsburg; J. W. Thomas, East, and A. H. Mercer, Allegheny.

**WINONA, MINN.**—The Mississippi, Eau Claire & Northern Railway Co., capitalized at \$500,000, has been incorporated, and proposes to build an electric line from East Winona to Eau Claire. Preliminary surveys are being made, and rights of way will be applied for.

**TIPTONVILLE, TENN.**—The Rapid Transit Electric Railway Co. is being organized to build a line from Tiptonville to Obion. Col. J. C. Harris, of Tiptonville, is principally interested. The rights of way have been applied for, and preliminary surveys are being made. The proposed line is 25 miles long.

**LEONARDTOWN, MD.**—The Washington, Mechanicsville, Leonardtown & Point Lookout Electric Railway has perfected its organization, with R. C. White, Delaware, president; E. M. Pine, New York, N. Y., vice-president; and C. R. Morgan, Philadelphia, secretary and treasurer. A street railway between the cities named in the title is projected.

**TACOMA, WASH.**—Articles of incorporation for the Seattle & Tacoma Short Line Railway Co. have been filed. It is proposed to commence the construction of the line so soon as the proper charter permit. The following officers have been elected: Thomas B. Carter, president; H. C. Bailou, secretary, and John L. Neagle, treasurer.

**AUGUSTA, ME.**—The Peaks Island Electric Railroad Co. has applied for incorporation with a capital stock of \$25,000, and proposes to build an electric line six miles long around Peaks Island, Portland Harbor. The principal promoters are: Louis R. Wheilden and James H. Boyd, of Portland, Me.; John Kelley, of Somerville, Mass., and George A. Bruce, of Brookline, Mass.

**PITTSFIELD, MASS.**—A company has been organized with a capital of \$1,000,000 to build an electric line from Adams, Mass., through the entire length of Berkshire County to the Connecticut state line, passing through Lenox and Stockbridge. Thomas Post, William D. Curtis, Capt. John S. Barnes, David Lydig and Mrs. Anna A. Bradford, all of Lenox, Mass., are the principal stockholders and promoters.

**BIRMINGHAM, ALA.**—The Metropolitan Rapid Transit Co. has been organized to build an electric railway through the city. It is stated that \$300,000 have been subscribed for the enterprise. Eugene Enslin has petitioned for county commissioners for rights of way.

**SISTERSVILLE, W. VA.**—The Tyler Railroad Co. has been chartered to build an electric line through Tyler County, from Sistersville to West Union. Local capitalists have subscribed \$150,000 for the construction of the line.



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## CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

## DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to *The Review*, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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In addition to the business office which the "Review" has for several years maintained in New York City, and which is now in charge of our eastern manager, Mr. H. J. Kenfield, an eastern editorial office has also been established. The editorial department of the "Review" will be represented by Mr. Charles B. Fairchild, jr. The New York office is at No. 39 Cortlandt St.

The dates for the next annual meeting of the American Street Railway Association having been decided upon, we are enabled to make our announcements concerning the "Daily Street Railway Review" which will be published at New York during the convention. The "Daily" will be issued each morning from October 9th to 12th, inclusive, the three days of the convention, Wednesday, Thursday and Friday, and on Saturday. As at Chicago in 1899, and at Kansas City last year, the "Daily" will contain full reports of the proceedings of the two associations, the register of those in attendance, the occurrences of interest, the programs for succeeding days and other features which will make the third annual publication of the "Daily" an even greater success than the first two proved to be.

The "Daily Street Railway Review," in addition to its circulation at the convention, will be mailed to every street railway company in the world.

The executive committee of the American Street Railway Association is to be heartily congratulated on the action it took regarding the papers to be read at the New York meeting. Heretofore it has been the policy of the Association to withhold the papers from the membership at large until they were read at the meeting; this required that the greater part of the time of the convention be devoted to the presentation of the papers, and that those delegates who wished to discuss the subjects on the program either prepare their remarks without knowledge as to the position the author of the paper had taken on debatable points, or else speak extemporaneously. Now a radical departure

from the former practice has been made and the papers will be printed and sent to the members in advance of the meetings, and in the convention will be read by title only. One very great advantage of the change is apparent from the program adopted, there having been eleven topics chosen on which papers will be submitted at the four business meetings of the Association; last year there were three business meetings and only four papers read.

In commenting, in the "Review" for November, 1900, on the Kansas City convention we urged the need of advance publication of the A. S. R. A. papers and pointed out that the delegates to our conventions are for the most part managers and other executive officers who cannot carry in mind all the details of the practice of their respective companies in technical matters, while at the same time, if given opportunity, they could easily inform themselves on such points and be prepared for discussion. We shall be greatly disappointed if the results of the new plan do not prove to be extremely satisfactory.

The subjects chosen are all timely and indicate by their variety that the field covered by the Association is constantly broadening.

The supply men will be well cared for in New York, Madison Square Garden having been leased for the entire week. The first meeting of the convention has been set for Wednesday instead of Tuesday, as has heretofore been the practice, and exhibitors will have an additional day for the installation of their exhibits. New York City is convenient for the great majority of the manufacturers of street railway supplies, and we may confidently look forward to a display by the exhibitors that will be more extensive and complete than at any previous convention.

It is earnestly to be hoped that the supply men attending the next convention will arrange for a permanent organization to which can be delegated the supervision of convention exhibits. There will undoubtedly be a very large attendance at the New York meeting, and a full representation of all the firms interested can be secured. As was evidenced by the interviews and letters published in the "Daily Review" at Kansas City and in our regular issue for November, 1900, there is a practically unanimous agreement among the manufacturers and their representatives that such an association is needed, and could relieve the officials of the street railways in the convention city of a vast amount of detail work which the present arrangement involves.

A gentleman recently suggested that it would be an excellent thing if all those who are engaged in the street railway supply business and who have occasion to travel more or less, would wear a button on the lapel of the coat, or some other badge, whereby "one brother might know another," even though he were a stranger. There are many times when such a badge would enable the wearer to recognize another as having interests in common with himself, and what might otherwise be a dull and lonesome Sunday spent away from home, would become an occasion long pleasantly remembered because of a new and congenial acquaintance formed.

The development of interurban electric railways, the cars of which are to run over the tracks of the local companies in cities already having street railways, has called attention to the difficulties that will result from the standard railroad gage, 4 ft 8½ in., not having been chosen by all street railways. While the standard gage is far more common than any other width in this country, and is adopted for all new work unless peculiar conditions exist, there are many different street railway gages to be found. In Pittsburg, Cincinnati and Columbus, Ohio, and on some of the New Orleans roads, the gage is 5 ft 2½ in.; in Nashville and Louisville it is 5 ft; in St. Louis, 4 ft. 10 in.; some Texas roads have a gage of 4 ft, and on the Pacific Coast various gages 3 ft. 6 in., 3 ft. 2 in., and 3 ft. are found. That even the present degree of uniformity exists is doubtless due to happy accident rather than design, because when the Cincinnati gage was fixed it was not conceivable that there should be any reason why it should be the same as the one used in Cleveland or Indianapolis.

There are nearly a score of interurban companies now organized to build electric railways into Columbus, O., all of them having tracks of standard gage, while that of the local company



is 6 in. wider. To enter the city the new companies must put down their own tracks, or the local road must lay a third rail. In any case the normal growth of various special services which the electric interurbans are rendering to the public must be seriously retarded. At Cincinnati the case is similar and none of the interurban lines can operate cars into the city because of the difference in gage; passengers must transfer to other cars at the city limits, which in many cases cannot but result in tedious delays. Sooner or later the non-standard gage lines will have to face the problem of changing the gage. The question is a difficult one now, but the solution will not be any easier at a later date.

In Great Britain there is far more diversity in gage; than here, a correspondent in the Electrical Engineer, London, giving the following statistics: Thirty-seven systems have the standard gage, 10 have 4 ft., 25 have 3 ft. 6 in., and 7 have 3 ft.; other gages are 2 ft. 3 in., 2 ft. 8½ in., 2 ft. 11¼ in., 5 ft. 3 in., the Irish standard, and the Glasgow tramways have 4 ft. 7¾ in.

The question of whether the street railways of Massachusetts should be given the right to construct and operate their lines outside the highways over private lands is attracting much attention in that state. The Railroad Commissioners of Massachusetts, in their last report, extracts from which will be found elsewhere in this issue, say they are not ready to abandon the doctrine that street railways belong in the street, though they recognize that in special cases the companies should be permitted to go upon private lands as an incident of the general use of the highway; the law now permits street railways to go upon private lands for the purpose of avoiding grade crossings.

Mr. Charles Francis Adams, who, as chairman of the committee authorized by the Massachusetts Legislature to investigate the relations of street railways and municipalities in that state, has given the subject a great deal of study, has recently been quoted as being in favor of incorporating street railways under the same laws that govern steam railways so as to give the former the right of eminent domain.

Mr. Adams cites the subway and elevated systems as illustrations of the tendency to provide electric railways with ways apart from the streets, and in fact the same reasons which lead to the construction of elevated and underground ways in cities, are among those urged for permitting interurban electric roads to secure rights of way over private lands in the less crowded districts. A private right of way will as a rule permit of a more direct route being chosen for interurban lines; cuts and fills necessary to secure favorable grades can be made at less expense; since the grade of the whole highway need not be changed; maintenance charges are reduced; the safety of operation is greatly increased and the franchise question is much simplified. So apparent are the advantages of being removed from the highways, except in towns and villages, that in the announcements concerning new roads in states where the laws permit it being done, one very frequently sees the statement: "A private right of way has been secured for the entire distance except through the towns of A, B and C."

With the growth of interurban street railways their passenger and freight service has in many cases reached proportions which call for better facilities for convenient transfers between different roads. In some cities a number of such roads terminate, and for some time past the necessity for union stations for all the connecting lines at a central point has been felt. In our last issue we published the views of several street railway men of Cleveland on this subject, all of them agreeing as to the desirability of a union station for the suburban roads entering that city, and since then the matter has been taken up by a committee representing the different roads with the result that the companies interested have pledged themselves to raise the money necessary for a union passenger and freight station. This practice which has been found of the greatest advantage in steam railway service will be an entirely new departure in electric railway service, but there can be but little doubt of its utility. Passengers and baggage can be brought into the city over any suburban route and be transferred to any other line without trouble or delay. In addition to the convenience to passengers a union station would be of the greatest benefit to suburban roads doing a regular freight and express business, as goods could be trans-

ferred between the cars of any of the connecting roads with but a single handling, and all delay and extra cost of transferring about the city on wagons would be avoided.

The suggestion for a union station is not confined to Cleveland as one has also been proposed for the roads centering in Columbus, O., and another for Detroit, Mich. In the latter city the Detroit United Railway Co. is said to be considering a plan to erect a union freight and express station for all the street railways entering the city.

A number of these suburban roads have freight depots of their own and the gains made by consolidating these into one union station would be of as much advantage to the companies themselves in the handling of freight as it would be an accommodation to passengers.

As year after year electric railways have attained to greater lengths, heavier cars or trains and higher speeds, it seems as though the time is not far off when new methods of distribution of electrical energy will force themselves upon the consideration of electrical engineers. The direct current 500-volt system has until very recently been exclusively used for electric traction and for the ordinary cases of urban roads it is safe to assume that this method of distribution will remain standard. New conditions are, however, gradually creeping into electric railway practice which point to the eventual division of electric railway distribution into two different classes, viz: Low potential, or the usual 500-volt direct current for urban work, and high potential distribution for long distance roads. It is not uncommon now to find interurban and long distance lines extending to fifty or even seventy-five miles, and on some of these the speeds, weight of trains and character of the traffic approach very nearly to the proportions of steam railroads. The introduction of polyphase alternating currents a few years ago made roads of the latter class possible, as the amount of current consumed by heavy, high-speed cars and the amount of copper required to distribute the 500-volt current to very great distances both precluded the use of the low tension system. Aside from the difficulty of handling very heavy currents, the cost of the copper to conduct them is prohibitive.

The first important departure from the old practice was in the use of polyphase currents at the central generating plant, which were led to sub-stations along the routes, where rotary transformers converted the polyphase into direct currents for use on the cars. This is the general practice for long distance railway distribution today and the system is giving very satisfactory service on a large number of interurban roads. As far as roads of moderate length are concerned, where two or three converter sub-stations suffice for the distribution, this system can be operated with a very satisfactory degree of economy, but as the roads increase in length and the cars or trains run less frequently and at much higher speeds, the number of sub-stations must be proportionately increased to keep down the cost of the copper conductors for the secondary distribution, and even if the sub-stations are but a few miles apart the amount of current required for heavy, high-speed trains requires a considerable carrying capacity in the copper aside from the consideration of distance. Heavy currents also imply more or less difficulty in the construction work, in taking off the current at the trolleys and at the commutators and brushes of the motors. These and other considerations point to the advantage in the use of higher potentials, and it is in this direction that European engineers have already taken the first steps. This question is of special interest at present owing to the fact that Messrs. Ganz & Co., of Budapest, have submitted a tender for equipping the Metropolitan & District Railways, of London, with a system using a 20,000-volt, three-phase current which is reduced to a 3,000-volt, three-phase current for the trolley line. The proposed system is a purely three-phase one, using three-phase motors on the cars, and as yet there has been but little published concerning its details. It has been introduced on the Valtellina railway in Italy and on an experimental road in Budapest, in both of which cases it is reported to be working successfully.

Should the operation of such a system be found practical its economy both in construction and operation can hardly be questioned for even very long roads. The line consists of two trolley wires and the rail forms the third conductor. The converter sta-



tions would need practically no attendance, as the transformers have no moving parts, and the cost of these would be but little in comparison to the rotary transformer stations owing to the character of the apparatus necessary and the staff of attendants required for the latter. Such a system could be easily adapted to supplant steam locomotives on long steam roads at a very moderate expense if the anticipations in regard to the system are realized. While final judgment upon it must be suspended, the development of such a system points to the recognized advantages of higher potentials for long distance working.

### NEW YORK MEETING OF THE A. S. R. A.

The executive committee of the American Street Railway Association met at the Murray Hill Hotel, New York, on February 28th, to make arrangements for the 20th annual meeting of the Association, which will be held in New York City. The following named members were present: President, Walton H. Holmes, Kansas City, Mo.; H. H. Vreeland, New York; N. H. Heft, Meriden, Conn.; John B. McClary, Birmingham, Ala.; G. W. Baumhoff, St. Louis; Frank L. Fuller, Philadelphia; John R. Graham, Boston; T. C. Pennington, Chicago. It was decided to hold the convention on Wednesday, Thursday and Friday, Oct. 9, 10 and 11, 1901. There will be two sessions of the convention on each of the first two days, and the last day will be set aside for the inspection of exhibits. The banquet will be held in the evening of the last day, when the newly-elected officers will be installed.

The Madison Square Garden, 26th St. and Madison Ave., has been leased from October 6th to 13th. This is one of the largest and finest buildings for assembly purposes in the world, and it is expected that the exhibit of street railway appliances will be on a very large scale. The meetings of the Association will be held in the same building. Provision has also been made for the meetings at the same time of the Street Railway Accountants' Association of America. The usual charge of 10 cents per square foot for space in the exhibit hall will be made.

A new departure has been decided upon in the matter of the papers presented to the meeting. They are to be printed and advance copies sent to the members. They will be read at the meeting by title only. The president was authorized to select a speaker to open the discussion on each paper, and 30 minutes will be given to the consideration of each paper.

The following topics were selected, upon which papers are to be presented:

Street Railways: A Review of the Past and a Forecast of the Future.

The Adoption of Electric Signals on Suburban and Interurban Railways, Single or Double Track, and Their Economy of Operation.

The Value of Storage Batteries as Auxiliaries to Power Plants. The Public, the Operator and the Company.

The Best Manner and Mode of Conducting the Return Circuit to the Power House.

The American Street Railway Association; The Purposes of its Organization and the Benefits Accruing to Investors in, and Operators of, Street Railway Properties by Membership Therein.

The Economies Resulting from the Use of Four Motors instead of Two on Double Motor Equipments.

The Best Form of Car for City Service; A Consideration of the Various Types of Car as to Size of Car and Arrangements of Seats, including the Best Types of Brakes and Wheels.

Practical Results Obtained from Three-Phase Transmission and Rotary Transformers or Motor Generators in Transmitting Power on Railway Lines.

Relations of Interurban and City Railways.

The Modern Power House, including the use of Cooling Towers for Condensing Purposes.

The initiation fee will be waived in the case of any company becoming a member of the Association prior to October 1st next, provided the annual dues to October next be paid at the time the application for membership is made.

The president appointed the following named gentlemen as a committee on "Standardizing of Street Railway Equipment": J. R. Graham, Boston; N. H. Heft, Meriden; F. G. Jones, Memphis; W.

J. Hield, Minneapolis; C. F. Holmes, Kansas City. The committee is authorized to incur an expenditure not to exceed \$1,000.

The president also appointed the following named gentlemen as a committee to report at the next convention on the subject of "Transporting the Mails and Mail Carriers on Street Railway Cars": C. S. Sergeant, Boston; C. L. Rossiter, Brooklyn; J. B. Parsons, Philadelphia. It is confidently expected that the forthcoming meeting will be the most largely attended and of greater value from a practical standpoint than any that have been held.

The executive committee was most pleasantly entertained by President Vreeland, of the Metropolitan Street Railway Co., during the stay of the members in the city. On Friday they were tendered a lunch at the office of the Metropolitan Street Ry., and in the evening they attended the performance at Weber & Fields, as Mr. Vreeland's guests.

### SOUTHWESTERN ASSOCIATION.

A meeting of the directors of the Southwestern Gas, Electric & Street Railway Association was held at Austin, Tex., Feb. 24, 1901, at which the following members were present: J. F. Strickland, president; Thomas D. Miller, E. H. Janjins, H. F. Mac Gregor, C. F. Drake, F. E. Scovill, C. F. Yeager.

It was decided to hold the next meeting of the association at Houston, Tex., April 19th to 22d. The Rice Hotel will be headquarters. Messrs. J. F. Strickland, T. H. Stuart, H. L. Monroe and H. F. Mac Gregor were constituted a committee on arrangements, the chairman being given power to appoint local committees.

Papers were assigned on the following subjects:

"Municipal Ownership v. Private Corporations," T. D. Miller, Dallas.

"Association Between Meetings," C. A. Newning, Houston.

"Station Work," George Cushman, San Antonio.

"Corporations and Their Employees," H. F. Mac Gregor, Houston.

"Street Railways of Texas," F. E. Scovill, Austin.

"Inspection," W. S. Rathell, Waco.

"Electrical Potpourri," John G. Boyd, Terrell.

"What Are We Here For?" E. L. Wells, Marshall.

"Cheap Fuel and How to Use it Economically," L. T. Fuller, Calvert.

"Water Power for Small Plants," F. R. Starr, Gonzales.

### THREE-CENT FARE ORDINANCE VOID.

Judge Ricks, of the United States District Court, on March 17th decided that the 3-cent-fare ordinance passed by the Cleveland city council two years ago is void as being an attempt to impair the obligations of existing contracts, and therefore in violation of the federal constitution.

### CONSOLIDATION AT CLEVELAND.

Our Ohio correspondent advises us that the Everett syndicate has arranged for the consolidation of the Sandusky, Norwalk & Southern Railway Co., which includes the Sandusky local lines, the Lorain & Cleveland Railway Co., and the Sandusky & Interurban Electric Railway Co. It is stated that the new company, which is to be known as the Lake Shore Electric Railway Co., will be capitalized at \$4,000,000 and that Mr. B. Mahler, of Cleveland, will be chosen president. The consolidated company will have 130 miles of track.

### FOR A MASSACHUSETTS EXPRESS COMPANY.

A bill has been introduced in the Massachusetts Legislature to incorporate the Massachusetts Electric Express Co., which proposes to contract with electric railway companies to convey express matter and baggage. The express company will furnish special cars and pay the carrying company for services rendered, on a mileage basis. The plan is particularly recommended as a means of avoiding, on the part of street railway companies, the necessity of petitioning for special legislation whenever it is desired by them to institute an express service over their lines.

## Cleveland & Eastern Interurban Line.

The Cleveland & Eastern Electric Railroad Co., organized March, 1898, is the sixth large interurban electric railway to be built with Cleveland as one of the termini. The line, which was opened for traffic Dec. 29, 1899, is known as the "Maple Route," its present eastern terminals being at Chardon and Middlefield in the midst of the maple sugar region of Ohio. The territory served has no east and west lines of steam railroads, save those following the lake shore, and consequently the road was from the first certain of a good business.

Like the other Cleveland interurban, this road makes use of the tracks of the urban company to reach its city terminus, the public square. From the square the route is over the Euclid Ave. line of the Cleveland Electric Railway Co. to the city limits, about six miles out. Here the Cleveland & Eastern track begins. The route is along the highway up to a short distance beyond Mayfield, and the company derives its rights from the county commissioners

the bluffs are capped with precipitous walls of hard rock, the "Bea-re-a grit," which marks the summits of the Chagrin valley hills. Mounting eastward from the Chagrin River the track crosses a deep ravine, and curves around a spur of the bluff, giving a beautiful panoramic view of hill and valley to the west and north.

Leaving the hemlock belt, several maple woods are traversed, and the line dividing Cuyahoga from Geauga county is here marked by a road. Northward from the track, about a mile from the county line, extends a ledge of conglomerate rock, worn into picturesque shapes, and affording protection to big hemlocks. Less than a mile distant, at a point along this ledge, occurs "Chester's Cave," a series of gigantic fissures in the conglomerate, washed out by the subterranean streams. This place is now used as a pleasure resort.

Scotland, the next town, is a hardwood lumber station of some importance. Beyond Scotland the route is through a high, open,



MAP OF THE CLEVELAND ELECTRIC INTERURBAN LINES.

and from the plank road company. Beyond Mayfield the line is all on a private right of way which the company considers one of its most valuable possessions. The next town to Mayfield is Gate's Mill, on the Chagrin River, and at this point the power house is located. Carrying the tracks over the Chagrin River there is one steel, through-truss, pin-connected, bridge, about 100 ft. span, on masonry abutments. The bridge was designed and erected by the New Columbus Bridge Co. of Columbus, O., under the specifications and supervision of the Osborn Engineering Co., of Cleveland. In crossing the valley of the Chagrin River two timber trestles, 300 ft. long and 65 ft. high at their highest point, carry the cars over two deep gulches.

Cutting through the high east side bluffs opposite this point a creek of some volume makes what is named "Dean's Gully." Whoever seeks diversion in a wild, exhilarating ramble will be able to spend several hours with pleasure in this bit of mountain topography. For a speedy trip along the bottom the visitor should be prepared to travel in the stream, from which the slopes ascend abruptly. At the end of half an hour's ramble, he will notice that

slightly rolling farming country, with short distances through bottom land affording varied river views. Passing Novelty and Warrenderdale the line forks, one branch proceeding northeast along the valley of the Chagrin River, through Fowler's, Mansfield's and Bass Lake to Chardon a town of 1,500 inhabitants. The other branch runs to Middlefield in a southeasterly direction passing Lake Funderderson and Burton. Burton was settled in 1798, and now has a population of about 1,000; Middlefield has about 500 inhabitants, and is a center for marketing maple sugar and cattle. The branch to Burton is made particularly interesting for an observation car service by reason of its many hills, ponds and peat bottoms; the company contemplates running night excursions, illuminating the scenery by searchlights.

The maximum grade on the line is 3.8 per cent for 2,000 ft. There is but one railroad crossing, which is at Chardon, where the Pittsburg & Western is crossed on an overhead bridge 22 ft. above the lower track. The right of way is fenced on both sides with wire fencing made by the Frost Wire Fence Co. and erected by the Harris Fence Co., both of Cleveland. Wherever the road cut through





POWER HOUSE AND SHOPS.

property and access to one side from the other was desired, a bridge or trestle called a cattle-pass was put in to give a subway for stock, etc.

One of the important features will be the pleasure riding and the traffic to the two lakes mentioned. The property surrounding Bass Lake was formerly leased to a club, but is now controlled by the Cleveland & Eastern. Punderson Lake is already a popular summer resort, there being a large hotel for the accommodation of visitors.

The power house, which is at Gates Mill, is a brick and stone building; the engine room is 40 x 90 ft. and the boiler room 50 x 77 ft. The engine room floor is above the tops of the boilers, the steam mains being below the engine room floor. An iron footway leads from the engine room, between the boilers and along the front of the boilers near the top so that the gage glasses, the cleaning out holes of the boiler settings are readily accessible.

The main equipment comprises three 400-h. p. Stirling boilers, carrying 150 lb. steam pressure; two 600-h. p. cross-compound engines direct connected to Siemens-Halske Churchwarden type generators rated at 571 amperes, and 670 volts at full load; two 150-h. p. tandem compound engines direct connected to 500-



BRIDGE AT GATES MILL.

ampere 200 volt Siemens Halske boosters; Ludlow Dunn Gordon pumps; Snyder-Hughes Pump Co. fly-wheel, horizontal cylinder condensers. In the basement, where the pumps and condensers are located, are an air compressor plant and a Cross oil filter. There is room to install another 600-h. p. unit.

The total output of the station, winter schedule is about 3,700 kilowatt-hours per day, and the cost per kilowatt-hour is given as .88 cent. Run of mine coal costing \$1.85 per ton is burned, 12 tons being required per day.

E. P. Roberts & Co., of Cleveland, were the consulting engineers for the electrical and mechanical equipment of the road and station.

There is one brick car house 73 x 153 ft. at Gates Mill and small frame car houses at Chardon and Burton for sheltering cars remaining there over night. The large house at Gates Mill has

three car storage tracks, and a repair track about 100 ft. long, the other 50 ft. being taken by a repair shop and stock room.

A train dispatcher's office is placed close to the main line not far from the car house, and all orders for the movement of cars come from the dispatcher at this point, each conductor reporting by telephone from telephone booths placed at the regular turn-



INTERIOR OF ENGINE ROOM.

outs, and writing down the telephoned orders which he then turns over to his motorman.

The rolling stock now comprises 4 passenger cars, 2 baggage cars, 2 Brill snow plows and 1 electric locomotive, used for construction work and hauling freight. The cars were built by the Jewett Car Co. and the St. Louis Car Co. These cars are 45 ft. long, mounted on Peckham No. 14A and No. 26 trucks, and equipped with four 50-h. p. Steel motors; they have Magann air storage brake equipments and heaters made by the Peter Smith Heater Co., of Detroit. The trolley wheels used are made by the International Specialty Co., of Detroit. The snow plows have four 50-h. p. Steel motors. Wagenhal's arc headlights are used.

A fire in November last destroyed the car house together with 5 passenger coaches, 1 snow plow, 1 sweeper and 2 steam locomotives. Ten new cars have been ordered from the St. Louis Car Co. for March delivery. These cars will have the Christensen storage air brake system.

The principal distances are: Public Sq., Cleveland, to Cleveland & Eastern line 6 miles; Cleveland & Eastern line to Junction, 19 miles; Junction to Chardon, 7.4 miles; Junction to Middlefield, 14.3 miles.

The company has 45 miles of single track laid with 60-lb. rails of the A. S. C. E. standard section. The ties are of oak, cherry



RAILROAD CROSSING AT CHARDON.

and cedar, 6 x 8 in. x 8 in. spaced 24 in. c. to c.; the joints are made with 4 hole splice bars, and bonded with American Steel & Wire Co's. "Crown" bonds.

The overhead lines are carried on elm and cedar poles, bracket suspension being used except at passing points. The trol-



Jey wire is No. 00 figure 8 made by the American Steel & Wire Co., and double lines are used to avoid overhead switches; the hangers, brackets, etc. are all of the Ohio Brass Co. make. The lines were erected by the Chase Construction Co.

According to the present schedule cars arrive at and leave the Public Sq. in Cleveland on the even hours from 6 a. m. to 11 p. m. Of these 16 cars, 9 run to Chardon, 4 to the junction and 3 to Gate's Mill only. Six trips east and five west are made between



PUNDERSON LAKE.

the junction and Middlefield. The time between Cleveland and the junction is 1 hour and 38 minutes; between the junction and Chardon, 20 minutes; and between the junction and Middlefield, 34 minutes.

If desired, however, much better time can be made as was shown on February 23d, when a special car with Mr. H. A. Everett and a party of railway men on board made the run from Middlefield to the Public Sq., Cleveland, in 78 minutes.

The company at present employs 20 conductors, 22 motormen, 12 trackmen, 2 linemen, 4 men in the car house and 1 man in the repair shop. Trainmen are paid 20 cents per hour and work 9½ hours per day.

The officers and heads of departments are: President, H. P. McIntosh; vice-president, H. A. Sherwin; secretary and treasurer, H. A. Tillotson; general manager, R. L. Andrews; superintendent,



TRESTLE CONSTRUCTION.

Joseph O'Hara; electrical engineer, M. Petingale; attorneys, Ford, Snyder, Henry and McGraw.

In order to better show the Cleveland & Eastern road in its relations to the other Cleveland electric interurbans, we have reproduced a map, which includes all of these systems, and it will also be of interest to note here some of the extensions that are contemplated.

The Northern Ohio Traction Co., chartered in 1899, as a consolidation of the Akron, Bedford & Cleveland Railroad Co. and

the Akron Traction & Electric Co. a few months ago secured the Akron & Cuyahoga Falls Rapid Transit Co., giving it a total of about 83 miles of track, and the company will build from Kent, to Barborton. Barborton is about as far to the southwest of Akron as Kent is to the northeast.

The Sandusky & Interurban Electric Railway Co., of Sandusky, will build a line along the lake shore from Sandusky to Lorain, 47 miles, via Huron, Ceylon and Vermillion; 10 miles of this line is built. From Ceylon, 29 miles west of Lorain, a branch line will be built southwest to Norwalk, 18 miles, where it will connect with the Toledo, Fremont & Norwalk R. R.

Another line to Norwalk will be that of the Cleveland, Elyria & Western, which is building an extension from Oberlin.

The Cleveland & Southern Railway Co., a new corporation in which the interests of the Cleveland, Elyria & Western and the old Cleveland Medina & Southern are represented, has secured a right of way near the county road from Berea to Medina. Later it will be extended to Wooster, though this part of the route has not been definitely decided upon. The Osborn Engineering Co. is the engineer and E. P. Roberts & Co. are consulting engineers on the electrical and mechanical work.

The Cleveland & Chagrin Falls line was only recently completed to Middlefield, though it was operating to within a short distance of that town in December last.

### DENVER CITY LOOP STATION.

The accompanying illustration shows the down-town loop waiting room of the Denver City Tramway Co. The arrangement of the tracks at this point which was described in the issue of the "Review" of January, 1898, consists of two loops running around



WAITING ROOM—DENVER LOOP.

adjacent blocks, the tracks being connected at several points. The waiting room illustrated is situated between the two sides of the loops in Tramway Place, and the covered portion is approximately 162 ft. long x 22 ft. wide. The roof which is of corrugated tiles, is supported by 26 iron columns. In the center of this structure is an enclosed house about 50 ft. long by 10 ft. wide, which is used by the public as a waiting room. The closed portion is heated by steam. It is not a general transfer station, although those passengers who desire to transfer here do so. This loop is in the heart of the business district, being within one block of the Post Office, City Hall, Chamber of Commerce, Mining Exchange, Tabor Opera House, etc.

Mrs. Clinton L. Rossiter, wife of President Rossiter of the Brooklyn Rapid Transit Co. entertained a number of friends aboard the president's private parlor car, February 13th. The car was given the right of way over the entire road.

A bill introduced in the Wisconsin Legislature and passed by the house, March 1st, provides that upon petition of 10 per cent of the voters of any city, any franchise which has been granted by the common council shall be submitted to a popular vote.

## TWO WELL-MANAGED EXPRESS AND FREIGHT DEPARTMENTS.

The "Review" has at different times given considerable space to descriptions of the methods followed by various street railway companies for handling their freight and express departments. We wish to take this occasion to reiterate that judging from letters and inquiries received, this subject of carrying freight and express matter is still one of the liveliest topics of the day, and we believe the rapid development of this phase of the street railway business fully justifies the attention we have given it.

We present herewith operating details of the express service as given by two prominent roads. One, the Rochester (N. Y.) &



ROCHESTER MILK CAR.

Sodus Bay Ry., is purely an interurban line, and the other, the United Traction Co., of Albany, N. Y., although it serves several nearby towns, partakes more of the nature of a strictly urban system.

The Rochester & Sodus Bay Ry. is a single track road with turnouts, and runs from Rochester to Sodus Point, a distance of 41 miles. Both freight and express matter is accepted, the difference between the two being in the time of delivery. Express cars run every three hours and freight cars but once a day. In addition, express matter is delivered within reasonable limits free of charge, wagons being used for this purpose. The traffic, comprises chiefly farm products, dressed meats, poultry, milk and

(P. O. 9-1096-6-25-1900.) <b>Rochester &amp; Sodus Bay Ry. Co.</b> <b>MILK TICKET.</b>		<b>R. &amp; S. B. RY.</b> <b>32 Quarts</b> <b>MILK</b> BETWEEN ONTARIO AND ROCHESTER. <b>12 Cents.</b> <small>Conductor Punch Here.</small>
To _____ NOTICE. Tickets of the proper value must be attached to each can.	<b>E 5177</b>	

ice coming toward Rochester, and merchandise going from Rochester to the fourteen or fifteen small stations along the route.

The milk business is a particularly important feature, and it is believed a special milk train will soon be required to meet the demands. Milk is carried from any point on the line to any other for 1½ cents a quart or 12 cents for a 32-quart can. A large creamery is situated at Ontario, a station 18 miles from Rochester, and a special rate of 5 cents a can is made on milk consigned to the creamery from points within six miles either side of Ontario. To each can presented for shipment over the Rochester & Sodus Bay Ry., there must be attached a regular 12-cent tag, or a special 5-cent tag, as the case may be. The regular tag is printed on

manila paper and is shown reduced, herewith; the special tag is red in color. These tags are sold in quantities at their face value to the regular milk shippers. The empty cans are returned free. The hauling of ice is also an important item.

When goods are received by the company for transmission over its line, a proper receipt is given the consignor. For express matter the receipt resembles the form usually given by the old line express companies. For freight matter a bill of lading is given, similar to the form extensively used by steam railroads. The upper and lower portions of the face of this form are shown reduced. On the reverse side are printed the conditions under which the company agrees to carry the goods. These conditions are 11 in number and are the same as those adopted by the steam roads of New York state. No. 1 releases the company from loss by causes beyond its control. No. 2 states that the company is not bound to carry the property by any train or vessel or otherwise than with as reasonable despatch as its general business will permit. No. 3 provides that no carrier shall be liable for loss not occurring on its own road; it also provides that the amount of any loss for which any carrier becomes liable shall be computed at the value of the property at the place and time of shipment, unless a lower value has been agreed upon, or is determined by the classification upon which the rate is based; claims for damages must be made promptly, and if delayed for more than 30 days after the delivery of the goods, the carrier shall not be liable; any carrier liable on account of damage to goods shall have the full benefit of any insurance that may have been effected upon the property. No. 4 provides that all property shall be subject to necessary coöperage and baling at owner's cost and makes special regulations for carrying cotton and grain. No. 5 permits the carrier to charge storage on goods not called for within 24 hours after arrival, and provides that property destined to or taken from a station at which there is no regularly appointed agent, shall be entirely at owner's risk, while at the station. No. 6 releases the carrier from liability for documents, specie or any article of extraordinary value, unless a special agreement is made. No. 7 places the liability for all damages resulting from the carrying of inflammable, explosive or dangerous goods upon the owner of the property. No. 8 forbids any alteration, addition, or erasure in the bill of lading without the special notations of the carrier's agent thereon. No. 9 reads: "If the word 'order' is written hereon immediately before or after the name of the party to whose order the property is consigned, without any condition or limitation other than the name of the party to be notified of the arrival of the property, the surrender of this bill of lading properly indorsed



INTERIOR OF FREIGHT HOUSE, ROCHESTER.

shall be required before the delivery of the property at destination. If any other than the aforesaid form of consignment is used herein, the said property may, at the option of the carrier, be delivered without requiring the production or surrender of the bill of lading." No. 10 provides that if the goods shipped are not the articles described in the bill of lading, freight charges must be paid upon the articles shipped. No. 11 is a special regulation to apply





which give the rates per 100 lb., that the company has adopted on its road for each of the different classes. The company also publishes two similar sheets, giving the rates on express matters for from 1 lb. to 50 lb., and from 50 lb. to 100 lb.; also a sheet giving the special rates for bicycles, trunks and baby carriages.

The company is now carrying about 824 tons of freight and express matter a month. For a recent month the receipts from express were \$268; from freight, \$522. Mr. E. J. Wilcoxon, Rochester, is general freight agent.

The United Traction Co., of Albany, operates an express service over its lines to Cohoes, Watervliet, Troy and Lansingburg, and arrangements are now being perfected for transferring goods direct to the Stillwater & Mechanicsville Street Railway Co., and the Albany & Hudson Railway and Power Co. As an adjunct to the electric railway service, the company operates four wagons in Albany, three in Troy, two in Watervliet and three in Cohoes, which collect and deliver goods within reasonable limits from the stations without extra charge. The wagon delivery and collection is done by contract with owners of suitable vehicles, upon a percentage basis, the commission ranging from 20 to 25 per cent of the receipts taken in. A flat rate of 8 cents per 100 lb. is made on goods to Troy, 6 miles from Albany, and of 10 cents per 100 lb. to Cohoes, 9 miles from Albany. Boxes of canned goods, soap, etc., from regular shippers are carried for 5 cents; trunks are taken for 25 cents, and small packages for 10 cents. These



HANDLING EXPRESS AT ALBANY.

rates include collection and delivery. The total receipts of the express department average \$3,500 a month and there are 14 men on the pay roll of the department, including three clerks, men to load and unload, and the train crews. Six closed cars and one flat car are used exclusively for transporting express matter.

When express goods are received by a driver or agent in Albany, a receipt or bill of lading is made out, practically identical in form with the freight bill of lading used by the Rochester & Sodus Bay Ry. The duplicate half of this is delivered to the consignor and the originals are numbered consecutively, commencing with 1, the first of each month, and are entered in what is known as the "Manifest Book," which contains pages 16 3/4 in. wide by 16 1/2 in. high, with column heads as follows: Receipt No.; Consignor; Consignee, Name and Address; Articles; No. of Packages; Weight; Rate; Charges Prepaid; Charges Collect; Charges on Account; Ledger Folio; Remarks. A manifest book is kept for each of the four stations on the road, and the manifest pages or sheets for each station are numbered consecutively, beginning with 1, the first of each year. The sheets are made out in duplicate by means of a carbon sheet, the original remaining in the book as a record; the duplicate is torn out and accompanies the car carrying the corresponding goods, as a way bill. The corresponding "original" receipts or bills of lading also accompany the car, and the agent at the receiving station, after recording them, sends the receipts out with the drivers delivering the goods, who secure the signatures of the consignees thereon. The drivers return these receipts to the agent at the receiving station, who checks them off on his "duplicate" manifest sheet, and then forwards them to the general agent at Albany, who checks them off on his "original" manifest sheet. As will be evident, this system of checking is not complicated, but it insures careful attention to every piece of goods, and provides an easy method of tracing when com-

plaints are made. The original receipts are ultimately filed in numerical order for possible future reference.

All goods coming into the Albany station from along the line are treated in exactly the same way, the agents at the various stations keeping manifest books similar to the ones at Albany. The local station express agents make daily reports to the general express agent, showing the receipt numbers handled and the

Manifest No.		190	
<b>UNITED TRACTION CO.</b>		<b>C. O. D.</b>	
<b>ELECTRIC EXPRESS</b>			
ALBANY (HEAD OFFICE), 100 BROADWAY, NEW YORK			
Bill	Return Charges		
—	—		
Total	From		
\$	\$		
	Albany, N. Y.		
	On		

ENVELOPE FOR REMITTING MONEY.

amount of money collected at their stations, either as express charges prepaid or collected.

The general express agent at Albany keeps a journal, which is merely a blank book in which is entered the receipt or bill-of-lading numbers, with the amount of express charges actually collected in each case. He also keeps a cash book in which is entered the total receipts, divided into "Receipts from express charges," "Receipts from C. O. D. packages," and "Accounts," this last entry referring to the ledger account which the company keeps with a number of large shippers.

The envelope used for returning money collected on C. O. D. goods is reproduced here. The original size is 8 3/4 in. by 3 3/8 in.

## NEW COMPANY IN WEST VIRGINIA.

The Camden Interstate Railway Co., a consolidation of the Iron-ton (O.) Street Railway Co., the Ashland (Ky.) & Catlettsburg Street Railway Co., and the Consolidated Light & Railway Co., of Huntington, W. Va., has opened general offices at Huntington. The company operates a total of 30 miles of street railways and owns 41 cars. The officers are: J. N. Camden, Jr., Versailles, Ky., president; S. D. Camden, Parkersburg, W. Va., secretary; W. W. Magoon, Huntington, treasurer; J. C. Lugar, Huntington, general manager and purchasing agent; H. P. Wellman, superintendent of the Ashland and Huntington divisions and chief electrician, and A. L. Thuma, superintendent of the Iron-ton division.

## GRAND RAPIDS, HOLLAND & LAKE MICHIGAN.

One of the many new interurban electric railways in Michigan is that building by the Grand Rapids, Holland & Lake Michigan Rapid Railway Co. This line will extend from Macatawa Beach, on the east shore of Lake Michigan, to Grand Rapids, via the towns of Holland, Zeeland, Vriesland, Jamestown, Jenison and Grandville; there is also a branch line from Saugatuck north, which connects with the main line between Macatawa Beach and Holland. The principal distances are: Saugatuck to junction point, 10 miles; Macatawa Beach to Holland, 6 1/2 miles; Holland to Jenison, 20 miles; Jenison to limits of Grand Rapids, 5 1/2 miles. This last section is built and the rest of the route is graded and the bridges erected.

The power house is to be at Jenison with sub-stations at Zeeland and the Saugatuck junction point. Two Westinghouse 500-kw. three-phase generators will be installed in the power house. The three-phase transmission potential is to be 20,000 volts.

The officers of this company are: President, John Winter; vice-president, Ben Hanchett, jr., of the Grand Rapids Consolidated Street Ry.; secretary, O. H. Lan. The work is being done by the Detroit Construction Co.

The belief that the consolidation of the street railways in the city of Cleveland, O., will take place within a short time, is rapidly gaining ground.

# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

## NEW 1500-KW. UNIT FOR CLEVELAND CITY RAILWAY.

The accompanying illustration shows the 1,500-kw. generating unit recently installed in the power house of the Cleveland City Ry. The engine was built by the C. & G. Cooper Co., of Mt. Vernon, O., and is rated at 2,200 h. p. It is of the cross-compound condensing type with cylinders 32 and 64 by 60 in., and runs at 75 r. p. m. The steam pressure is 150 lb. per gage and vacuum is from 25 to 26 in. The principal dimensions other than of the cylinders are: Diameter of fly-wheel, 22 ft.; section of rim, 22x24 in.; weight of fly-wheel, 150,000 lb.; diameter of shaft at bearings, 23 in.; diameter of shaft at the fly-wheel, 27 in.

The frame is of the Tangye type, the offset in the valve gear made necessary by this design is provided for by a frame which

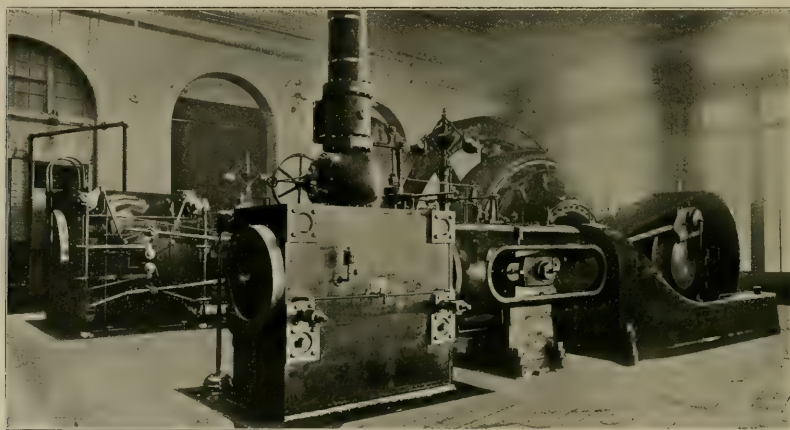
## RADIATION FROM PIPING.

Numerous experiments made to determine the heat lost by radiation from steam pipes in power plants were collected and compared in an article on "Mica Insulation for Steam Boilers and Pipes," published in Engineering of London, Feb. 22, 1901. The figures for heat loss were reduced to pounds of water condensed per square foot of bare pipe per hour and a smooth curve drawn to represent the average of the results. Some of the co-ordinates of the curve are as follows:

Temperature, degrees F....	212	259	294	324	338	365	384
Steam pressure per gage, lb	0	20.3	47.0	80.0	100	150	200
Steam condensed per sq.							

ft., per hour, lb.....	0.33	0.50	0.67	0.83	1.00	1.17	1.36
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In preparing the table no account was taken of the fact that



C. & G. COOPER ENGINE, CLEVELAND CITY RY.

is bolted to the side of the engine bed and carries two rocker shafts to arms on which the eccentric rod and reach rod are attached. There are two governors used, the one on the low pressure engine controlling the trip mechanism of both cylinders and that on the high pressure engine operating a safety stop mechanism. The safety governor holds one end of a horizontal lever carrying a weight and connected to the stem of the auxiliary throttle valve, which is located immediately above the main throttle. When the engine speed exceeds that for which the governor is set the horizontal lever is released and the weight acts to close the auxiliary throttle.

The cylinders are lubricated on the forced feed system by "Improved Rochester" automatic lubricators made by Greene, Tweed & Co.; the lubricators receive motion from one of the wrist plates. The bearings have oil cups to which oil is delivered by pipes under a pressure of about 30 lb. per sq. in. The oil drips are piped to a "Cross" oil filter, made by the Burt Manufacturing Co., of Akron, O.

The generator was built by the Westinghouse Electric & Manufacturing Co. The average load carried is about 3,000 amperes at 525 volts, but the output often reaches 4,200 amperes for short periods.

the atmospheric temperature was different in the different experiments.

Experiments with non-conducting pipe coverings have shown that 75 per cent of this loss by radiation can be saved without an excessive investment in covering material. Tests of a mica boiler covering, which was first used in Canada, showed that it would prevent 90 per cent of the radiation loss. For boilers and large pipes the mica is made up in flat and curved mattresses, enclosed between covers of wire netting and sewed with wire; for small pipes it is molded to form and enclosed in textile covers.

## IMPROVEMENTS AT TOLEDO.

The Toledo Traction Co. has recently extended the boiler room of its power station so that the two sides of the building are now the same length, the engine room having been extended in 1899. The increased space thus provided in the engine room was sufficient for three new units. One of these is a vertical cross-compound condensing Allis engine with cylinders 28 and 60 by 48 in.; it runs at 80 r. p. m. and is directly connected to a 1,050-kw. General Electric generator. The unit is for railway work and has

## COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION.	MONTH. 1900.	Monthly Output, Kilowatt- Hours.	Cost of Electrical Output per Kilowatt- Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricat- ing Oil per 10,000 k. w. h.	Lb. Water per Lb. Coal.	Lb. Fuel per k. w. h.	Price of Fuel per Ton of 2,000 Lb.	Kind of Fuel
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re- pairs.	Total.						
1.....	Nov.	2,109,400	.337	.129	.031	.030	.052	.579	2.69	.99	11.05	2.49	\$2.51	Bituminous
1.....	Dec.	2,335,200	.346	.115	.039	.028	.057	.585	2.50	.89	10.96	2.41	2.87	"
5 Metropolitan Ele- vated, Chicago.....	Nov.	2,002,596	.434	.131	.017	.015	.051	.648	2.71	1.52	5.32	4.57	1.92	"
6.....	Dec.	2,102,916	.451	.127	.016	.013	.034	.641	2.95	1.23	5.28	4.63	1.95	"

been running since November, 1899. A second engine of the same type and cylinder dimensions, but carrying the armatures of three generators on the shaft, was put in during the winter and was first turned over February 23d. These three generators are for lighting service only; two are 500-kw., 150-volt, direct current machines, and one a 500-kw. three-phase generating current at 4,000 volts. All three are General Electric. A contract for a third engine has been let to the Allis company for delivery in the spring of 1902; this is to be a vertical cross-compound condensing machine with cylinders 42 and 88 by 60 in., to be directly connected to a 2,000-kw. railway generator. New lighting apparatus recently installed by the Traction company comprises a 400-kw. rotary converter and two 150-kw. three-phase generators.

Additional boilers have been put in so that there are now four Stirling and eight Heine boilers. American stokers have been placed under two boilers and a McKenzie patent furnace with traveling grate under another, the intention being to make a test and equip the entire plant with that stoker and grate which gives the best results.

In the new portion of the boiler room coal bunkers measuring 20x74 ft. inside have been erected overhead, and it is the intention to extend the bunkers the entire length of the building, giving a storage capacity of 3,000 tons. The present average coal consumption of the station is about 112 tons per day. John A. Mead & Co. are installing a coal and ash conveyor with a capacity of 40 tons per hour.

The present method of handling ashes is a very convenient one, though temporary in character. A recent survey of the Maumee River resulted in the establishment of a new dock line 80 ft. farther out than the old one, thus giving the Traction company 110 ft. between its station building and the river. Piling was driven at the new line and the company is now filling in back of the piling by washing the ashes from the boiler room basement into the water.

A portion of the newly made land will probably be utilized for a steamboat freight house.

February 20th the governor and belt wheels of a Straight Line high speed engine in the power house of the Lorain & Elyria Street Railway, burst and completely wrecked the engine. No one was injured and none of the other engines in the plant were damaged.

Consul Hughes, of Coburg, Germany, has advised the State Department that the Schwartzkopff apparatus for burning coal dust is meeting with much favor in Germany, and that an imperial commission appointed to investigate smoke preventing apparatus tested the device and made a favorable report. A highly heated combustion chamber is essential to the process, as direct contact with the boiler surfaces seriously interferes with the ignition. In some installations with tubular boilers combustion chambers have been provided by lining the tubes for a length of 5 to 8 ft. with fireproof material.

The Detroit & Northwestern Ry. finds there is quite a demand for special cars, which are placed at the disposal of private parties for special trips over the line. The rates are \$25 per car for the round trip of 61 miles; shorter runs in proportion. During January there were 27 special cars run.

## SKATING POND AT HACKENSACK, N. J.

The illustration herewith is reproduced from a photograph sent us by Mr. Frank R. Ford, general manager of the New Jersey & Hudson River Railway & Ferry Co., and shows the company's skating pond at Hackensack, N. J. During the past season the



SKATING POND, HACKENSACK, N. J.

pond was lighted at night by 80 incandescent lamps and proved to be very popular. Mr. Ford states that although the pond is small it has been a source of profit by reason of the extra traffic it brought; no admission fee was charged.

## BROOKLYN ELEVATED SERVICE.

In deciding on a complaint that the Brooklyn Elevated road was failing to give a sufficient service on one of its branch lines, that to Cypress Hill, during certain hours of the day, the New York Railroad Commissioners said in part:

"The board has no hesitation in saying that the construction of the 'loop' (a cross connection between the Kings County and the Brooklyn Elevated lines) and its operation as now conducted is a business-like and practical railroad proposition, and is in the interest of the general public of the city of Brooklyn. If it has inconvenienced some of the 66,000 residents of the twenty-sixth ward, it has doubtless given greater facilities to a population six or seven times as large, located between the loop and the bridge. This conclusion is reached from the testimony, from examinations made daily during several weeks by the experts of the board, and from visitations made by the commissioners, accompanied by the representatives of both parties, and unattended."

The board decided some service must be rendered on the Cypress Hill branch, but left the number of trains to the discretion of the company.

## FIRE AT ST. LOUIS.

The St. Louis Transit Co.'s car sheds at 18th and McNulty streets, St. Louis, were damaged by fire March 3rd to the extent of \$20,000. Thirty-four grip cars and one electric car were totally destroyed. The company is preparing to rebuild the sheds



## PERSONAL.

MR. CHARLES T. YERKES and family started for Liverpool March 6th, on the steamer Teutonic.

MR. HENRY A. EVERETT, of Cleveland, left in the latter part of February for California to be gone several weeks.

COL. G. B. M. HARVEY has resigned as president of the Atlantic Coast Electric Railroad Co., of Asbury Park, N. J.

MR. H. S. KEMP has severed his connection with the Staten Island (N. Y.) Electric Ry., as superintendent of maintenance.

MR. H. G. LAWRENCE will succeed Mr. Harrigan as superintendent of the Chippewa Valley Electric Ry., at Eau Claire, Wis.

MR. A. C. VOSBURGH, secretary and treasurer of the New Process Raw Hide Co., Syracuse, N. Y., was in Chicago recently.

MR. W. F. WEH has been appointed claim agent and MR. ALVAN F. INGERSOLL, attorney, for the Cleveland Electric Railway Co.

MR. N. A. CHRISTENSEN, general manager of the Christensen Engineering Co., of Milwaukee, Wis., will shortly leave for a trip through Europe.

MR. HUGH J. COLLINS has been appointed assistant treasurer of the United Traction Co. of Albany, to succeed Mr. Joseph S. House, resigned.

MR. HENRY E. CHAMBERLIN has resigned as superintendent of the Concord (N. H.) Street Railway Co., a position he has occupied for eight years.

MR. GEORGE J. BLAKESLEY has been appointed general manager of the Albany & Hudson Ry., succeeding Mr. Maurice Hoopes, who has resigned.

MR. J. N. AKARMAN, for many years superintendent and purchasing agent of the Worcester (Mass.) Consolidated Street Railway Co., has resigned.

MR. CLARENCE W. BUTTS, who was principal assistant engineer of the St. Louis & Suburban Ry., is now with the Detroit Construction Co., Detroit, Mich.

MR. A. E. BORIE has been appointed general sales agent of Bethlehem Steel Company, with headquarters at South Bethlehem, Pa., the appointment dating from Feb. 1, 1901.

MR. WILLIAM T. IRWIN has been elected secretary and treasurer of the Cincinnati Traction Co., and MR. S. C. COOPER, of New York, has been appointed assistant secretary.

MR. H. S. BEATTIE, for many years treasurer of the Metropolitan Street Railway Co., of New York, has resigned. On March 11th, it is stated, Mr. Beattie sued the company for \$100,000 for breach of contract.

MR. W. A. UNDERWOOD retired recently from the receivership of the Seattle (Wash.) City Railway Co., and has been succeeded by Mr. A. F. Haas, formerly secretary and general manager of the company.

MR. L. M. RICE will engineer the construction of the Greenwood (Wash.) & Phoenix Ry. Mr. Rice has prepared maps of the district and has under consideration three practicable routes between Greenwood and Phoenix.

HERR BAPTIST GEIM, formerly deputy director of the Nuremberg-Fuerther Street Ry., on January 1st succeeded Herr Gustav Rooth as director of the company. Herr Konrad Sieber, engineer, was also made a director.

MR. STEWART S. NEFF, until recently consulting engineer for the Boston Elevated Railway Co., has been appointed superintendent of that system. Mr. Neff was formerly superintendent of the Union Elevated R. R., of Chicago.

MR. JOHN R. HARRIGAN, superintendent of the Chippewa Valley Electric Ry., of Eau Claire, Wis., has resigned that position to take the superintendency of the Dayton (O.) Springfield & Urbana Ry. Mr. Harrigan will live in Dayton.

MR. GEORGE B. HARRIS has been elected as president of the Chicago, Burlington & Quincy R. R., to succeed Mr. C. E. Perkins, who recently resigned. Mr. Harris is a director of the Metropolitan West Side Elevated Railroad Co., of Chicago.

MR. C. W. WASON, a director and purchasing agent of the Cleveland Electric Ry., was married to Miss Mabel Breckenridge, of Hamilton, Ont., February 12th. Mr. and Mrs. Wason are traveling in Europe, and will return to Cleveland in May.

MR. CHARLES S. BUTTS has resigned as engineer of maintenance of way for the St. Louis & Suburban Ry., and has taken a position with the St. Louis Transit Co., where his first work will be to prepare a report on the track and street improvements of the company.

MR. DAVID YOUNG, general manager of the North Jersey Street Railway Co., Jersey City, Hoboken & Patterson Street Railway Co. and the Elizabeth, Plainfield & Central Jersey Street Railway Co., has gone to Atlanta, Ga., on a short trip combining business with pleasure.

MR. GEORGE F. McCULLOCH, of Muncie, Ind., a director and formerly treasurer of the Union Traction Co., of Anderson, Ind., was on March 5th elected general manager of that company, to succeed Mr. C. L. Henry, who resigned to devote more time to other interests.



THOMAS E. MITTEN.

MR. THOMAS E. MITTEN, general superintendent of the railway department of the Milwaukee Electric Railway and Light Co., resigned that position and on March 12th assumed his duties as general superintendent of the International Traction Co., which operates the Buffalo street railway systems. He will assist the company in handling the crowds which it is expected will attend the Pan-American Exposition this summer. The selection of Mr. Mitten is a well deserved recognition of the excellent work he has done at Milwaukee. On the evening of March 9th Mr.

Mitten was tendered a public reception by the employees of the company and presented with a silver loving cup, a silver punch bowl and an album containing an illuminated address to which were subscribed the signatures of 1,228 of the employees. Victor Manhart, a conductor, presented the punch bowl in behalf of the trainmen and in the course of his remarks referred to Mr. Mitten as their "union," saying that since he had come they had needed no union, as they knew his office door was always open and that they would find him the embodiment of justice and generosity. When it is remembered that one of Mr. Mitten's first duties in Milwaukee was to combat the strike of 1896 one realizes that the

spontaneous demonstration of their good will accorded to him by the men is indeed a high tribute. The "Review" joins Mr. Mitten's friends in predicting for him a very successful career in Buffalo.

MR. HUGH MCGOWAN has recently been elected president of the Cincinnati Traction Co., which has leased all the property of the Cincinnati Street Ry. Mr. McGowan is already president of the Indianapolis Street Railway Co. and is prominently connected with a number of other corporations. His ability as an organizer and financier is widely known.

MR. J. R. CHAPMAN, accompanied by his wife and daughter, sailed on the Teutonic on March 6th for London, where he takes charge of the electrical work on the new underground road. Mr. Chapman takes with him the hearty good wishes of all the American street railway fraternity, particularly those in Chicago where he has accomplished so much.

MR. CHESTER P. WILSON was married to Miss Alice Anderson, of Waukesha, Wis., February 20th, and with his wife has sailed for South Africa, where he will be general manager of the Camps Bay, Cape Town & Seapoint Tramway Co., of Cape Town. Mr. Wilson was formerly general manager of the Sioux City (Ia.) Railway Co., and later chief engineer of the Milwaukee (Wis.) Electric Railway & Light Co.

MR. J. J. COLEMAN, who has been filling the office of assistant to the president of the Washington (D. C.) Traction & Electric Co., has resigned this position. Mr. H. W. Fuller, formerly assistant to the vice-president of the North Jersey Street Railway Co., of Jersey City, has been appointed to fill the vacancy. Mr. Fuller will be assisted by Mr. G. Campbell, late of the Union Railroad Co., of Providence, R. I.

MR. AND MRS. W. WORTH BEAN, St. Joseph, Mich., announce the marriage of their daughter, Miss Nanie Keith Bean, to Mr. Ralph Ransom. The wedding took place at the residence of the bride's parents, and was largely attended. Miss Bean has attended a number of the railway conventions and has a quite extended acquaintance among the convention ladies. Mr. and Mrs. Ransom will be at home in Paris, France, after April 10th.

### OBITUARY.

MR. HENRY A. IDDINGS, superintendent of the Market Street Ry., of San Francisco, died February 11th, in the mountains near Ballarat, Cal.

MAJOR E. F. ABBOTT, who some years ago was prominently connected with the Cincinnati street railways, died February 1st at Daytona, Fla. Major Abbott was formerly a resident of Covington, Ky.

MR. JAMES B. CANTERBURY, of La Crosse, Wis., who built the Onalaska Electric Ry. and the La Crosse & Onalaska R. R., afterward sold to the Chicago, Milwaukee & St. Paul company, died February 14th at La Crosse. Mr. Canterbury was born in Ireland in 1837. He came to the United States when 14 years of age, and later served in the Union army in the Civil War.

MR. WILLIAM C. BAKER, inventor and patentee of the hot water system of car heating which bears his name, on February 6th was struck and killed by a train on the Erie R. R., while on his way to New York. Mr. Baker was born in 1828, and for the last 50 years has devoted his life to developing and introducing the Baker heating system, which is now used extensively on steam roads and street railways throughout this country. We understand the business will be carried on by the same management that has been associated with Mr. Baker during the past 10 years.

MR. S. T. NORVELL, of West Superior, Wis., a director in the Duluth-Superior Traction Co., died suddenly of heart failure January 31st, on a Southern Pacific train en route for New Orleans. Mr.

Norvell was 38 years old, and since 1882 has been prominently identified with the growth of West Superior. He was chief engineer in charge of the construction of the Northern Pacific R. R. between West Superior and Ashland and was one of the founders of the Douglas County Street Railway Co., of which at one time he was president. Prior to the absorption of the Superior street railways by the Lowry interests Mr. Norvell was president of the Superior Rapid Transit Co.

SENATOR CHRISTOPHER L. MAGEE, president of the Consolidated Traction Co. of Pittsburg, died at his Harrisburg residence March 8th after an illness of nearly two years' duration. To him is credited in a large measure the establishment of the present splendid street railway system in Pittsburg. He was primarily a business man, although since 20 years of age he had wielded a powerful influence in Pennsylvania state politics. In 1869 he was made cashier of the city treasury, of Pittsburg, and two years later was elected city treasurer. He was twice secretary of the Republican state committee, and in 1880 was one of the principal supporters of General Grant at the Republican national convention. Mr. Magee was re-elected to the State Senate in 1896 and again in 1900. Besides his street railway interests Mr. Magee was a director in several Pittsburg banks and was the principal owner of the Pittsburg Times.

MR. THOMAS H. McLEAN, vice-president and general manager of the Toledo (O.) Traction Co., died at his home in that city March 1st. The attending physicians state that double pneumonia was the immediate cause of his death. Mr. McLean



THOMAS H. McLEAN.

was widely known for his efficient work as manager of the Toledo lines. He had occupied that position since Apr. 1, 1898, and in this less than two years' time he reconciled the interests of his company with the public demands, inaugurated an improved street railway service and materially increased the company's revenue. He was moreover the most popular of railway men, and the loss of genial "Tom" McLean from many business and social circles where he was prominent is sincerely and affectionately mourned. The deceased was born at Albany, N. Y., Dec. 10, 1855. He was first employed as a page and messenger in the state senate at Albany. During the years 1875-6-7 he gained his first experience in the transportation business as clerk of the Day line steamers, plying between Albany and New York, on the Hudson River. At the age of 22 he was appointed to a clerkship in the office of the Twenty-third Street Railway Co., of New York City. From 1882 to 1893 he filled the positions of secretary and manager of this company, and later, when the road was absorbed by the Metropolitan he acted as general manager for the consolidated lines. In 1893 he removed to Indianapolis to become general manager of the Citizens' Street Railroad Co. Three years later he resigned to go to London in the interest of a syndicate which had purchased the tramways in the City of Mexico, and in May was appointed president and general manager of the Mexico system. He filled this position until 1898, when he returned to the United States and became general manager at Toledo.

Mr. McLean, who was formerly Miss Helen Haley of Springfield, N. Y., survives her husband. The interment occurred at Albany, March 3rd, under the auspices of the Elks' fraternity.

The Akron city council has passed an ordinance extending the franchise of the Northern Ohio Traction company's newly acquired Rapid Transit property. The extension makes all the franchises of the company in the city expire at the same time, Feb. 1, 1924. The ordinance provides for universal transfers and the company promises a 5-minute service on the main line between the hours of 6 and 7 a. m. and 5 and 6 p. m. Important improvements are to be made on the Cuyahoga Falls line.



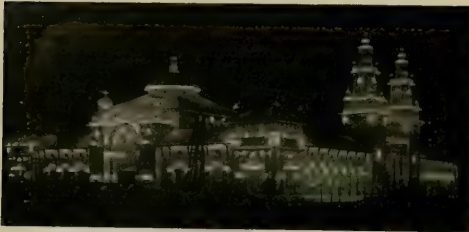
PAN-AMERICAN EXPOSITION.

The Pan-American Exposition, which will be opened to the world on May 1, 1901, is, as its name indicates, to be an exposition for all America, or as worded by its promoters, an "Information Clearing House" in all that appertains to the industrial and intellectual development of the countries of the Western Hemisphere. The movement has received the cordial endorsement and financial aid of the United States Government; of a majority of the state legislatures, and of practically all the Central and South American Governments, and it is confidently asserted by those in charge, that the Pan-American will surpass in grandeur, and in magnitude of conception, both the Chicago and Paris expositions.

The site selected for the display is in the northern part of the

The Machinery and Transportation Building is one of the largest and handsomest of the large group. Its dimensions are 500x350 ft.

The illumination of the buildings and grounds will be accomplished by means of incandescent lighting, and the possibility of



TESTING THE CIRCUIT.

city of Buffalo. The grounds include 350 acres, 133 acres of which are improved park lands and lakes. The site is one mile long by one-half mile wide. Elaborate preparations are being made, both at the grounds and in the city of Buffalo, for handling and caring for the crowds, which it is expected will exceed the attendance at the Chicago World's Fair. The International Traction Co. has two routes running to the grounds and is building large terminal loading and unloading stations, with ample facilities for having several hundred cars ready to dispatch at one time during the rush hours.

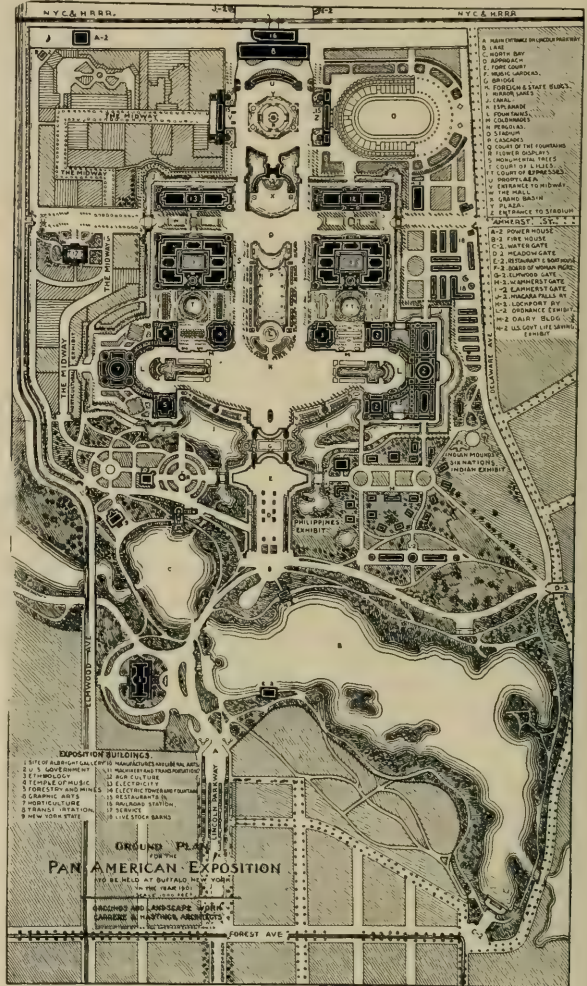
Of particular interest to street railway operating and supply men will be the exhibits pertaining to electricity and electrical appliances, shown in the Electricity Building; and the transpor-



TRANSPORTATION AND ELECTRICITY BUILDINGS.

tation exhibits in the Machinery and Transportation Building. The former group, known in the official catalog as Division X, will include machinery and apparatus for generating and using electricity for all purposes; and the latter, Division XI, includes special elevated, surface, and underground railway systems.

The area covered by the Electricity Building is 75,000 sq. ft., the structure being 500 ft. long from east to west, and 150 ft. wide. Owing to the architectural features which have been incorporated in order to make it conform with the general architectural setting, the space available for exhibit purposes is much less, approximately 25,000 sq. ft.



PLAN OF EXPOSITION GROUNDS.

obtaining power from Niagara Falls in greater quantities than have been at the disposal of any of the recent great fairs or expositions, will permit of many novel and elaborate features never before attempted.

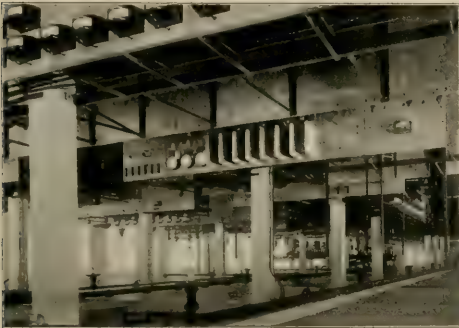
DES MOINES TAX CASE.

In the case of the Des Moines (Ia.) City Railway Co. vs. the City of Des Moines, an appeal from the decision of the board of review relative to the company's assessment for the year 1897-8, the court holds that the assessment from which the appeal was taken shall be set aside and held for naught except in certain matters in relation to the claim of the county, which the court reserves.



## A VISIT TO THE SCHENECTADY WORKS OF THE GENERAL ELECTRIC CO.

To the casual visitor through the mammoth shops of the General Electric Co. at Schenectady, there are two features that stand out prominently among others, and impress themselves again and again upon the mind. Walking up and down the miles of aisles in the many separate buildings and groups of buildings that go



VIEW IN SWITCHBOARD DEPARTMENT.

to make up this establishment, and watching the thousand and one widely differing processes that are going on, ranging from the electro-plating of a tiny screw-head to the casting of a spider for a 3,500-h. p. alternator, one's attention is first attracted by the evident care and skill with which every detail of the establishment has been organized and systematized to give the best results. There is no duplicating of work, no unnecessary handling

man reporting to the head of a group of departments, and so on up to the general manager. Each of these foremen has an assistant, who deals with the men in the department through heads of sections, a "section" usually comprising about 20 employees, insuring in this way the most careful inspection at every stage of every process by a responsible head. In addition each department has a special corps of inspectors, and it is well nigh impossible for a flaw in workmanship or material to pass through more than one pair of hands without detection.

The second feature that particularly impresses one is the care given to testing parts and groups of parts. Nothing is taken for granted and every controller, switch, motor, generator, switchboard and instrument that leaves the shops bearing the familiar G. E. trade mark, has demonstrated its ability to fulfill, for a stated period the conditions it is to fulfill in actual service. As a single example, controller cylinders, before they are placed in the cases are required to withstand a high voltage across the contacts and shaft, and when assembled each completed controller is tested on each point, for the series, shunt and electric brake windings at 550 volts, the current depending on the specifications and design of the controller.

Hardly less conspicuous than these two features is the evident regard displayed by the company for the welfare of its men. Cleanly, sanitary closets, wash sinks, ventilated lockers and well-kept tanks of drinking water are supplied for every group of men. In an establishment of this kind accidents are necessarily of more or less frequent occurrence. To insure immediate and competent aid for the injured employee, each department foreman is required to take a course in "first aid to the injured" at the company's expense, and there is always a capable physician within call. Stretchers in boxes are distributed through the buildings and medicine and restorative chests are kept in accessible places.

Through the courtesy of Mr. J. G. Barry of the railway department, a representative of the "Review" was recently furnished with a guide for a hurried trip through several of the factory shops. All departments were found working at their full capacity. The new G. E. high potential, oil break switch is meeting with a heavy



GENERAL MACHINE SHOP—GENERAL ELECTRIC CO.

of raw material or finished products, and no conflict between departments, but in so far as possible the rough materials are delivered at one end of the building devoted to the specialty of which they are to form a part, and they pass in continuous and sequential order from department to department, where each piece is formed and finished, and all the parts gradually assembled until this same material is delivered to the shipping room at the other end of the building as a finished product. Each department has a fore-

man and a number of orders are now in hand. Another specialty of which large numbers are being shipped is the M. L. circuit breakers, which embody several improved features.

The quarters formerly assigned to the switchboard department have been outgrown and the company is now arranging to give this department 1,600 sq. ft. of floor space, in addition to the 4,000 sq. ft. it now occupies. New and improved drills, grinders, presses, emery wheels and other tools will be added, and new ovens for

giving the Japan finishes to the marble slabs used in the making of switchboards. Every switchboard made at the General Electric shops is erected and electrically and mechanically tested before shipment. One of the views reproduced herewith gives some idea of the magnitude of this department and the work now in hand.

The company is planning to build a number of extensions in the spring, including a large new office building.

### NEW NIAGARA FALLS TRANSMISSION LINE.

A second transmission line between Niagara Falls and Buffalo has recently been completed by the Niagara Falls Power Co., making it now possible to transmit 30,000 e. h. p. from the generating station at the Falls to the city of Buffalo.

The old line was designed and erected by the J. G. White Co., of New York, and consists of six copper cables, or two three-phase circuits, each cable having 19 strands. The poles are about 75 ft. apart, and the cables are supported on heavy white insulators made by the Imperial Porcelain Co., of Trenton, N. J. In the erection of the line many new engineering problems had to be



NIAGARA FALLS TRANSMISSION LINE.  
Copper, Old. Aluminum, New.

faced, but the obstacles were all overcome and the service has been satisfactory to the fullest degree.

The new cables, three in number, are of aluminum, each consisting of 37 strands and having 300,000 c. m. cross section. The poles used average 35 ft. in length, and as the aluminum is much lighter than the copper cables, the poles on the new line have been placed 112½ ft. apart on the average. The insulators are reddish brown and were made by C. S. Knowles, of Boston. The Pittsburgh Reduction Co. furnished the aluminum cables.

In erecting the new line, the route of the old right of way has been followed to the south boundary of the village of Tonawanda, but at the point where the old transmission line crosses the New York Central tracks, the new line diverges and reaches the terminal station over a shorter route.

### CONNETTE INSPECTS NEW ORLEANS ROAD.

Mr. E. G. Connette, general manager of the Syracuse Rapid Transit Railway Co., was for two weeks in February the guest of the directors of the New Orleans City R. R. This is the largest street railway system in the South and for some time the company has had no manager. Last summer the directors asked Mr. Connette to assume this position, but he preferred to remain in Syracuse. They lately prevailed upon him, however, to visit New Orleans and suggest ways and means of improving the system.

### RENEWING STEEL RAILS.

In a paper on "Finishing Temperatures for Steel Rails," read by Robert W. Hunt at the Richmond meeting of the American Institute of Mining Engineers, the author touches upon a subject which is of importance to electric inter-urban railways, owing to the fact that they are using rails of heavier section than are used by steam roads of similar traffic.

The Pennsylvania Railroad Co. made it a part of its contracts this year that the rails must be finished at a low heat. This led to some observations and experiments on what constitutes a low heat and at how low a heat the rails can be worked. If the steel is too cold it will spring the rolls, receive no work on its interior structure and thus be unsatisfactory. A new method of handling the rails has been introduced the gist of which consists in placing the head of one rail against the flange of another on the cooling table, and so on. The head of the outside rail to be first entered in the finishing pass is exposed, but the bottom of its flange is against the head of the next rail. The theory is that the flange being thinner, its heat will pass off quicker, and it will thus draw heat from the head of the rail lying against it, and so remain longer at a temperature sufficiently hot to roll, and by so doing give more time for the heat to pass off from the head of the rail, which, as stated, lies exposed. When that rail is entered into the finishing rolls the head of the next one which had laid against its flange becomes exposed, and so on. By this method of manufacture the rails are finished free from scale, and the steel shows more elasticity under the cold straightening process. The grain of the fractured steel is much finer than in rails of the same section rolled under the old practice. Such metal must offer greater resistance to abrasion.

The author regards this rail rolling practice as a revolution in steel rail making and, as such, it justifies the consideration of new sections for heavy rails better adapted to the new method of manufacture.

Now that the makers have modified their rolling practice, it is but wise for the railway engineers to modify their rail sections, so as to obtain the best results from such practice, and in doing this, at the same time adopt sections which will be the best for renewing, while adhering to all of the essential features of the sections recommended by the American Society committee. Some railway officials may not be prepared to admit that renewing is to be considered, but when the time comes for the necessary removal of the heavy sections from tracks renewing of them will force itself upon their favorable consideration. At all events, if a section is adopted which is the best for the original manufacturer of the rail, which will give satisfactory results in service, and is good for renewal, it would seem to be for the best interests of all. The writer does not advocate changing the 80-lb. section, or those below it, but thinks, in view of the coming manufacturing conditions, that the heavier sections can be advantageously altered.

The greater the area of metal in the head of a rail the longer it will take while lying on the intermediate table for the heat to pass off, and if sufficient time is not given the less will be the "fining" effect of the finishing pass, and the length of time which the rail can remain on the table depends on the temperature of the flange. The thinner it is the more rapidly it will cool, and hence its condition, controls. Therefore, it will be well to design new sections for 85, 90, 95 and 100 lb. rails on lines adapted to this heat condition, and which will also be best for renewal into lighter sections.

In American railway practice rails are not permitted to remain in main lines until the wear of metal from off the top of their heads has exceeded ¼ in. Side or curve wear is another matter. Logging roads and other usual customers for relaying rails cannot afford to buy them of such heavy sections. It certainly will not be economy to consign them to the scrap heap. Renewing them certainly will be true economy, and it can be confidently expected that the rails will be improved by each renewal.

### SCIOTO VALLEY LINE IN OHIO.

The Scioto Valley Traction Co., of Columbus, O., has for the last three months been working to obtain private rights of way for its proposed electric line, and reports satisfactory progress. The line will be 100 miles long, as projected, connecting Columbus, Circleville, Chillicothe, Washington C. H. and Lancaster. B. Mahler, of Cleveland, is president of the Scioto Valley company.



## Street Railways of Portsmouth, N. H., and Kittery, Me.

BY C. B. FAIRCHILD.

In recent issues of the "Review" there have been described a number of interesting electric railways operating in the territory along the eastern coast of New England. Portsmouth is the headquarters for two companies operating sections of the electric line connecting Boston and York Beach, Me., 85½ miles.

### PORTSMOUTH STREET RY.

The Portsmouth Street Ry. is owned by the Boston & Maine R. R., which company also leases the lines of the Portsmouth & Dover Railway Co. The management is under the local superintendent of electric road, Mr. A. F. Howard, jr. The system embraces about 17 miles of single track, and the most interesting portion is the Portsmouth and Dover section which connects on the south just below Little Boars Head with the extension of the Exeter, Hampton & Amesbury road which was described in our issue for November, 1900, page 630. This section borders the extensive salt marshes which extend for many miles parallel with the coast line; at intervals there are fine views of the ocean. Passing behind Little Boars Head the line continues past the hotels and summer cottages of Rye Beach, one of the most popular of the New Hampshire beaches. The coast is alternately broken by sharp and storm worn ledges and strips of sandy beach which afford safe and pleasant bathing. Between Rye and Portsmouth the line is near some of the prominent hotels, including the Farragut House and Sea View House, while nearly all the way to Portsmouth about nine miles from Boars Head there are many hotels and summer cottages, so that the road has a liberal patronage from the tourist population in addition to the city population of 10,000. A branch road a few miles from Portsmouth leads to North Hampton, a station three miles distant on the Boston & Maine R. R. Continuing the line runs to Market Sq. in Portsmouth, at which point the different branches of the local system terminate and from which transfers are made.

The power house is in Portsmouth on tide water. Its equipment comprises Babcock & Wilcox boilers, two simple condensing Allis engines of 200 h. p. each, Dean condensers and two Westinghouse 200-kw. generators. Coal is delivered from barges. In the suburbs of Portsmouth, about six miles from the power station, is an auxiliary station with an 800 ampere-hour storage battery of 260 cells furnished by the Electric Storage Battery Co., of Philadelphia. The battery serves to take the light loads morning and night, and the main station can thus be run fewer hours per day. Aluminum conductors, equivalent to 500,000 c. m. copper, made by the Pittsburgh Reduction Co., are used between the main and sub-stations.

The rolling stock comprises eight 13-bench open cars made by the Laconia Car Co., and mounted on Laconia trucks, and three 10-bench open and seven closed cars mounted on Peckham trucks. The company also has a heavy Taunton snow plow.

### PORTSMOUTH, KITTERY & YORK STREET RY.

This line was built about four years ago and runs along the irregular Maine coast line through what was formerly one of the wildest regions on the New England coast. It is said, in jest, that no street railway can be built with more crooks and turns and be more wavy up and down than this, unless it should be longer. The first step, from Portsmouth, in making a journey over this line, is the ferry passage across the Piscataqua, a tide-water river that gives to Portsmouth its fine deep harbor. The street railway company owns two ferry boats by means of which the river is crossed and one of which is a new boat constructed to carry teams, which was put in service during the last season. The landing on the Maine side is known as Badger's Island, and here the cars are in waiting and the track leads over a bridge to the main land into the old town of Kittery. The distance from Portsmouth to the terminal of the line at St. Aspinquid Park, a short distance beyond York Beach, is 16 miles. The through fare from Portsmouth is 25 cents, and the running time an hour and a half. The trip presents an unsurpassed variety of scenic attractions; a portion of the way the track is very close to the shore line, so that the seer sometimes dashes over the rails. The names of the settlements along

the route from Kittery to the terminal are Kittery Point, Sea Point, York Corner, York Village, York Harbor and York Beach. Along almost the entire route are large hotels and summer cottages, many of the latter being mansions where the wealthy owners spend the summer months. Indeed, York Harbor and York Beach are really thickly built up settlements or towns with



FERRY BOAT KITTERY.

stores, churches and all the characteristics of a seaside popular resort.

The most important factor as an income producer is the Kittery Navy Yard just across the water in the suburbs of Kittery. Here are the extensive shipbuilding yards of the Government and because of the fine deep harbor here is also located an extensive dry dock. Many visitors patronize the street railway line in reaching the navy yard, as the cars pass the entrance near Kittery Foreside. In addition, a large number of the employees of the Navy Yard re-



ENTRANCE TO KITTERY NAVY YARD.

side along the line over almost all the distance to York Beach, and patronize the cars in going to and returning from work in the morning and evening. One of the interesting islands pointed out along the route is that of Seavy's, where the Spanish prisoners were confined three years ago. There are a number of very old churches, also historical colonial houses, government fortifications. Boon Island Tower, the old Wilcox Tavern, and an old jail built in 1630 with curiously constructed dungeons, which are pointed out



to the tourists and which form a striking contrast to the modern summer cottages and hotels with which the region abounds. Quaint farmhouses with stone fences everywhere add to the attractive features. The Isles of Shoals, seven miles off from the coast, are distinctly seen in clear weather. The line is along the highway the



CROSSING WITH BOSTON & MAINE R. R. AT YORK.

most of the route, but cuts across some of the points on private rights of way and at one section passes over a trestle one mile long, which spans the tide waters of Brave-Boat Harbor near which are extensive salt meadows with their numerous hay-ricks.

St. Aspinquid Park, the terminus of the line, is a place of amusement with casino, restaurant, menagerie and varied attractions. It is a well wooded tract and is laid out with carriage drives, walks and at intervals provided with rustic arbors and statues of Indians and groups of statuary.

The power station is located near the line of the road about four



TRACK AT YORK BEACH AFTER A STORM.

miles from Kittery, and is supplemented by a storage battery station located near York Beach, 10 miles from the power station, measured by the track, but is fed through eight miles of wire which is led across a short cut from the power house to the station. The batteries comprise 240 cells of the F-9 type furnished by the Electric Storage Battery Co. The jars are large and have a capacity for F-13 plates. The power station equipment consists of two high speed engines, belted to General Electric generators.

The track is laid with 60-lb. rails in 60-ft. lengths. At the turn-outs are Couch & Seeley telephones for signaling; these are housed in iron boxes attached to the side poles. At intervals all along the road are carefully designed and well finished one-story houses with waiting rooms and accommodations for the patrons, and everything possible is done for the comfort of passengers.

The car equipment of which the greater part was made by the Wason Manufacturing Co., consists of seven 14-bench cars and two 10-bench open cars and five closed cars, one of which is a double truck car. All the cars are mounted on Peckham trucks.

There are also a mail and express car on which the mail is sorted en route, and a specially designed freight car. Two Taunton snow plows complete the rolling stock equipment. The motors are Westinghouse No. 49 and No. 12 A machines.

The passenger traffic in good weather is from 12,000 to 15,000 a day. The resident population in the neighborhood of the line is estimated about 50,000, and the line is operated all the year around, but in the summer time enjoys increased traffic from the tourists.

The new ferry boat mentioned above as having been purchased during the present season is so designed that tracks can be laid on the main deck with the view of transporting the cars back and forth across the river to Portsmouth.

Mr. E. Burton Hart, jr., of New York, is president of the company, but the line is operated under the immediate supervision of Mr. W. G. Meloon, who has the title of general manager. Mr. Meloon is a pioneer in electrical work, having been employed in the Lynn shops of the General Electric Co. in the early history of electric railway and lighting work, and installed plants in a large num-



ENTRANCE TO ST. ASPINQUID PARK.

ber of cities in the South and West. His many friends will be glad to know that he has become manager of this important and interesting system.

### ELECTRICITY ON GERMAN RAILWAYS.

Emperor William of Germany is taking an active interest in the development of electric traction on steam railways and has sanctioned the formation of a commission that is to investigate and report upon the feasibility of substituting electricity for steam on all the trunk lines in the German Empire. Privy Councillor Rathenau, who is director of the Allgemeine Electricitäts-Gesellschaft, of Berlin, has been in conversation with the emperor and will build an experimental line from Berlin to Zessen, over which single cars, each seating 50 passengers, will be run at high speed.

### BOOKS OF TICKETS IN BUFFALO.

The International Traction Co., of Buffalo, charges a straight 5-cent fare within the city limits, but for the convenience of patrons sells books of tickets, which may be used by anyone and are good until used. Many of the cars carry in two of the windows large signs reading:

Buy our new books of street car tickets.  
100 rides . \$5.00.  
50 rides . 2.50.

A convenient thing to have in your pocket.  
On sale corner Main and Terrace Sts.

The books are appreciated by the public, and it is believed their sale induces riding as people will often ride when they can pay with a ticket instead of cash fare.

## PRECAUTIONS AGAINST LOSSES BY FIRE.

The proverbial ounce of prevention is never worth more than when applied to protecting street railway power houses and car barns from destruction by fire. Buildings of this class are commonly located in suburban districts in order to take advantage of cheaper land values, and therefore do not have the protection of the city fire department. Insurance rates are generally exorbitant and often prohibitive, and a small fire in the power station may cripple the entire system for several hours, with all the attendant losses of traffic, train crews' wages, etc. It is, therefore, the duty of every manager to take all possible precautions to prevent fires, and he should also provide ready means for extinguishing fires when they do occur.

The following article is an attempt to give suggestions that will be of service along this line and to this end the views of a few of the leading managers are also presented. From a canvass it appears that fire rules and regulations differ on different roads and range from the simple order for "every man to holler and run to the scene of the fire," to a well organized brigade with efficient apparatus and an elaborate code of signals.

The decision is nearly unanimous, however, that the best safeguards against conflagrations are good watchmen. In the smaller plants it is not always expedient to employ a man who shall give his entire time to watching, but it is always possible to arrange the duties of some one on both the day and night shifts, so that they can take general oversight of this matter and devote part of their time to making tours around the buildings and inspecting hose, hydrants and apparatus. Where the road shuts down during the early hours of the morning it is imperative that some one be left in the buildings, whose exclusive duty should be to watch for fires.

The amount of hose, number of hydrants and extent of apparatus will have to be decided in each case. Reels of hose should be placed at convenient places, but a bucket of water or sand which can be used the instant it is required will sometimes prove of greater value than two or three streams of water after the flames have taken a good start. Sand, if applied before the fire has made headway, is better than water around a switchboard, or where there are wires carrying current.

Whatever the apparatus provided, the shop, barn and station men should be drilled in its use and where the number of employees is large, better results will be secured by organizing them into a fire brigade and assigning certain men to certain duties. It can be arranged to give the fire signals on gongs or on the power station whistle, and it is not difficult to devise a code that will give the best results. On some roads the location of the fire is indicated by the number of strokes on a gong, or by whistle signals, and the men proceed independently to the scene of the trouble, while on others the employees gather at a designated place and put themselves under the leadership of the superintendent or some other person in authority. On an interurban road in Kansas all barn men, linemen or other employees within hearing report immediately at the dispatcher's office upon five blasts of the power house whistle.

Whatever the arrangements in this respect, full instructions, together with the signal code should be posted in prominent places, and a false alarm should be given at least once a month to familiarize the men with their duties and make sure that all apparatus, water pails and hydrants are in working order.

There are now on the market several automatic devices for announcing and extinguishing fires, some of which are good and some bad. The system by which a room is flooded from pipes suspended from the ceiling whenever the temperature rises above a certain point is excellent, especially for repair shops. Water can be kept under pressure in these pipes from either an elevated tank or by means of a small pump, run by steam from the main boilers and arranged to automatically speed up when the pressure in the pipes begins to fall. Hand fire extinguishers filled with chemicals will put out small fires, but are apt to be out of order when most needed.

Several ways have been suggested for running cars out of barns quickly in case of fire. One that has saved a good many cars from ruin is to build the tracks in the house on a slight grade, not over 1 per cent, so that when the cars are started they will run out by gravity, this system having the advantage of being operative when the power station is shut down.

The following arrangement could be easily made and might prevent considerable loss of rolling stock in barns where it is not desirable to have the tracks on an incline: Beside the regular trolley wire over each track, place a second wire, to be normally dead, but capable of being connected with a source of power by means of a knife switch. Use the live wire for moving cars in the barn, but when a car is to remain at rest for any length of time, change the trolley pole to the dead wire and leave the controller on the first notch. With such an arrangement one man could empty a barn in a short time by cutting in the switch to the second wire, as each car would immediately start without further attention. If the curves at the entrance of the house are complicated it would, of course, be necessary to switch the current in on but one track at a time to avoid collisions.

Owing to the classification of street railway buildings as undesirable risks by the insurance underwriters, a number of companies are taking the risks themselves and setting aside a percentage of the receipts each year as an insurance fund to cover losses by fire and storm. Where it is not thought desirable to do this, material reduction in rates can be obtained from the established companies if sufficient attention is given to various fire precautions, such as have been outlined. The Springfield (Mass.) Street Railway Co. writes that by employing watchmen and equipping the houses with automatic ceiling sprinklers, fire pails, hand extinguishers and lines of hose, the insurance company reduced the rate from 90 cents per \$100 on buildings, and \$1.15 on contents, to 25 cents and 45 cents, respectively.

The Exeter (N. H.) Hampton & Amesbury Street Railway Co. has an elaborate system of automatic sprinklers and hydrants, by reason of which the insurance rates have been reduced from \$1.40 to 60 cents on buildings. The fire system is supplied with water by a Davidson pump, having a capacity of 1,000 gallons per minute, there being a constant supply of 10,000 gallons of water from a tank at an elevation of 80 ft. Connection is made with one three-way and two two-way hydrants, located at convenient places, and stand pipes in the car barns and power house. Hose is kept on small hose carts. All the buildings are also provided with an automatic sprinkler system, which is connected directly with the tank.

The following letters will show what the practice is in several cities:

Mr. C. K. Durbin, formerly superintendent of the Denver City Tramway Co., writes as follows: "All the barns of the Denver tramway are equipped with stand pipes and lines of hose, in addition to several fire extinguishers. They are also fitted up with an automatic sprinkler system, which works to the complete satisfaction of the management, as well as to the satisfaction of the insurance companies, which grant a substantial reduction in the rate as the result of its use. A short time ago one of the cars took fire in the house, the fire starting in the motors, and the car was almost entirely consumed. No other appreciable damage was done, however, as the sprinklers went off and subdued the flames, otherwise the building in all probability would have been destroyed. At the shops the men in the different departments are drilled, so that when the whistle is blown, different signals being given for different parts of the building and grounds, they all turn out and see which department can get its stream of water going first. Occasionally signals are given when the men least expect it, and considerable rivalry exists as to who shall possess the fireman's cap, which is held by the winning crew until wrested from them. I believe in keeping property well insured, and in doing everything to prevent fires."

Mr. C. L. Rossier, president of the Brooklyn Rapid Transit Co., writes: "About two years ago we went over our fire alarm system thoroughly at the depots and shops. In some cases automatic fire alarms were installed and in others connection made with the city fire alarm system, and in addition we provided each place with hose and buckets, some filled with water and some with sand. We also put cut-out switches in all car houses, in order to cut off the railway circuit. Watchmen are employed in all the larger places, and at the repair shops two men are constantly on duty, one remaining at the fire alarm signal system ready to give immediate notice, while the other man is making the rounds. At the shops we also have a separate fire alarm system, with signals to our power house, where our own men are constantly on duty. The superintendents test the apparatus at frequent intervals. We also have in one of our largest car houses a sprinkler system. In reply



to your question as to the rates of insurance, I certainly think that these arrangements have enabled us to secure better rates."

Mr. C. E. Flynn, general manager of the Easton (Pa.) Consolidated Electric Co., writes: "We are using steel and brick construction for car and power houses, and are dispensing with our wooden structures. We employ watchmen, who operate the watchman's clock every quarter of an hour from stations in and around the buildings. We also have a large number of fire pails kept constantly filled with water for an emergency. These pails are arranged in groups of four at convenient places in and around the buildings. We also have fire hose arranged in different parts of the buildings, and kept ready for use and the employees are instructed how to use them, although we have no regulation fire drills. In the construction of our new car houses, we intend placing the tracks at sufficient grade to permit cars to run out of car houses when brakes are released. We are using standard 2½-in. fire hose, which is always ready for use by simply opening the valve. There is no question but that our various precautions give us a reduction in insurance rates."

Mr. E. G. Connette, general manager of the Syracuse (N. Y.) Rapid Transit Co., states: "It has always been my practice to have sections of hose in racks in various parts of the building ready for immediate use, and at intervals from time to time to have a false alarm given to see how quickly the men can avail themselves of the use of the various means of protection. Of course, this is not necessary, except about once a month, and at a time when the men are not expecting it. With drills of this kind the manager can observe the movements of the employees and correct any inefficiency in their service in regard to taking care of a fire. At our main car barns we have men on duty day and night, and would be able at any time to remove a large portion, if not all, of the cars within a period of time that would be necessary in order to save them in case of fire. Our insurance rates are moderate."

Mr. E. P. Vining, general manager of the Market Street Railway Co., of San Francisco, states that his company does not take insurance from insurance companies, but sets aside an insurance fund, which, however, has never been drawn upon except for a few very small amounts. Most of the buildings are built of redwood, which does not burn easily.

Mr. Herbert Warren, general manager Duluth-Superior Traction Co., writes: "We do not employ any special watchmen to keep a lookout for fires. In all our buildings there are employees who have work to do all night, and we depend upon them to detect anything wrong. Our employees are not organized into a fire brigade, and we do not have fire drills. We have no code of signals for announcing the location of fires. In our car house, which has a capacity of about 80 cars, all the tracks run straight out and connect with the main line. We use no transfer tables. All the cars could be pulled out onto the main line in a very few minutes with this arrangement of tracks. We have stand pipes and hose located in such a way in all of our buildings that any part of the building could be deluged with water on a moment's notice. We believe that this arrangement has enabled us to get a low rate of insurance."

Mr. S. Harris, general manager of the Lehigh Valley Traction Co., of Allentown, Pa., makes the following statement: "We have watchmen in our car house and shops, but have no organized fire brigade. We have a city fire alarm box in our car house and shop and also have water pipes running through the building from city main, with hose attached at different points, ready for use by turning on a valve. The watchmen have instructions to call the superintendent by telephone on the first indication of fire, after ringing in the city alarm. As far as we have been able to determine these precautions do not make any difference in our insurance rate."

Last winter the buildings of the Dunkirk (N. Y.) & Fredonia R. R. were totally destroyed by fire. Mr. M. M. Fenner, general manager of the road, sends us the following account of the disaster: "Our power house was equipped with water pipes carrying water at 100 lb. pressure; also with a steam-chemical apparatus. At the same time a hotel and livery stable opposite our building caught fire during a terrible wind storm and the hay in the stable produced such a smudge as to make all efforts at stopping our fire useless. Our power house district and everything in it, including all our rolling stock, burned up. The first thing we did after

that was to get the village board of trustees to declare a fire district, and then we proceeded to rebuild and are still rebuilding and re-equipping. Our new building is not exactly fireproof, but nearly so, being a brick building, with brick floors, brick partitions and wooden rafters and roof boards covered with asbestos paper and steel. On account of the fire district, we cannot be burned up by outsiders, and having two hydrants near our plant with 100 lb. pressure of water, together with steam and chemical equipments, we feel our station will not burn up again. We have two men at work in the building nights, as well as day time, and a part of their duty is to watch for fire."

The power station of the City Street Car Co., of Stainton, Va., is fitted with pipes running on the steel girders of the roof, and which are connected with one 2-in. pipe. By opening one valve the building can be flooded in three minutes. The Worcester (Mass.) Consolidated Street Railway Co. employs a watchman, who rings in on a watchman's clock every hour through the night, from 6 p. m. to 6 a. m.

### SUMMER THEATER PAYS WELL AT SYRACUSE.

In a recent interview, Mr. E. G. Connette, general manager of the Syracuse Rapid Transit Co., kindly gave a representative of the "Review", a statement of receipts and expenses for last season at the Valley Theater, which is owned and managed by the Rapid Transit company as a means of creating traffic. A complete description of this theater with the seating arrangements and terminal facilities will be found in the "Review" for August, 1900, page 478.

The theater is devoted exclusively to light opera, and the Rapid Transit company, with the aid of a theatrical agent in New York, organizes its own opera company and maintains it throughout the season, which usually lasts about nine weeks beginning some time in June.

Last season the total expense incident to running the theater was \$8,000, this including renting of costumes, salaries of the



actors, and all charges for maintenance and care of the theater. Receipts from the sale of seats were \$7,600, leaving a deficit from the operation of the theater itself, of \$400. But by actual record the weekly passenger receipts on the line running to the theater were greater by \$500 each week during the opera season. For the nine weeks this would give \$4,500 as the income due to the theater. It is estimated it cost about \$2,000 over the regular expenses to carry this extra traffic, which, deducting the \$400 deficit, leaves a net profit for the season of \$2,100. As the theater cost complete with scenery but \$3,000, the company is well satisfied with the investment.

Mr. Connette states that plans for the coming summer are well matured and the theater will be run on a broader scale than last year. A first-class opera company of 27 members is being organized, and will include eight principals and a chorus. This company will give a different comic opera every week, with a performance each night and two matinees. Mr. Connette states that the prima donna, who was formerly a leading member of the "Bostonian" musical organization, is paid \$75 per week, and the two comedians \$30 and \$40 per week. The street railway company furnishes transportation to and from Syracuse, but does not pay



the singers' hotel bills. All the costumes are rented from New York, the costumer sending the necessary paraphernalia for each opera several days before the week it is to be given.

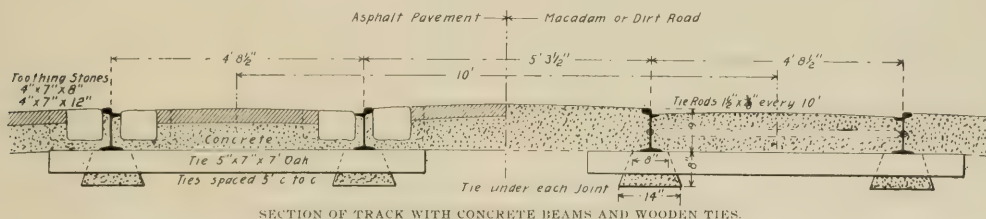
Asked regarding the advertising arrangements Mr. Connette said he does not believe in plastering the cars with placards and announcements. Neat interior signs will be placed over the front doors in the cars and these will announce the bill for the coming week. He has also had made 12 large frames which will be placed in conspicuous windows in the city, the only compensation asked by the owners for this use of their windows being free tickets to the theater. These frames are fitted with heavy mats having square and oval openings to receive photographs. The photographs will be changed every week and will show the principal members of the opera company in the costumes of the opera for the current week. Arrangements have been made with a local photographer for taking the pictures at \$1.50 a dozen, and he will also take charge of the frames and see that the photographs are changed at the proper time.

Standing advertisements will be kept in the amusement columns of the daily and weekly papers and Mr. Connette has engaged the musical reporter of a leading local paper to act as press agent.

The price of admission to the theater is 25 cents, but the company sells coupon tickets for 25 cents, entitling the holder to a return trip on the street car and general admission to the theater. About 500 seats are reserved at 10 and 25 cents each, and there are in addition 500 unreserved seats for holders of general admission tickets. Seats in the boxes are 50 cents. Mr. Connette aims to give at the Valley theater, performances that the public would ordinarily pay a dollar or a dollar and a half to see.

### TRACK CONSTRUCTION WITH CONCRETE BEAMS.

There is now being built in the city of Niagara Falls, N. Y., a three mile electric railway which possesses two interesting features. The trolley wire is a shape developed by the General Electric Co., and known as its "grooved circular" section, formed as its name implies of a circular section of wire with two continuous grooves cut into the sides to receive the hangers. The use of this section



is believed to be new for street railway work. When the wire is in place these grooves are at the ends of the horizontal diameter. The section is practically a modification of figure 8 wire, and it is thought will do away with the difficulties encountered with the figure 8 section on curves.

The second departure from common practice is in the roadbed construction. In this work, 9-in. girder rails are laid on concrete beams, the work being very similar to track constructed with steel ties for the Buffalo Traction Co., several years ago. Instead, however, of the steel, wooden ties have been laid because they are cheaper. The track laid with steel ties on concrete beams has shown remarkably low maintenance charges, but inasmuch as the traffic on the new road will not be exceptionally heavy, and the function of the ties in this case is mainly to preserve the alignment, rather than to support the rails, it is believed the substitution of wooden for steel ties will materially reduce the cost of construction, without lessening the life of the roadbed.

Cross sections of the track for both asphalt and macadam roads are shown herewith. When building the roadbed, a trench 14 in. wider than the length of the ties, is first excavated to a depth of 14 in., and in the bottom of this two additional trenches, 3 in. deep

and 14 in. wide at the bottom, are dug along the line the rails will occupy when in place. Oak ties, 5x7 in. x 7 ft., are then placed every 5 ft., with one under each joint, and the rails are spiked to the ties in the usual manner. The work is then ready for the concrete beams, which are made of one part best American portland cement; five parts Canadian bank sand; and 10 parts, 3/4 in. to 2 1/2 in. broken stone. This mixture is tamped into the small trenches under the ties, and between the ties up flush with the foot of the rails, a distance of 8 in. from the bottom of the small trenches, the width of the beam gradually narrowing to 8 in. at the top.

With asphalt paving the concrete is brought up around the rails, and in the concrete are set tooting stones, 4x7x8-in. stones, alternating with 4x7x12-in. stones. In macadam and dirt roads, tie rods 1 1/2 x 3/4 in. are placed every 10 ft. Each joint is bonded with two "Crown" bonds.

This new line is owned by the Niagara Falls Street Railway Co., of which Mr. Geo. A. Richer, of Buffalo, is chief engineer. The road reaches a new residential district in the northeast part of the town, that promises to become one of the finest sections of the city, as the increase in business houses is gradually crowding out desirable residences along the water front. The Niagara Falls Street Railway Co. is controlled by the owners of the Gorge electric railway and the new line will give the Gorge road entrance into the city of Niagara Falls, over practically its own tracks.

The officers of the Niagara Falls Street Railway Co. are: President, Capt. Jos. T. Jones, of Buffalo, formerly president of the Niagara Falls & Suspension Bridge Railway Co.; vice-president, H. P. Bissell; secretary and treasurer, Bert L. Jones; general superintendent, Godfrey Morgan, general manager of the Gorge road.

### VIRGINIA CONSOLIDATION.

February 28th, the Portsmouth Street Railway Co., of Portsmouth, Va., the River Front Railroad Co., the Norfolk County Railway Co. and the Virginia Equipment Co. were consolidated and merged into one corporation under the name of the Old Dominion Railway Co. The officers and directors of the Portsmouth Street Railway Co. are, by the terms of the consolidation, the officers and directors of the Old Dominion Railway Co. All agents and employees of the corporation parties to the consolidation are

continued as agents and employees of the Old Dominion Railway Co. until further notice. All tickets, vouchers, checks, notes, acceptances, and all other obligations and liabilities of any of the corporations parties to the consolidation will be honored by the Old Dominion Railway Co. in the usual course of business.

The officers are Horace G. Williams, president, and M. II. Leonard, treasurer, with headquarters at 119 S. 4th St., Philadelphia.

### UNION STATION FOR CLEVELAND.

A committee representing the Cleveland Electric Ry. and the six electric interurban lines entering Cleveland is now considering building a union passenger and freight station for the use of the roads interested. The seven companies have pledged themselves to raise \$100,000 for carrying out the recommendations of the committee, and a lot 100 x 100 ft. on Erie St., extending from Eagle St. to Bolivar St. has been selected as a building site. The station building will probably be built and owned by a separate company, the control being vested in a board representing all the roads making use of the property.

## POLE LINES.

BY G. W. KNOX.

The location of pole lines in public streets and alleys is usually attended with a general protest from the public. There have been many test suits to decide the right of objection on the part of the property owners to the placing of poles in front of their property, and the court has in nearly every instance held that streets are designed for public uses, and if poles are so constructed and maintained as to not effect prejudicially the rights of the public, and not to interfere with the proper use of the street by others, no burden not contemplated by the dedication of the street is placed upon it. It follows that an abutting lot owner has no sufficient ground to complain of the erection and maintenance of poles in the street in front of his premises if they are properly placed, and this is true whether he owns what is technically termed the fee of the street or not, and in general, that the company has the right to so place its poles as to secure its best results for its purposes, provided that it so places them as not to cause any unnecessary injury.

Outside of the contention made that pole lines are unsightly, there really cannot be any justifiable objection to their being placed in the streets, and yet it means in nearly every instance a continual skirmish from gaining consent of the property owners to the securing of the franchise from the municipality.

A street railway company in the metropolis of the West was asking for a franchise for a pole line a few years ago. When the measure was presented to the city council for its consideration one of the leading members of the council arose and in words more emphatic than choice said: "I for one shall oppose first, last and all the time the granting of a franchise for any more pole lines in the vicinity mentioned. That part of the city now looks like a decayed forest, and I shall myself chop down any additional poles erected in the neighborhood in question." The franchise was not granted.

There being a very general feeling on the part of the public against pole lines, it must be the aim of the parties building lines, for harmony's sake, to overcome the main objection of unsightliness by building the lines so they will be presentable.

The first matter the engineer has to decide in laying out a pole line is what shall be its capacity and what shall he allow, supposing it to be a feeder line, for future growth. The latter question is the most safely disposed of by building as heavy a line as is practicable for it is a rare thing that the full capacity of the line, no matter how much it may be, is not in time required to take care of the natural growth always to be expected. The additional cost to build a heavy pole line as compared with a light line is so slight, when the value of increased capacity is considered, as to make this one item insignificant.

The engineer should cover in his specifications and estimates all of the special requirements, of which there are many, in building a line. In general, he should be explicit in his requirements with respect to material, thus:

## Wooden Poles:

- Kind and quality of wood.
- Length.
- Size at top and ten feet from bottom.
- Green winter cut or summer cut, with sap removed.
- Knot allowance.
- Dead heart or decayed center allowance.
- If treated or creosoted and manner of doing same.
- Deflection test.

## Iron Poles—Tubular:

- Kind of metal.
- Length.
- Number of sections per pole.
- Length of each section.
- Size of pipe of each section.
- Cross section of metal of each section.
- Method of making joints.
- Kind of paint to use.
- Painting at factory before shipment.

## Cross Arms:

- Kind of wood.
- Size.

- Braces, size of.
- Bolts and lags, size of.
- Kind of insulating pins.
- Size of insulating pins.
- Insulators, size of.

## Installation of Work:

- Location of poles.
- Manner of shaving, roofing and gaining.
- Digging holes, depth and size.
- Setting and anchoring poles.
- Rake of poles.
- Tamping in.
- Concreting; amount and kind; method of mixing.
- Time allowed for setting of concrete before applying strain on work.
- Base protecting shells; with iron poles.
- Painting after erected.

Taking up, briefly, matters pertaining to material and manner of installation consideration should be given to the following points:

Cedar poles are more largely used in wooden pole construction than any other kind, owing to their cheapness and the quantity available. Chestnut and Norway pine are perhaps the best lasting of all, but their scarcity and excessive cost at this time largely prohibit their use. Cypress is extensively used in the South and gives very good satisfaction, but does not last as long as cedar. White cedar, untreated, set in clay soil, lasts on an average about 15 years, and Norway pine and chestnut, 20 to 30 years. Cypress will not last much over 8 to 10 years. Experience shows that by creosoting wooden poles at a cost of from \$3.50 to \$7.00, it is possible to practically double their life. This has been done in this country in some cases and in many of the European countries to a considerable extent, and is recommended by the parties trying the experiment.

Wooden poles should have a good heavy butt, tapering gradually to the top. Where 30-ft. wooden poles are used for side pole trolley suspension, nothing less than a 7-in. top with a 10-in. to 12-in. butt, measured at a point 3 ft. from the bottom end should be used, and for heavy feeder lines with say 45 and 50-ft. poles, nothing less than an 8-in. top with a 12-in. to 15-in. butt, measuring 3 ft. from the bottom. Winter cut poles and those cut in the summer with the sap wood removed are invariably required in building a good line, and great care should be taken in excluding a dead cut pole, as after they are in use a very few years deterioration sets in and progresses at a rapid rate; also they are liable to be brittle and break easily. Knots, of course, cannot be avoided and as a rule, the more knots there are the stronger the pole, providing they are not dead limb knots grown over.

Some engineers require that a wooden pole stand a certain stress, latterly applied, with an allowable amount of deflection. To make a correct test with a wooden pole in this manner the stress should be applied from four different points on the pole's side, as in simply pulling from one side, owing to the peculiar location of a wind crack or knot the weak spot in the pole may be missed. The best way of determining qualities of wooden poles as to their strength and probable utility, is to have an experienced man inspect and pass upon them. Very large poles are quite liable to have decayed centers and are to be considered very undesirable for the reason that as soon as the sap in the pole is exhausted, deterioration sets in from the surface, and the center being hollow it lacks the support naturally afforded by a solid heart or center, thus reducing very materially the life of the pole.

With iron poles, theory indicates that the strongest form in which material can be placed to resist stresses from all directions, the point of support being at a distance from the plane in which the forces act, is tapering, circular in cross section, and having walls gradually diminishing in thickness as the diameter becomes smaller. It is generally found that the cheapest form of iron poles which can be made approximates closely to the theoretical conditions in being the strongest for a given weight of metal.

In the process of making the joints of an iron pole, the smaller section of tube telescopes into the larger with a small margin to spare. The larger section is brought to a high temperature and then compressed or swaged around the smaller section and allowed to cool, thus giving a solid swaged joint, nearly welded.

The general dimensions of iron poles for all practical purposes may be had from the accompanying table:

DIMENSIONS OF IRON STREET RAILWAY POLES.

	LINEAR DIMENSIONS.													Thickness of Metal for Section.			Area of Cross Section of Metal for Section.			Specified Weight, Lb.	Allowable Variation in Weight, Either Way, Lb.
	A	B	C	D	E	F	G	H	I	J	K	L	A	B	C	A	B	C			
Standard 30' Side Pole, 7' 6" S.	17' 6"	8' 0"	7' 6"	18"	18"	30' 0"	7 3/4"	7"	6 5/8"	6"	5 1/2"	5"	3 3/8"	5/8"	1 1/4"	8.69	6.20	4.11	870	22	
Standard Corner Strain Pole, 8' 7" 6"	17' 6"	8' 0"	7' 6"	18"	18"	30' 0"	9"	8"	8"	7"	6 3/4"	6"	1 1/2"	1 1/2"	3 3/8"	13.35	11.79	7.51	1330	23	
35' Feeder Pole, 7' 6" S.	21' 0"	9' 6"	7' 6"	18"	18"	35' 0"	7 7/8"	7"	6 3/8"	6"	5 1/2"	5"	1 1/8"	1 1/8"	1 1/4"	10.22	6.20	4.11	1110	28	
40' Feeder Pole, 7' 6" S.	21' 0"	13' 0"	9' 0"	18"	18"	40' 0"	8"	7"	6 3/8"	6"	5 3/8"	5"	1 1/2"	1 1/2"	1 1/4"	11.79	8.85	5.21	1325	33	
50' Feeder Pole, 8' 7" 6"	24' 0"	16' 6"	12' 6"	18"	18"	50' 0"	9"	8"	8"	7"	6 5/8"	6"	1 1/2"	1 1/2"	1 1/4"	13.35	11.79	8.85	2100	52	

The standard 30 ft. 7-6-5-in. "side poles" will stand a stress applied latterly of 2,500 to 3,000 lb. with but 3 in. to 4 in. deflection, while with special strain poles, 6,000 to 7,000 lb. may be applied with no greater amount of deflection.

The estimated, and undoubtedly the actual life also, of iron poles will be between 25 and 30 years where there is a due amount of care exercised in keeping them painted. Iron poles should be given one coat of good graphite or mineral paint before leaving the factory and another after being erected, with an additional coat at the expiration of at least every three years.

Painting of wooden poles is not commendable except it be for the sake of improved appearance, as the very small additional life it gives will in no wise compensate for the cost of painting. Applying a preservative paint on butts of wooden poles is a greater disadvantage than advantage in attempting to prevent rotting, as moisture will soak into the pole and be retained under the paint to a greater degree than if the paint were not there. With the butts of iron poles the factory coat should be sufficient, as the concrete used in anchoring them is a better protection against corrosion than an additional coat of paint.

Cross arms made of long leaf yellow pine 3 3/4 in. x 4 1/4 in. for two to four pins and 4 x 4 1/4 in. for six pins, lagged or bolted to the pole in gains 1/2 in. deep, braced with 5-32 x 1 1/4 in. iron braces gives good service. On all curves, right angles and dead ending work double arms made of oak substantially braced should be used.

With No. 0000 to 500,000 c. m. feeder wires nothing smaller than a 134-in. locust insulating pin should be used, and heavy top-tie double petticoat thoroughly annealed glass insulators.

For side suspension trolley support construction, poles should not be located any farther apart than 115 ft. in order to avoid excessive sag with the trolley wire. For medium capacity feeder lines, say twelve to sixteen, 350,000-c. m. water proof wires, poles should be located every 90 to 100 ft.; for heavier lines than these the poles should be 75 to 80 ft. apart.

To have an even grade with the poles after erected a measurement from the bottom up to say 8 ft. should be indicated on the pole, making proper allowance for any variation of grade where setting.

Shaving, trimming knots and roofing the poles not only improve the appearance, but make them easier to work upon while stringing wires; again, a shaved pole will last longer than a peeled pole as it will not hold as much moisture on the surface.

It is the usual practice to set poles 6 ft. in the ground, many making no distinction as to the height of poles or the number of wires placed upon them. Heavy feeder line poles should be set not less than 7 ft. in the ground and should be well tamped in with preferably a portion of the back filling of 2 in. to 3 in. crushed rock. A poorly anchored pole allows a swaying of the line to take place; this is an extra and severe strain on the line. The holes dug for wooden poles should be just enough larger than the pole to allow for good tamping.

With iron poles the holes should be enough larger than the pole to allow from 5 to 6 in. of concrete on all sides in the case of a 30-ft. side suspension pole, and from 8 to 12 in. of concrete with strain and heavy feeder line poles. Side suspension poles should have a rake of 1/2 in. to the foot which means with a 30 ft. pole 15 in. It is the practice of many to set them at a much less rake than this, which results in the pole going past the perpendicular line into the street at the end of one to two years after setting.

For concrete, 4 parts of clean cracked stone, size that will go through a 2-in. ring, 2 parts sharp sand and 1 part native cement, allowed to set for 10 days before applying strain or working on the pole, gives perfect results. It is absolutely necessary to place a base or bottoming board underneath the pole to prevent its settling in the earth. Not more than an 18-in. layer of concrete should be thrown in around the pole before being thoroughly tamped.

Top and bottom anchors are used in pole setting, usually, though only with wooden poles, where conditions may require extra anchoring. Iron protecting shells filled with cement or compound on iron poles just at the top of the ground are often used and are a protection against rusting at the point where weakness is first manifested. In using these shells care must be taken to have them well filled so there will not be a chance for water to lie between the pole and the shell.

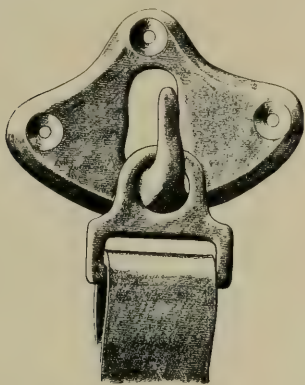
It is announced that the electric railway between Janesville and Beloit, Wis., will be open by July 4th.



### INDIVIDUAL STRAPS IN ROCHESTER.

The suggestion has been made at one time and another that it would be more satisfactory to all concerned, if the hand-straps usually provided in street cars for the convenience of standing passengers were supported from fixed brackets instead of from a horizontal pole as is more commonly done.

Those that favor the fixed-strap arrangement urge the following points in support of their suggestion: Passengers cannot so easily monopolize two straps; as the brackets may be fastened at regular intervals throughout the length of the car, the straps do not become bunched at any one point as they frequently do on the poles, and there is more apt to be one within reach from any part of the aisle. Moreover this arrangement tends to distribute the crowd



INDIVIDUAL STRAP.

throughout the car, making the conductor's task of passing up and down the aisle an easier one, and adding to the comfort of both standing and seated passengers.

The Rochester (N. Y.) Railway Co. has decided in favor of the fixed strap and many of its cars are being fitted in this way. The straps are hung about 18 in. apart, from malleable iron castings, shaped as shown in the accompanying sketch, and bronzed or plated to accord with the other interior metal trimmings. The eyelet piece which carries the strap is placed over the small hook, and to prevent it from slipping off, the top of the hook is driven inward by two or three blows of a hammer.

### NEW ORLEANS & CARROLLTON R. R. WEEKLY.

The New Orleans & Carrollton Railroad Co. has for the past three years published a small weekly devoted to the railway and local interests of the city. This publication, we are assured by Mr. J. H. DeGrange, vice-president of the railroad company, is a direct outcome of a suggestion made by the "Review" to the effect that such a publication would do much towards enlightening the public as to the efforts made by the company to improve its service and accommodate its patrons. It was also thought that such a paper would counteract the effect of the frequent unreasonable attacks of the daily press which at times seems to make the street railways special targets for its animosity.

Commenting editorially on this subject the "Review" for April, 1899, says: "A small monthly sheet can be issued at a very reasonable figure; when occasion demands it can appear as a weekly. Let it be devoted to local interests; to the announcements of all the notices the company desires to address to its patrons. Let its spirit be dignified but earnest and very much alive. Pursue a patient course of education in which the good work the company is doing is set forth, not in any boastful manner, but in the same tenor the daily paper treats other institutions it desires to commend."

Following these lines Mr. George H. Davis, manager, and Mr.

J. H. DeGrange, vice-president of the New Orleans & Carrollton company, started the little weekly mentioned above, and for three years it has met with a great deal of favor on that road, its patrons anticipating its appearance every week. In size the paper is 2 $\frac{3}{4}$  in. x 6 in. and contains four pages. It is published every Saturday and the first page is always devoted to a special article on some topic of interest in connection with the railway. A recent issue takes up the subject of street car ventilation, for example, and shows that the company endeavors to regulate the ventilation to please the majority of its passengers and to strike a compromise between the passenger who wants the car all open and the one who wishes it entirely closed. Another issue describes the attractions of the Carnival and the arrangements of the company for handling the great volume of traffic during that event.

The various attractions along the company's routes are given for each week and the rules and regulations for passengers are also printed from time to time. In this way the company reaches the public directly, especially the patrons of its lines.

### ELECTRIC TRAMWAYS IN CARDIFF.

Like many other cities in Great Britain, Cardiff has been behind the times in the matter of street railways but now electric tramways are to be erected in this city of nearly 200,000 inhabitants by the municipality. U. S. Consul D. T. Phillips has forwarded some details of this undertaking which also includes a lighting as well as a power plant. The enterprise is divided into two departments, namely, the public works and the tramways. The borough engineer acts as architect for the erection of the buildings. He has to put up the power station, car depots, prepare the tracks, lay all the lines, and then hand them over to the tramways department for electrical equipment. The tramways engineer has to design all the plant for the power station, provide plans for cable laying, direct the overhead equipment, and all other details after the borough engineer has turned over to him the tracks and necessary buildings. The foundations for the power station are already completed and gangs of men are busily at work laying tracks.

The engine room will be 104 ft. long by 60 ft. wide, with boiler houses on either side. Outside the boiler houses there is a special coal-storage arrangement whereby fuel is tipped from wagons on the railway siding into large hoppers immediately above the boilers. For tramway purposes there will be four engines of 500 h. p. each, capable of running up to a maximum of 650. Direct connected to each engine will be a generator of 300 kw. capacity, and these are built to withstand a temporary overload of 50 per cent. Each engine will have its own condenser, while outside the building there is room for a large reservoir for cooling purposes. Besides the plant already on order the engine room is capable of accommodating a further 3,000 h. p., and half of this it is proposed to install during the present year for lighting purposes, so that shortly after the station is opened there will be there 3,500 h. p.

A feature of the design is that all the engines and generators are built to supply current for lighting and traction, the object being to minimize as much as possible the amount of reserve plant. Each boiler house will hold seven boilers, making 14 in all, each having a capacity of 500 h. p. In addition to the boilers, there will be complete sets of economizers. They are placed in the main flue, between the boiler and the chimney stack. Superheaters will also be attached to each boiler. Elaborate arrangements are to be made for dealing with coal. From the railway siding coal will be placed in hoppers, and from these it will be automatically fed into the furnaces, and similar labor-saving methods will be resorted to in dealing with the ashes.

The whole current will be led to a switchboard 60 ft. long, from which it will be distributed. The cables are all to be carried in earthenware conduits.

The Leavenworth (Kan.) Electric Railway Co. has applied to the War Department for permission to build an electric railway from Leavenworth to Fort Leavenworth.

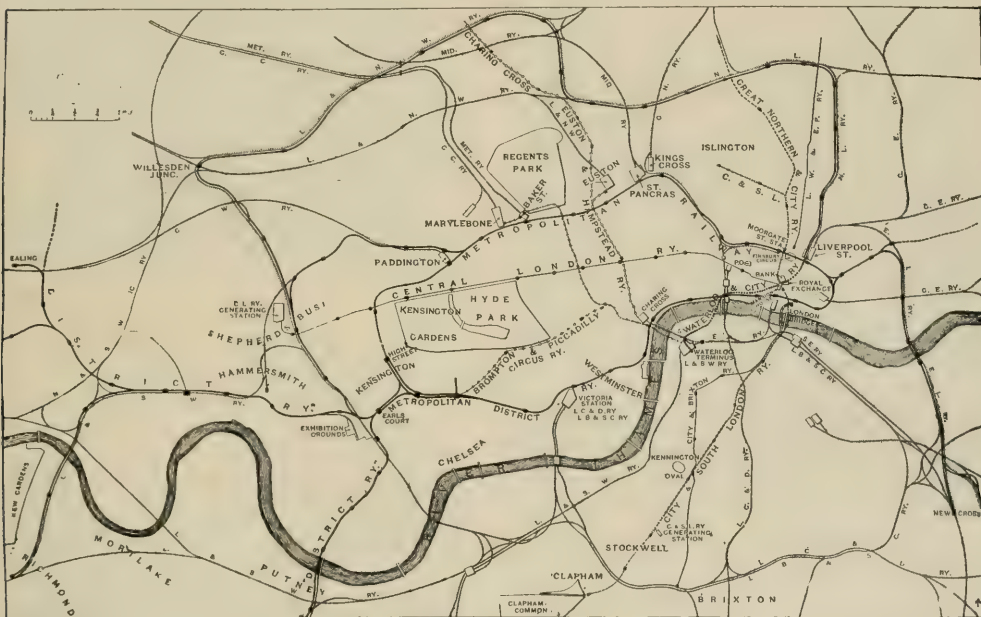
The Cleveland & Chagrin Falls Electric Railroad Co. has installed a storage battery in its power house. Six new cars, with double floors and plate glass windows have been put in operation by the company.

## THE UNDERGROUND ELECTRIC RAILWAYS OF LONDON.

The accompanying map serves to show the underground railways of the city of London. The oldest of the underground electric lines is the City & South London, which has twin tunnels 4¾ miles long. A portion of this line, 3.1-3 miles, was opened in November, 1890. The track is standard gage, laid with 60 and 80-lb. rails. The power house has two 1,100 h.-p. corliss engines, two 500 h.-p. and two 250-h. p. Willans engines. The company has 32 electric locomotives, and its car-mileage in 1900 was 468,500. Mr. T. C. Jenkins is manager, and Mr. P. V. McMahon electrical engineer.

The Waterloo & City Ry., opened for traffic in August, 1898, extends from the Waterloo railroad station to the Bank of England, a distance of two miles, the tracks being laid in twin tunnels. The gage is 4 ft. 8½ in. It only runs six days per week. The line is operated on a 500-volt direct current. The company

equipment also comprises 16 Babcock & Wilcox water-tube boilers, supplying steam at 150 lb. pressure. Vicar mechanical stokers are used; coal handling machinery was supplied by the C. W. Hunt Co., and the Crane Co., of Chicago, furnished all steam pipe bends and valves. The plant was constructed and equipped under the supervision of Mr. H. F. Parshall, consulting engineer. The Central London Ry. was constructed at a cost of £600,000 per mile. The Greathead shield was used in constructing its tunnels, the same device which had been employed in the building of the City & South London line ten years before. Tunneling in London was found to be a slow and expensive process, owing to the toughness of the clay to be excavated. The Central lines were five years under construction, and engineers claim that the work might have been accomplished in half the time had the clay been of a different character. Mr. G. C. Cunningham is general manager of the Central London Ry., and the staff of engineers comprises Sir John Fowler, Sir Benjamin Baker and Mr. Basil Mott. Nine trains of



THE UNDERGROUND RAILWAYS OF LONDON.

has 17 motor and 10 trail cars; the annual traffic is about 120,000 train-miles. Mr. C. J. Owens is manager and Mr. D. Heap, electrical engineer.

The Central London Ry. was opened for traffic July 30, 1900. It has 13 miles of track laid with 100-lb. rails through twin tunnels. The tunnels are 11½ ft. internal diameter except at the stations, where they are widened to 21 ft. for a distance of 375 feet. There is a 3 per cent grade on each side of each station in order to retard or accelerate the trains, and it is estimated that by this plan one-third of the power otherwise necessary for the acceleration of trains is saved. The trains run at a speed of 14½ miles per hour. In the "Review" for July, 1897, a map showing the route of the Central London Ry. from Liverpool St. to Shepherd's Bush was given, together with a description of so much of the equipment as had at that time been contracted for. Nearly all the contracts were awarded American manufacturers, the entire electrical equipment, with the exception of the elevators, being furnished by the British Thomson-Houston Company, representing the General Electric Co. The terminal station at Shepherd's Bush is equipped with six Reynolds-Corliss horizontal compound condensing engines of 1,300 h.-p., made by the E. P. Allis Co., direct connected to G. E. 850-kw. three phase generators. The

six carriages each are operated, affording a three minute service. The number of passengers carried per month is 2,750,000.

The Baker Street & Waterloo Railway, begun in 1898, will probably not be completed for two or three years. This road, having 3.12 miles of track, will connect with the Central London at Oxford Circus and with the Waterloo & City at Waterloo. Connections will also be made with the Metropolitan and the Great Central Rys. Twin tunnels are in course of construction; they will run side by side, except for a short distance south of the river, where one will be built above the other. The tunnels have an average diameter of 12 ft., except at the stations, where there is a single tunnel 21 ft. in diameter. At the third station, at Trafalgar Square, the company will construct a series of subways similar to those at the terminus of the Central London Ry. Two of the tunnels have been nearly completed from the south side of the river to the bottom of Regent St. Progress is being made on the tunnel under Regent's Park and another is well under way from the Baker St. terminus toward Marylebone Road and Portland Place. Mr. C. A. Rowell, who was previously employed in the construction of the Waterloo & City Ry., is resident engineer and manager of the work in hand. Perry & Co. are the contractors.



The experimental electrical section of the Metropolitan & Metropolitan District Ry. extends from Earls Court to High St., Kensington. The contract for equipping the whole of this road, which is the oldest of London's underground system, for electric traction, was to have been let recently, but a very low offer was received from Ganz & Co., of Budapest, and the directors of the Metropolitan deferred the awarding of the contract until a committee set to Budapest for the purpose shall return and render a report.

In addition to these roads, the Great Northern & City is now building. This line will connect with the City & South London at Old St., and extend some two miles north, serving one of the best of London districts between Finsbury Park, N., and Moor-gate in the heart of the city. The line will be operated by electric locomotives, and its power station will be located on the banks of the Regent's Canal. Arrangements have been made with the Great Northern Railway Co., whereby the latter will operate a specified number of cars over the line each day. The engineers are Sir Douglas Fox and Mr. Francis Fox. The date set for completion is June, 1902.

The Charing Cross, Euston & Hampstead Ry. is now practically an American enterprise, Mr. Charles T. Yerkes, of Chicago, being president of the company. The equipment of the line will be furnished principally by American manufacturers. Contracts have been awarded and the work is progressing favorably; it is hoped that the road will be in operation within two years. This line, seven miles long, will afford a day and night service through the most populous district of London, and place Hampstead within half an hour's easy journey from Charing Cross. Messrs. Price & Reeves, of Westminster, who built a portion of the Central London Ry., and are now engaged on the Whitechapel and Bow extension of the Metropolitan District Ry., are the contractors.

This project dates from 1893, when Parliamentary powers for the construction of the line in its original form were first obtained. In 1899, the promoters obtained from Parliament powers to make an extension of the line formerly authorized to connect with the Midland near Kentish Town, and to alter the route of the main line between Charing Cross and Hampstead so as to include the station of Euston. Mr. Turner, general manager of the Midland, and Mr. Willis, general manager of the Southeastern railway, successfully supported these proposals and obtained the requisite authority, but were later prevented by the other heavy engagements entered into by both the Southeastern and Midland companies, from giving the Charing Cross project the backing necessary for its success. It was then that Mr. Yerkes became interested. Mr. D. H. Louderback represented Mr. Yerkes for some time, but, being compelled to return to America, he was succeeded by Mr. Howard Abel, who resigned as president of the Lake Street Elevated, Chicago, and sailed for England in December last. Mr. J. R. Chapman, electrical engineer of the Union Traction Co., and the Yerkes elevated roads in Chicago, went to England this month, where he will have direction of the electrical features of the new underground line.

### SEATTLE-TACOMA LINE TO BE BUILT.

Contracts are reported to have been awarded for the construction of the Seattle-Tacoma electric railway which Fred E. Sander of Seattle is building. The road will cost \$1,000,000, and Mr. Sander, it is reported, has enlisted some capital of Washington, D. C., and New York, in the enterprise. A right of way for this line, with the exception of that part traversing the Puyallup Indian reservation has been secured. The line will be a competitor of that which the Seattle Electric Co. projects building between Seattle and Tacoma. Mr. Sander was the builder of the Grant St. and the Yesler Way electric lines in Seattle.

According to a London contemporary, electrical machinery, and all component parts thereof that are not adapted for any other purpose, are admitted into India free of duty. On instruments and other auxiliary attachments not indispensable to the operation of the machinery, a duty of 5 per cent ad valorem is imposed, except when imported by or under the orders of a railway company.

### WHALOM LAKE AND PARK, FITCHBURG, MASS.

"The very best of everything," is the controlling motto of the superintendent of the Fitchburg & Leominster Street Railway Co., Mr. W. W. Sargent, who in addition to his street railway duties has full charge of the park owned and operated by the company.



ROAD TO THE PARK.

The success of this park as a traffic producer makes an article descriptive of it interesting for the managers of all roads that contemplate engaging in similar enterprises.

The park was first opened in 1893, and was at that time modest in its proportions and pretensions, but it was fully appreciated by the residents of the nearby cities and towns. Each succeeding year



RUSTIC BRIDGE.

the park has become more popular both as a public resort and for private picnic parties. It has been found that picnic parties return year after year which in itself is the strongest evidence of the excellence of the facilities and management.

Whalom Park is a heavily wooded tract of 60 acres, located three miles from Fitchburg on the shore of Whalom Lake, named for a celebrated Indian chief, who once lived on its shores. The lake has an irregular shore line, and covers about 94 acres; it is spring fed, and is bordered with alternate farms and forests. Along the shore are charming summer cottages. The patronage of the park comes not only from Fitchburg, but also from Leominster, distant





WHALOM LAKE.

four miles, and from excursion parties brought over the Fitchburg Railroad from all the region within thirty miles. The steam road delivers its passengers at the depots of either Fitchburg, West Fitchburg, Leominster and North Leominster, with all of which the cars of the street railway company connect, and land their passengers within the park enclosure, coming in from both directions through lanes of giant white pines, turning on the same loop, and stopping in front of the park depot which is a pagoda-like structure.

The native trees which shade the park, are mostly pine, standing in very thick clusters, while there are on the borders areas of slender white birches, which form delightful retreats from the more crowded portions of the park. There is a large open lawn in the park from which the trees have all been cut, leaving only a border of ancient pines along the lake front which form a shelter for a pretty band stand, and the fifty or more lawn swings and rustic seats, which are grouped at intervals all about the front border of the lawn. The light green of the lawn presents a delightful contrast to the prevailing sombre green of the pine. The lawn is fenced in by a two bar fence of iron pipes, and in the enclosure are a number of well designed flower beds with a luxuriant growth of cannas, perennial phlox, coleus, and other bedding plants.

Facing the lawn, but within the grove, is the principal building of the park known as the Whalom Park Inn. This is a combined hall and cafe. The hall occupies the upper floor, and is available for concerts, reunions, dancing, and other entertainments. On the first floor is the cafe, which is in charge of a first-class caterer, and the menu includes a full line of substantial, and all the delicacies of the changing seasons. On the first floor are stands for soda water and other light drinks, and others for the sale of first-class cigars, candies, fruits, peanuts, and the goods usually sold at such places. The sale of intoxicants is prohibited in and about the company's property. Back of the inn is a substantial building,

containing on the first floor a bowling alley, which is said to be the best in the vicinity, while in the same building are billiard and pool tables, a shuffle board, and a shooting gallery. At the front end is an elevated platform, from which ladies and children can watch the games. The upper floor in this building is divided into parlors



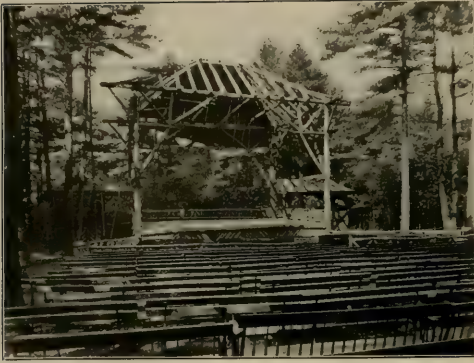
WHALOM PARK INN.

and waiting room. To the right on approaching the inn, is a large dancing pavilion, and for those engaging in the amusement, a charge of 5 cents is made for each set danced. This pavilion is also provided with a platform for accommodating those who wish to watch the dancers. Near the dance hall and on one side of the lawn is located a small building in which tin-types are made by electric light, and on the walk to the lake is a phonograph pavilion in which there are many other entertaining attractions. Tables for picnic parties, park settees, and lawn swings are distributed in convenient spots over the 60 acres of grove. The swings are free to the public.

The principal feature of the park, however, is the rustic theater, which is thoroughly and artistically rustic, although built on nearly level ground, as may be seen from the illustration. During the summer season, the roof is covered with canvas, and there is a canopy that acts as a sounding board, so that the lowest tones can be heard at the rear seats. The platform is unusually large, and is provided with ample dressing rooms so that the largest traveling companies can be accommodated. The seating area is open, but is thoroughly shaded by the massive pines which border the enclosure. The auditorium proper is fenced off with a white birch



AT THE WHARF.



WHALOM PARK THEATER.

railing, and reserved seats to the number of 750, to which an admission fee of 10 cents is charged are also enclosed by the rustic fence, and outside, about 1,200 seats are sold for five cents each. In the rear of these, standing room is free to the general public, whether patrons of the road or outside visitors.

The entertainment season opens Decoration Day, May 30th, for that day only. No shows are given until the week of June 11. Vaudeville is the attraction until the first week in July, then the opera season opens and lasts until and including Labor Day week.

The company, which is known as the Whalom Opera Co., consists of about twenty-five people, and only experienced opera performers are engaged. The operas given last season were Billee Taylor, Girofle-Girofla, Boccaccio, The Mascot, The Bohemian Girl, Three Black Cloaks, Fra Diavolo, Chimes of Normandy, The Grand Duchess, and Said Pasha. The operas have always been well received and have proved a drawing card for three seasons. Sundays, band concerts are given at intervals from 2 until 9 p. m.

The wildest portion of the park is fenced in with high wire fences, and in these enclosures are found the very finest specimens of moose, elk, deer, and foxes, while in isolated cages in the same neighborhood are bears and numerous small animals. This animal enclosure is crossed by a large rustic bridge, which was built after a design furnished by Mr. Sargent.

On the lake is a boat livery, which is fully in keeping with the other attractions, and in the collection are canoes, Adirondacks, small boats, large row boats, all of which are kept clean and dry.

In addition to these there is a commodious steam launch, always in charge of an experienced man, which makes regular trips about the lake for parties or for regular patrons. Near the boat landing



WHITE BIRCH SUMMER HOUSE.

is anchored a novel looking craft, known as the cruiser "McKinley." This was the famous trolley gun-boat, that was run as a trolley car over the street railway lines of Fitchburg in the Presidential campaign of 1896. At night this craft is brilliantly lighted with various colored incandescent lamps, which, with the electric illum-

ination of the grove and the rustic theater, present a most beautiful appearance. Near the boat house pier is a raft from which fireworks are set off on special occasions. Beside the boat attractions, there are bath houses at different points on the shore, and near them are sandy beaches which provide for safe and clean bathing. Besides the animals already mentioned, which form interesting attractions to the children, there are on the shores of the lake, flocks of ducks of handsome varieties and of all colors. Among the features provided for entertaining the youthful element are beds of clean sand, with wooden borders, in which the children never tire of playing. On one side of park are racks for bicycles, and just outside the main entrances are fences to which those who drive to the park can hitch their horses; no teams or bicycles are allowed within the enclosure. The best of order is maintained at all times, as the grounds are



W. W. SARGENT.

constantly policed by the town officers, and by the company's uniformed police. Everything is kept scrupulously clean and neat, and all paper and debris of every description is daily removed. The management makes it a constant study to so please the patrons, that they will desire to come again. The patrons are all of a respectable class, and spend their money freely. The manager makes it a practice to thoroughly advertise the park and its attractions, and provides in this connection, a finely illustrated pamphlet, containing about 25 half-tone illustrations of the various attractive features of the park.

Mr. W. W. Sargent, superintendent of the company, is a veteran street railway man. He began his railway work with the Lynn & Boston R. R., on the Chelsea Division, in 1880, and after various promotions was appointed superintendent of the Fitchburg & Leominster, his present position, in 1886.

The syndicate that leased the Cincinnati Street Ry. is said to be negotiating for the property of the Hamilton (O.) & Lindenwald Electric Traction Co.



TO PROTECT THE HARBOR.



## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### UNSETTLED ABOUT RIGHT TO USE COUNTRY ROAD.

*Ehret v. Camden & Trenton Railway Co. (N. J.), 46 Atl. Rep. 578, June 13, 1900.*

The contention that the construction of an electric railway, known as a "trolley" line, longitudinally upon a country public road, imposes a servitude in addition to that charged upon the lands by the original taking for a public highway, entitling the owner of the fee, or ultimate title, to additional compensation to be first made, the court of chancery of New Jersey says is an unsettled question in that state. And when a case presented for a preliminary writ of injunction depends upon the acceptance of this contention as established, the writ, it says, will not be allowed.

### RIGHTS OF DRIVER OF CARRIAGE REACHING CROSSING BEFORE TROLLEY CAR.

*Earle v. Consolidated Traction Co. (N. J.), 46 Atl. Rep. 613. June 18, 1900.*

Trolley cars and the drivers of ordinary carriages, the court of errors and appeals of New Jersey holds, have equal rights upon the public streets and street crossings. The first to reach the crossing has the right to pass over first. But if it appears that the motorman does not intend to respect his right of priority, and that the driver cannot, in the exercise of reasonable prudence, exercise his right, he is guilty of contributory negligence if he fails to wait or turn aside, if he can do so by the use of due care, and thus protect himself from injury. In such case the remedy of the driver, the court goes on to state, would be by suit against the trolley company for failing to observe his right of priority at the crossing.

### CONSTRUCTION OF STATUTE AUTHORIZING TWO DIFFERENT LINES TO USE THE SAME STREET.

*Hook v. Los Angeles Railway Co. (Cal.), 61 Pac. Rep. 912. July 18, 1900.*

Section 499 of the Civil Code of California is as follows: "Two lines of street railway operated under different managements may be permitted to use the same street, each paying an equal portion for the construction of the tracks and appurtenances used by said railways jointly; but in no case must two lines of street railway operated under different managements use the same street or tracks for a distance of more than five blocks consecutively." This section is in its terms prospective for each of the two lines of street railway, and, literally construed, the supreme court of California says, applies to a case where permission is given to them to use a street in which no track has yet been constructed. In such a case, the construction of the track and appurtenances would be a matter of contract between the two lines, under which the expense of the construction would be borne in accordance with the provisions of the section. But a proper interpretation of the section, the court goes on to say, extends its provisions to a case in which a franchise is granted to operate a street railway over a portion of a street on which another railway has already been constructed and is in operation. True, the section itself does not use the term "cost" or "value" in defining the rights and obligations of the two, but states that each shall pay an equal portion "for the construction," without specifying of what the "portion" consists. This ellipsis, however, may be reasonably supplied, the court thinks, by holding that the legislature intended that, in the absence of some unusual or controlling circumstance, each should contribute one-half of what would be the reasonable expense "for the construction," if at the time the right to use the same is sought both lines were for the first time preparing to make a joint use of the street, and to construct tracks and appurtenances thereon. But the court declares that it would be manifestly unjust to require payment of one-half of the money which may have been paid for the construction of tracks and appurtenances which have become greatly dilapidated, or which may have been constructed at a time when materials were much more expensive. The owner of the

road that had been thus constructed, the court holds, would receive the full compensation intended by the statute if he should be paid one-half of the value of the track and appurtenances at the time the other is permitted to make use of them.

### WHEN PASSENGERS ARE ENCOURAGED TO BOARD CARS IN MOTION AT TRANSFER STATIONS.

*North Chicago Street Railroad Co. v. Kaspers (Ill.), 57 N. E. Rep. 849. June 21, 1900.*

It is not negligence in itself and as matter of law, the supreme court of Illinois says, for a passenger to get on a street car when it is in motion. The care which, as a matter of law, he is bound to prove is such degree of care as a reasonably prudent person would exercise under similar conditions. On the question he will not be entitled to prove the mere fact that other persons have boarded the cars while in motion, for the purpose of establishing a standard of ordinary care, regardless of whether those persons were reasonably prudent or negligent in so doing. It is not competent to show as an excuse for an act of negligence, that others are accustomed to be equally negligent. But in this case the evidence was not only of the fact that other passengers got upon cars while in motion at the transfer place in question, but also that the company permitted them to do so without objection, and even encouraged the practice. The evidence tended to prove notice to the company of the fact that passengers were likely to get aboard there when arriving on a car at the transfer station just as the cable train they wanted to take for the business part of the city was starting and was crossing the vault between two cables where it would pick up one of increased speed, and also to prove that the company did not discourage the practice or prohibit it, but rather induced it, and a continuance of it, through its conductors. And if those facts were established it became the company's duty, the court holds—in affirming a judgment for \$5,000 for injuries sustained by a boy 14 years of age who received a fracture of the bones of the left leg above the ankle in attempting to board a cable train under such circumstances, and falling off when the speed was increased—to run its trains with reference to the practice and consistently with it. The plaintiff, it adds, was a passenger entitled to the degree of care due from the company to a passenger, and if the company knew that persons would probably be getting on the moving trains at that place, and consented to the practice, the law, it holds, imposed upon it the duty to not expose the plaintiff to unnecessary danger in adopting the practice, and to manage the train accordingly.

### SHOULD HAVE INSTRUCTED CONDUCTOR IN USE OF BRAKES.

*Sullivan v. Metropolitan Street Railway Co. (N. Y.), 65 N. Y. Supp. 842. July 17, 1900.*

This action was brought to recover for injuries sustained by a driver of a horse car. It seems that he came to a place where, on account of the company having dug an excavation along the track for the purpose of making repairs, it became necessary for him to detach his horses from the car and to drive them around to the other end of the excavation, leaving the car to run down the grade at that point by its own weight, until it reached a place where he could hitch the horses to it again. As he unhitched the horses from the car, he rang the bell for the conductor to come to the front platform. The conductor did so, and assumed the control of the car as it passed over the excavation. But as the plaintiff was driving the horses, he stumbled and fell, and before he could recover himself, the car, which was following, ran upon him and injured him severely. The conductor, on the front platform, undertook to check the speed of the car by applying the brakes. He was far enough from the driver when he stumbled to stop the car, had he known how to do it. But he was ignorant, and, instead of applying the brakes, he loosened them; and there was nothing to check the speed of the car or to prevent it running against the driver as it did. The conductor had just been hired by



the company, and, before being set to work, he had received instructions as to the collection of fares, giving transfers, ringing the bell to notify the driver to stop and start the car, and calling the names of the streets, but he had received no instructions whatever as to the proper manner of handling the brakes in case it should become necessary for him to do so. Under these circumstances, the appellate division, first department, of the supreme court of New York, affirms a judgment for the plaintiff, because the conductor had not been properly instructed as to his duties in managing the brakes on this car, and the accident happened because he did not know how to apply them. Ordinarily, the court says, when one is injured because of the negligence of a fellow servant, he cannot charge the master with the results of that negligence, because it is one of the risks of the employment which he assumes; but, before a master can require a servant to assume the risk of the negligence of a fellow servant, he is bound to use reasonable care to employ a person competent to perform the duties of his position, or, if incompetent when hired, to give him proper instructions about them.

#### INJURY TO PERSON ON SIDEWALK BY CAR RUN INTO BARN WITHOUT WARNING.

Wahlgren v. Market Street Railway Co. (Cal.), 62 Pac. Rep. 308. Sept. 17, 1900.

Where a pedestrian on the sidewalk in front of a car barn was struck and injured in the nighttime by a cable car being let run backwards by gravity from the main track into the barn so as to start it out on another track, the conductor being at a switch and neither he nor the gripman in a position where he could see a person approaching the curved track on the sidewalk, though the conductor took a look to see that the way was clear before going to the switch, the supreme court of California thinks that the jury was fully warranted in finding that the party's injury was the result of the company's negligence in having no one where he could keep a lookout and endeavor to avoid running over people on the sidewalk. Certainly, it declares, it cannot say, as a matter of law, that it was negligence for the party to endeavor to cross the track, no warnings or signals having been given, and the approach of the car not having been discovered until too late to get out of its way.

#### CONTRIBUTORY NEGLIGENCE OF BOY UNDER NINE YEARS OLD IN NOT LOOKING FOR CAR.

Ryan v. La Crosse City Railway Co. (Wis.), 83 N. W. Rep. 770. Sept. 25, 1900.

Where a boy eight years and nine months old was sent across double tracks on an errand, had lived right opposite them for two years, was in the habit of crossing them daily, had attended school for three years, was unusually intelligent, knew that south-bound cars ran on the west track as well as that north-bound cars ran on the east track, and had nothing to divert his attention or prevent his seeing a south-bound car, the supreme court of Wisconsin holds that he was guilty of contributory negligence, when returning from his errand, in not, after seeing a north-bound car pass, looking for, or paying any attention at all as to whether there was a south-bound car coming. It seems settled, the court says, that where, as here, it appears from the undisputed evidence that the plaintiff, considering his age and intelligence, did not exercise proper care in crossing the track, the trial court may determine, as a proposition of law, that the plaintiff is guilty of contributory negligence, and cannot recover.

#### PREMATURELY STARTING CAR.

Davey v. Greenfield & Turners Falls Street Railway Co. (Mass.), 58 N. E. Rep. 172. Oct. 19, 1900.

The supreme judicial court of Massachusetts upholds here instructions to the effect that when a car stops on the street to receive passengers any person taking hold of it to enter has the warrant therefor of an invitation, and is protected thereby unless the invitation was previously recalled; and that, while it cannot be stated as a matter of law that the conductor must on all occasions and on every occasion know that no one is seeking to enter when

he gives the signal to start, yet when nothing is shown, more than the fact that the car had stopped to receive passengers, and the persons were seeking to enter, it is his duty to know whether any are entering at the time he gives the signal for starting; as also that the starting of a car by the motorman without having received the signal from the conductor is to be treated as if he had had the signal, that is, it will be negligence if it would have been negligence for the conductor to have given the signal then to start the car.

#### DUTY TO KEEP TRACKS FROM BECOMING AN OBSTRUCTION.

Groves v. Louisville Railway Co. (Ky.), 58 S. W. Rep. 508. Oct. 4, 1900.

The court of appeals of Kentucky says that it cannot assent to any such construction of the law as that if tracks are at first constructed so as not to materially obstruct and endanger the safety of persons using the streets, and the rails remain in the position first placed, the company is not liable for any damages to persons or property by reason of the rails or tracks becoming an obstruction by reason of the wearing away of the street from the rails or natural sinking or from any cause whatever. It says that even if it be conceded that it is the duty of the city to do all that is necessary to keep the streets in proper and safe condition, yet the company cannot lawfully operate and control railway tracks which are a material obstruction to travel or dangerous to life or property, and still escape liability for damage or injuries resulting therefrom, or resulting from permitting the tracks or rails to become dangerous to those traveling such streets. It thinks that public policy and public necessity alike demand that street railway companies should see to it that the streets between the rails and next to them on all sides should be kept level with the rails, or so nearly level as to not endanger the lives or property of those having a right to cross them or be upon them. The rails and road, it continues, are a permanent structure, and necessarily keep the travel across and near to the rails from being the same that it would otherwise be; hence the use by such companies is not at all analogous to the use of the streets by the public generally. And it says in conclusion, that it seems clear, upon both reason and authority, that it was the duty of the defendant company to see that the street or road in question was so nearly upon a level with the rails of its road as to reasonably prevent injury to the person or property of any person traveling or rightfully being upon said street or road, and, if it did fail so to do, it was liable in damages for such failure, without regard to whether any other person or corporation was liable to respond in damages for such injury.

#### ELECTRIC STREET RAILWAYS AND POLES NOT AN ADDED BURDEN.

La Crosse City Railway Co. v. Higbee (Wis.), 83 N. W. Rep. 701. Sept. 25, 1900.

It has long been held in Wisconsin that a railroad, constructed on the grade of a street and operated so as not to materially interfere with the common use thereof for public travel by ordinary modes, or with private rights of abutting landowners, and for the purpose of transporting persons from place to place on such street at their reasonable convenience, is not an additional burden on the fee thereof. And this rule, the supreme court of Wisconsin now holds, applies to street railroads operated by electric power communicated by means of a trolley wire supported over the track by cross wires attached to poles set in the streets near the outer edge of the sidewalk lines, so far as the construction and operation of such roads fall within the principle of the rule. A railroad, it declares, satisfies the essentials above stated, regardless of the motive power used or how it is applied, if it be strictly a street railroad for the carriage of passengers on the street, taking them on and discharging them at reasonable points, and it be so constructed and operated as not to materially interfere with the ordinary modes of using the street for public travel or with private rights. A supporting trolley-wire pole, set in a street in front of the sidewalk, it holds, does not violate the above rule if it be placed with reasonable regard for the convenience of the owner of the fee of the land on which it is located, and so as not to materially interfere with access to his lot outside the street line. But the court wants it un-

derstood that it does not hold that an electric street railway pole may be placed at any point in the street near the outer edge of the sidewalk without being an added burden upon the fee title. Reasonable regard must be had, in locating such poles, for the convenience of abutting property owners in the enjoyment of their property.

#### DUTY OF ANTICIPATING PASSENGERS' DESIRES AND ACTIONS.

Root v. Des Moines City Railway Co. (Ia.), 83 N. W. Rep. 904. Oct. 17, 1900.

According to the passenger's testimony, the motorman had left the car, and the conductor was in sole charge. On approaching the street where she wanted to get off, she nodded to the conductor, as he was looking back, which was a signal customarily recognized by those in charge of the cars. Then, when the car was crossing the street she went to the rear end, to be ready to get off. It, however, was going too fast for her to get off, but gradually decreased its speed until hardly moving, and, as she thought it had stopped, she started to alight, without taking hold of the handle, when the car started very suddenly, and she fell and was seriously injured. The conductor admitted looking back, but denied that any signal had been given to stop, and explained that he did not begin to slow up until he approached a switch that was 20 feet beyond the street. Now, not what the conductor in fact knew, but what, in the exercise of a high degree of care, he was bound to anticipate, the supreme court of Iowa holds, was the controlling inquiry. If, in the proper discharge of his duty, he should have observed the effort of the passenger to leave the car, and failed to do so, and, because of his omission, started it suddenly, while she was stepping to the ground, and thereby occasioned the injury, then the company, through him, was negligent. Knowing, as he must be assumed to know, that she desired to alight at that street, and that the speed had been gradually decreasing before and after reaching it, the very natural inference was that after passing that street she would get off at the first opportunity. A man of ordinary prudence, the court goes on to say, would have understood, under such circumstances, that continuing to slow the car until barely moving would be likely to be accepted by the passenger as an invitation to step to the ground. The company is not prohibited from letting passengers off elsewhere than at intersections, and, if it gives them reason to assume that such a stop is being made for that purpose, the measure of care exacted is the same as though at crossing. So, the court concludes that the evidence was such that the jury may have found that the passengers reasonably assumed that the car was stopping for her to alight, and that the conductor ought to have anticipated her action in leaving it.

#### ONE ALIGHTING FROM CAR AND GOING BEHIND IT NO LONGER A PASSENGER.

Chattanooga Electric Railway Co. v. Boddy (Tenn.), 58 S. W. Rep. 646. Oct. 8, 1900.

The supreme court of Tennessee holds that it was error to instruct a jury that, "If the proof shows that the plaintiff was a passenger on one of the defendant's cars, and he had alighted from the car upon which he had been transported, and in attempting to leave the point of his destination, to go to his business, he was injured by another car being operated by the defendant company, while attempting to cross behind the car from which he had alighted, \* \* \* he would still be considered a passenger, \* \* \* and the defendant would owe him a high or extraordinary degree of care to protect him. \* \* \* He has the legal right to cross the track and go to his destination in safety, and the defendant was bound, in the highest degree, that he was exposed to no peril." The court says that it is obvious that the situation in which the plaintiff was placed just before and at the moment he received this injury, while such as to require prudence on his part, at the same imposed the duty of diligent attention upon the railway company to see that he received no injury from anything under its control. The conductor and motorman on the approaching car, seeing that a car on the opposite track had stopped at the crossing, were bound to know that passengers were alighting from or getting on it. If alighting, they might well have anticipated the possibility that they

would come out from behind the car to cross the street, and in doing so would be put in peril by the approaching car, unless it was under perfect control. That the care required of the company was proportioned to the danger more or less incident to the situation is obvious; but, the court asks, did the passenger relation between the common carrier and this man exist at the moment of the injury complained of, so that the law imposed in his favor, upon the company, the extraordinary degree of care required by the above instruction? On this question, the court says, there is a conflict of authority, but it thinks the more reasonable view is that, where a man who has traveled on a street car steps from the car upon the street, this terminates his relation and rights as passengers, and the railway company is not responsible to him, as carrier, for the condition of the street, or for his safe passage from the car to the sidewalk. One who steps from a street railway car to the street, it says, is not upon the premises of the railway company, but upon a public place, where he has the same rights with every other occupier, and over which the company has no control. Hence, it holds that his rights are those of a traveler upon the highway, and not of a passenger.

#### AS TO DUTY TO SOUND BELL AND CHILD RUNNING OUT FROM BEHIND WAGON.

Murphy v. Derby Street Railway Co. (Conn.), 47 Atl. Rep. 120. Oct. 4, 1900.

This was an action brought by an administrator to recover for injuries causing the death of a boy 6 years of age who was playing behind an ice wagon in the street and ran out therefrom at a time to be struck by an approaching car. In affirming a judgment against the company, the supreme court of errors of Connecticut holds that it was a correct ruling, in the case, that whenever a car is rapidly approaching a point where, from the existing condition and occupancy of the highway, it is apparent that the danger of injury to the public at that time and place will be materially lessened by sounding the bell, it is the duty of the company and its motorman to sound the bell. Such conduct as that of a boy 6 years old, of ordinary intelligence, running across a street where there is a street railway track, without looking in both directions to see if a car is approaching, the court says, may be evidence of contributory negligence, but is not necessarily conclusive. It also holds that whether parents are negligent or not in permitting a child to be in the street unattended is an immaterial question in a suit by the child for injury to it.

#### NOT NECESSARILY CHILD'S DUTY TO LOOK AND LISTEN.

Louisville Railway Co. v. Phillips (Ky.), 58 S. W. Rep. 995. Nov. 14, 1900.

A little girl 12 years of age having been struck by an electric car at a street crossing, the court of appeals of Kentucky holds that the court below properly refused to instruct the jury that it was her duty to look and listen. It was her duty, it says, to exercise such caution as may be reasonably expected of one of her age under the circumstances. This the trial court, in effect, said to the jury, and he should not have gone further, for the degree of care required would depend on a number of circumstances, and it is peculiarly a question for the jury whether the person injured exercised such care as she should have exercised.

#### VALIDITY OF WISCONSIN FREIGHT-CARRYING PROVISION AND OF A FRANCHISE-EXTENDING ORDINANCE.

Linden Land Co. v. Milwaukee Electric Railway & Lighting Co. (Wis.), 83 N. W. Rep. 851. Oct. 12, 1900.

One of the contentions in this case was that section 1862 of the Revised Statutes of Wisconsin, under which the defendant company was incorporated, is unconstitutional, because it attempts to authorize the formation of street railway corporations vested with the power to carry freight as well as passengers, thus making it a commercial railroad, and also authorizes municipal corporations to grant the use of streets to such railway companies for the carriage



of freight and passengers, and nowhere provides for the payment of compensation to the abutting owners. Now, it may be admitted, for the purposes of the case, the supreme court of Wisconsin says, that a railway authorized to carry freight as well as passengers becomes a commercial railroad, instead of a street railroad, and that such a railroad, when laid in a street, becomes an additional burden on the fee, and cannot be laid without the consent of, or compensation made to, the adjoining owners. It also says that it is true that the Wisconsin statutes contain no provisions authorizing such companies to condemn private property in the streets of cities or villages, although such condemnation may be had outside of cities and villages. But while this deficiency in the law may render it impossible for the defendant company to lay or operate a track for the transportation of freight without actually purchasing the right from private owners to cross their lands, the court holds that the legislature had power to authorize the formation of just such corporations; and that, if it neglected to provide the corporation, when formed, with a means essential to its successful operation, the result might be a very unfortunate one for the corporation, and perhaps one fatal to its business success, but would not be fatal to its corporate character. If such a corporation attempted to condemn, it could be successfully defeated by the fact that it was given no such power; and, if it attempted to lay tracks without condemning, it would be stopped with the proposition that it was taking private property without compensation. And the court thinks that it may reasonably be said that this law was only intended to authorize corporations to use streets with the consent of the city for carriage of freight as against the rights of the public only, and not as against private owners, leaving such owners in full possession of their rights to stop the construction, insist on compensation, or give their consent, as they chose. Besides, the court cannot see how private property owners can make any point of the legislature having failed to endow a corporation with the power of condemnation so as to get the right to carry freight when the city has not chosen to grant it any right to carry freight, and all its franchises authorize carrying passengers only.

Moreover, under the authority of said section 1862, which gives the municipality power to grant street railway companies the use of streets, without limitation, save that such grant be made "upon such terms as the proper authorities shall determine," the court holds that franchises expiring in 1924 and succeeding years could all be extended in terms until the year 1934. Nor does it consider this extension of time unreasonable.

Then, after the proper authorities have exercised this discretion vested in them by section 1862, and have decided that the terms imposed should be a gradual reduction of fare, rather than payment of money into the treasury, the court holds that it cannot be said that any city fund has been squandered, lost, or misused, it being for the council to decide whether the city should receive any fund. So, too, it holds that it was a question addressed to the sound discretion of the council, whether, in this case, the franchise in question should be sold to a third person for \$100,000, who could only run fragmentary lines, or should be granted to a company which would be required to incorporate the fragments into its system, and thus furnish to the traveling public continuous trips under a transfer system from one part of the city to another for a single fare. And the same considerations, it says, will evidently apply to a number of other allegations in the complaint in this case, to the effect that the grant would necessarily put the city to great expense in repairing, widening, and improving streets and viaducts, and would seriously injure the water system of the city, by electrolysis of the pipes, thus increasing the burdens of the taxpayer. The fact that such injurious effects to streets, or water pipes in the streets, are liable to result from the granting of the franchise, does not impair the power to grant it, the court holds, but simply becomes an important consideration to be taken into account in the fixing of the terms which shall accompany the grant. This question also becomes a question of discretion, which discretion is vested in the common council, and cannot be controlled by a taxpayer or any body of taxpayers.

Nor does the court consider the ordinance in question unconstitutional as being in effect a special or private law "granting corporate powers or privileges," which the state constitution of Wisconsin prohibits. It holds that while such franchises as were here granted are legislative grants, they are not corporate powers or privileges, within the meaning of the constitution.

And not only does the court hold that one abutting owner cannot maintain an action, on behalf of all other abutting owners, challenging the validity of franchises granted by the city council and demanding judgment that the grantee of the franchises be forbidden to accept them, but that an abutter has no right to an injunction to prevent the acceptance of a franchise, or the laying of tracks on other streets, although one may enjoin the laying of them without legal authority on the street in front of his premises. It also holds that objections to the regularity of the council proceedings in the adoption of an ordinance, such as that it was passed without publication of the required notice and without being referred to the appropriate committee, as also the point that its passage was secured by an alleged agreement of the officers of the company to pay certain citizens large sums to cease their opposition to the passage of the ordinance, cannot be raised at the suit of private parties.

#### BOY RUNNING IN FRONT OF CAR GOING AT EXCESSIVE SPEED.

Holdridge v. Mendenhall (Wis.), 83 N. W. Rep. 1109. Oct. 30, 1900.

The supreme court of Wisconsin holds here that if a boy a little less than 7 years of age ran unexpectedly in front of a street car, and the motorman had no reason to expect any such action on his part, and the accident would have happened in the same way had the car been going at a normal and reasonable speed, then it could not be said that the speed, assuming that it was excessive and negligent, was the proximate cause of the injury, and no liability would attach on account of such speed.

#### CARE TO BE EXERCISED TO AVOID COLLISIONS.

Citizens' Street Railway Co. v. Damm (Ind.), 58 N. E. Rep. 564. Nov. 20, 1900.

The law casts upon persons in charge of a street car the duty, the appellate court of Indiana holds, of vigilance in observing the danger by collision to persons on the track, even though they may be negligent in being on the track; and to avoid inflicting an injury the speed of the car must be checked, if there is time so to check it, after the danger is observed; and, it says, the law goes to the extent of requiring the car to be stopped, if necessary, to prevent accident.

#### ALLOWING PASSENGER TO RIDE ON REAR BUMPER.

Grieve v. North Jersey Street Railway Co. (N. J.), 47 Atl. Rep. 427. Nov. 12, 1900.

The negligence of the agent of this company in permitting a boy 16 years of age to ride, as a passenger, on the rear bumper of a car, the supreme court of New Jersey pronounces clear, that being a place of exceptional danger. It says that it is also difficult to imagine how a car approaching from the rear could run against the car ahead of it, as in this case, without gross carelessness of the motorman of the approaching car, particularly as it was not dark, and with this passenger and others seated in plain sight.

#### CONSTRUCTION OF CROSS-OVER MORE THAN 500 FEET FROM DESIGNATED POINT.

City of Hartford v. Hartford Street Railway Co. (Conn.), 47 Atl. Rep. 330. Nov. 1, 1900.

The construction of a cross-over switch more than 500 feet from the point designated therefor on the plan approved by the mayor and city council, the supreme court of errors of Connecticut holds, is enough to prevent the company (certainly as against any order of the council enforcing its power of control over placing the track) from claiming that the track has been constructed in accordance with the plan approved; and the track thus laid may be ordered removed, and this order enforced by mandamus, where the statute, as in that state, gives power of direction over the placing of tracks and other structures, with the power of directing their removal when not so placed.



## NEW INTERURBANS AT DAYTON, O.

The Dayton & Northern Railway Co. is now building an electric line from Dayton, O., to Greenville a distance of 40 miles. E. P. Roberts & Co., of Cleveland, are consulting mechanical and electrical engineers. The Chase Construction Co., Detroit, has the contract for the electrical construction, poles and power house. The civil engineer in charge is Charles La Rue. At the present time the poles are up and the power house partly up. Rails have been laid for 15 miles; the American rail joint made by the Chisholm & Moore Mfg. Co., Cleveland, are used.

Some of the details are as follows: Three phase distribution at 10,000 volts with rotaries and storage batteries in power house and sub-station. Two 250-kw. Westinghouse generators each direct connected to a 375-h. p. Buckeye cross-compound condensing engine operating at 150 r. p. m. The power house and sub-station will each have two 100-kw. Westinghouse rotary converters.

The static transformers in the power house and sub-station will be three of 75 kw. The load, owing to the use of storage batteries, will be practically constant on the generators and rotaries for both direct and alternating current. The storage batteries will be made by the Electric Storage Battery Co., with capacity of 300 amperes for one hour, and cells of sufficient size to allow an increase of one-third; each battery will have a differential booster and complete switch-board. The boilers will be of the B. & W. type built by the Aultman-Taylor Co., and with natural draft.

The pumps and condensers to be Stillwell-Bierce & Smith-Vaile make, and the heater to be Cochran, with the Sorge purifying system.

The buildings were designed by A. Pretzinger, of the firm of Peters, Burns & Pretzinger, and include the power house, car house and storage battery building at Brookville and sub-station at Arcanum. This sub-station consists of rooms for the rotary and static transformers and storage batteries, and also waiting rooms, and a residence for the attendant.

The cars will be made by the Barney & Smith Car Co. The passenger cars will be approximately 44 ft. 6 in. over all, and complete with exceptionally heavy framing and handsome finish. Each car will have a toilet room, and most of the cars will have a section for smokers, the others having a baggage compartment, and there will also be a very complete work car, which will be used for repair work and for moving freight, and also for pulling trail cars for excursion parties. The trucks will be made by Barney & Smith Car Co. On each car will be four 50-h. p. Lorain Steel Co.'s motors. The headlights are to be Wagenthal's arc light. The air brake on the work car will be the Christensen air brake with independent motor; on the passenger cars the air brakes will be Christensen stored air, with Ingersoll-Sargeant compressor at the power house.

The overhead line is of side pole construction with Ohio Brass overhead material. For feeders there will be 66 miles of 471,000-c. m. aluminum cables and 42 miles of No. 3 aluminum cables. All cars will have Garl telephones with portable jointed poles for connecting with the line at any point.

Messrs. Winters and Clay who control the Dayton & Western road, are also interested in the Dayton & Troy, a 30-mile line. Sargent & Lundy, Chicago, are consulting engineers for the power house and the Chase Construction Co., Detroit, has the contract for all exterior work, excluding the grading and bridges. Work on track construction will soon commence and it is hoped that the road will be open by June 15th.

A third company now building a line with Dayton as one terminus, is the Troy, Tippecanoe & Dayton Interurban Railway Co., of Troy, O. From Troy to Tippecanoe this line will serve practically the same territory as the Dayton & Troy, being about one-half mile from the latter line, but from Tippecanoe south to Dayton the distance between the two lines is about six miles. Considerable grading has been done, and contracts for the rails, ties and poles have been let. The distance is 19½ miles, the towns other than those in the title being Cowlesville, Charleston Falls, West Charleston, Phoneton, Tadmire, Brandt, Taylorsville, Hooksville and Enklburg.

The officers of the Troy, Tippecanoe & Dayton are: President, E. H. McKnight; secretary and treasurer, W. P. Schwab.

## STREET RAILWAY SUPPLIES FOR THE PHILIPPINES.

(From Our Own Special Correspondent.)

The opening of new sections of mining, industrial and cocoanut lands in various parts of the Philippine archipelago has developed great interest in the railway field, and on a number of the islands capitalists are putting in lines of street railways. Some of the new roads are on the island of Luzon. These lines are primarily for passengers but considerable freight business is being done. One of the newest lines is from Dagupan to Baguio, which will reach some valuable mining lands and along which it is expected the country will be developed industrially. Manila is the common center, about which all the steam and other railway systems concentrate and the present systems are badly handicapped through lack of cars and other apparatus, but new equipments are constantly arriving and the conditions are being improved. There have been several new lines surveyed recently under the direction of Captain Mead, of the 36th Infantry, who has been designated engineer in charge of the improvement of the railway lines of the islands and for planning new systems. On the island of Panay several systems are being surveyed and in course of construction. Iloilo is the common center for this island and the points to be reached are the mines, the oil wells, the cocoanut sections and the hard woods forests. In addition to carrying the products of the country to the sea ports, the amount of traffic secured for local purposes is very encouraging. The passenger cars are always over-crowded as soon as put into service. On the islands of the southern portion of the Philippine archipelago there have been important steps taken lately for the putting in of passenger and freight street railway lines. A major of the regular army informs your correspondent that on inviting popular subscriptions for the first survey for an electric road, considerable more money was subscribed on the spot than would be required to build the entire system. The native planters, miners and merchants have great faith in American enterprises and will do all they can to assist in the development of the railway interests of the country by purchasing stock.

The erection of street railway lines throughout the richer sections of the islands is of course resulting in a call for cars, rails, ties, bolts, screws, power plants and general materials. There is hardly a place in the country at the present time where railroad contractors can go to purchase what they require. The Spaniards attempted to keep a few supply stores in operation in Manila, but these stores carry in stock only general machinery and hardware.

There ought to be an American agency for street railway cars in Manila with a branch house at Iloilo. Open cars should be provided for passenger traffic and it would be advisable to have some of these cars fitted with closed ends as there are seasons of the year when the winds blow severely. The weather is always clear and dry from October to June, and from June to October there is more or less rain.

It is a matter of notice that in nearly every instance where the Filipinos have subscribed the necessary funds for the building of street railways, electric power plants have been voted for. In many instances the roads are planned to make the entire circuit of an island, as the level of the beaches can be followed, and besides, most of the commercial interests of the islands are at the seaports. Feeders are arranged for in some places to extend to some interior points at which freights may be secured. Electric power is wanted by many of the new companies. The Americans who have the schemes in hand at different points are advising that electrical power plants be put in and the advice is being followed. There are some electrical agencies now established in Manila and one in Iloilo, and these concerns are reaping rich returns. They either arrange for charging a commission for buying the machinery, attending to its shipment to Manila and final delivery to the users, or they buy the outfit complete for cash and resell at a profit. In some instances the power machinery purchased originally for other purposes has been put to use for street railway service. The need of more electrical machinery and steam power plants for railway service is being felt.

As to the rails for street railroads, some of these at the present time are made of wood, the hardest fibered sorts being selected

and there are an abundance of these in the islands. Another rail used consists of flat iron bars screwed to smoothed pieces of lumber. These rails answer the purpose well, so long as the iron is kept secured firmly to the wood. In many cases I noticed that the ends of the iron strips were turned up. Some of the English and Russian concerns have of late, sent some good types of iron rails here and they sell freely. The construction work on many of the roads is engineered by Americans who naturally require American patterns of rails and fittings. There are no steel rails in the Philippine markets at the present time, although the demand for them is increasing and the future market will be good.

Small supplies, such as bolts, screw, wire nails and the like are always in demand. I have known instances where operations have been stopped temporarily owing to the shortage of these small articles. The bolts used for railroad work should be shipped here in much larger quantities than is being done at the present time. Hardly a machinery or hardware supply store of the country can be relied upon to furnish the desired amount of these wares. I have noticed native workmen trying to overcome the deficiency by making bolts and screws by hand. In cases where they have not taps and dies, the work is very tedious as the threads must be shaped with crude cutting tools. Screws are scarce and costly everywhere. One may go to a hardware store to purchase a quantity of screws and find that the dealer is so short of them that he will count them out for you one at a time. I have seen wire nails counted off and sold by the dozen. Manufacturers of wire nails, screws and bolts will find a good market here by shipping quantities of their products to the machinery and hardware people of the islands. The street railway concerns are also in want of iron, steel, brass and other rods. Sheet metal of all kinds is also in very great request. Some of the railroads are making their own cars and they use sheet metal for the tops. The English have supplied considerable sheet metal to the country, and some of it is corrugated for church and house roofing.

It seems strange to see newly made native cars being hauled over the lines without any paint on them. The wood is new and clean at first, and the cars look well, for the reason that some of the wood finish is in the hard woods of the islands. The writer remembers seeing some native cars made from mahogany. Rose wood finishes are common. But after a while, the wood gets dry, cracked and soiled and should be painted. But paints are scarce and varnishes are not to be had. The natives make white, blue and black paints by grinding the shells of the beaches and by adding the gums of the pine trees. But these coatings of paint wash off and fade. American colors and varnishes are wanted here. I have been in some of the stores of Manila and Iloilo and observed pound tins of colors and varnishes, but the storekeepers do not appear to have enough confidence to stock up with liberal quantities. The result is that the inferior native colors are used, some of which are worked out from the herbs and dyewoods of the country, or the woodwork is left unpainted.

Lubricating oils for car journals are in abundance here but in most cases are inferior. Cheap oils and fats are found here in liberal quantities, while the finer grades of cylinder oils for the engines and for the electrical machinery are scarce. There is certainly a good business to be done here in high grades of lubricating oils by any concern who takes advantage of the chance. The fine dust of the country works its way into the journals of machinery and all oil cups and oil channels to bearings ought to be protected. In most cases they are, but one frequently finds the channels clogged and the bearings gummed, due to the dust in the oils or the use of inferior greases. Oil cups, oil feeds, regulators and kindred devices should be supplied to the machinery agencies here.

There are very few street railway car fittings obtainable in the islands. The call is for brass fittings, bell ropes, window glasses, lamps, draperies, upholstering and all that goes toward making street railway cars comfortable for the public traffic. It must be borne in mind that there are several thousand of foreigners in every city of the Philippines most of whom are Europeans who have been accustomed to good railway accommodation. The cheap forms of freight cars were at first mistaken for passenger cars by the natives and I saw some of the higher-classes of native men and women mount these cars and seat themselves upon the platforms for a ride. But the new population of the Philippines which is rapidly increasing with recruits from every country of the

world, requires modern conveniences in the cars. Hence there is a demand for car fittings. Much of the passenger car outfit can be constructed from the split bamboo material of the country. I have observed some very fine designs worked out for the upholstering of some of the native made cars, using only native woods, bamboo and growths for the purpose. The pineapple fiber for example is very suitably worked into a texture which looks very nice for car trimmings.

The electrical power system's wire is one of the scarce articles. The natives try to make this wire by working down iron rods. After long and tedious labor they work down a few sections of wire and then connect the pieces and string them. Wire is greatly wanted here and some of the wire concerns of America should send considerable to the dealers, for the prices are high and the profits good.

The best way to reach the different commercial concerns of the various cities and towns of the country is through the commanding officers of the military districts. All of the islands are divided into departments, the departments into districts and the districts into subdistricts. It is the aim of all of the commanding officers of the districts to encourage industrial and commercial enterprises and they will respond to any communications on these lines. I know of many officers who want the addresses of American manufacturers of hardware, wire, tools, machinery, paints, etc. There are now about 450 posts occupied by troops, and if letters could be sent to the commanding officers of subdistricts, with requests that the officers commanding at the posts deliver certain letters to the business men of the posts, the desired end would be attained. There are at each post probably a dozen stores, for the posts are as a rule stationed at cities and large towns.

## GRAND RAPIDS, GRAND HAVEN & MUSKOGON.

The Grand Rapids, Grand Haven & Muskegon Railway Co. was organized in January, 1899, to build an electric road between the cities named in the title. Work was not commenced until the summer of 1900; since that time some of the grading has been done, the cars ordered and the general plans worked out. The road will be operated from one power house located at Fruitport, 10 miles from Muskegon, where alternating current will be generated and transmitted to sub-stations. Barney & Smith cars mounted on Baldwin trucks, with two 150-h. p. motors per car will be used. Work other than the power house will be done by the Central Construction Co. The third rail system is to be used and the road will comprise 41 miles of track, exclusive of sidings, between Muskegon and Grand Rapids, and 5 miles between Grand Rapids and Grand Haven.

The officers are: President, J. D. Hawks, Detroit; vice-president, T. F. Carroll, Grand Rapids; treasurer, Carl M. Vail, New York; secretary, Wallace Franklin, Detroit.

The company has a private right of way everywhere except in Muskegon and Grand Rapids, where it has contracts with the city roads.

## EXPRESS SERVICE ON CHICAGO & MILWAUKEE.

The Chicago & Milwaukee Electric Ry. will inaugurate an express service so soon as an entrance into the city of Chicago can be obtained for this purpose. Negotiations are in progress whereby the St. Paul railroad will be equipped for electric traction to convey the cars of the Chicago & Milwaukee into Chicago and so soon as this arrangement is consummated a morning and evening express service over the entire line will be inaugurated. Heretofore the passenger cars operated by the Chicago & Milwaukee have had compartments for express, and the business transacted in this way has so steadily increased that the new departure is fully warranted. Two cars per day in each direction will be operated at first, and this service will be increased as business demands. The management expects to have the express cars in operation some time in the present year.

A car of the Consolidated Traction Co., of Pittsburg, jumped the track while coming down an incline, February 15th, fell over and was smashed. Twenty passengers were more or less injured.



**BRILL SEMI-CONVERTIBLE CARS.**

A new type of semi-convertible car, invented by John A. Brill, which has just been furnished to the Washington, Alexandria & Mt. Vernon Ry., is shown in the accompanying illustrations. The ordinary convertible car is made to have side entrances and steps just like an open car, and as a closed car it has only the end entrances, having windows and doors of the usual closed car pattern. A semi-convertible car differs from the convertible in many important respects.

It is in general appearance much like those ordinarily used, but

in the fall, because during every warm day, or even every warm afternoon, they can be utilized as open cars, and the change can be made to the closed form in a matter of five minutes' time and while the car is in operation.

This construction is a very ingenious modification of the Brill convertible car; the sash are in two sections held in the usual way in the posts, but there are a pair of grooves on each post into which trunnions on the sash fit. When it is necessary to raise the sash the lower one is lifted to short distance when it automatically engages the upper sash and carries the latter along into the roof of the car, depositing it in its own pocket and itself sliding on until it



BRILL SEMI-CONVERTIBLE CAR WITH WINDOWS UP.

the windows are larger and the window rail is lower and the sash are not removed for storage nor do they, as in a few semi-convertible cars, drop into pockets. The car illustrated has the end entrances and platforms and the center aisle of the convertible car and also the cross seats, but the sash, while of the largest size, are not removed from the car which is entirely self-contained. When the windows are to be opened the sash, which are double, slide up into pockets in the car roof out of sight and out of the way, yet always ready to be dropped in place at a moment's notice. The time required to raise them into the roof or to bring them down again is

drops over a switch which holds it in place, and at the same time prevents it from moving or dropping. When in the roof both sash are completely locked and cannot fall. The brass work and mountings are particularly strong and large, and in fact are of sufficient size to give the hand a firm hold on them. The operation of lowering is as simple as that of raising, and in almost precisely the same motion as is used in dropping the sash of an ordinary street car. The sash are not hinged to each other and are entirely independent. They can be raised and held by the sash-lock at any desired height as long as the sash is on a vertical line with the post. The seats of this car are placed between the posts, and considerable space is gained which usually serves only for a pocket for the sash.

In the construction of the roof a very material gain is effected, because in addition to the ordinary rail, a heavy letter board is gained upon the posts so that with this rail and lining and the plate the roof has nearly as great a cross section of timber as the sill.

The Washington, Alexandria & Mt. Vernon has almost a steam road service; the cars carry a very heavy traffic at high speeds and are, on some parts of the line, on a steam car track. The leading dimensions of this car are 34 ft. in the body and 43 ft. over the dashers. They are 7 ft. 11½ in. wide at the sills and 8 ft. 3 in. at the widest point. The front platform has a vestibule with a folding door on the right hand side and a stirrup step. The forward end of the car is solid, with the exception of two windows 11 in. high on each side of the door, which are merely for ventilation. The transoms are of usual width, 10 of the ventilator sash being stationary and the others opened by means of arms on the hand pole; the end ventilating sash is made stationary. There are 24 walkover seats and two seats with stationary backs; the seats will accommodate 54 persons. The head lining is 3-ply birch with Empire decorations in gold; the inside trim is bronze throughout and the outside trim of painted iron.

This new semi-convertible car has a number of important features which point to its superiority, among which are the extra length of sash, the ease with which they are handled and the material gain in the length of the seats and the width of the aisles. An examination of these cars has already resulted in an order of six of this style from the Brill company by the Beaver Valley Traction Co.



INTERIOR OF SEMI-CONVERTIBLE CAR.

practically less than that required for raising the ordinary heavy window of a closed car.

The advantages of this construction are numerous. There is no storage of sash and consequently no breakage. The sash always fit the window, and there is none of the expense of handling and no delay in putting the open cars on in the spring, or taking them off



## CANADIAN NOTES

The Toronto Suburban Railway Co. is petitioning for power to extend the lines through the intervening townships to the city of Hamilton.

The Niagara District, Wellandpost & Dunnville Electric Railway Co., Dunnville, Ont., is seeking incorporation to build an electric railroad through this district.

The Cornwall Electric Co. has under contemplation plans for a new power station. It is proposed to build on the canal, using the water power there available.

Application has been made to the Quebec legislature for the incorporation of the St. Lawrence Southern Railway Co., with power to build a line of electric railroad between St. Hyacinthe and Valleyfield.

The Toronto Council has passed an ordinance to compel the use of an approved fender, and the representatives of the companies are now trying to agree with the civic authorities as to what shall be applied.

The township council of Raleigh, Ont., is supporting a bill to incorporate the Windsor, Essex & Lake Shore Rapid Ry. Co., which asks for power to build a line from Windsor to Chatham, with branches.

The projected sale of the Kingston, Portsmouth & Cataraqui Electric Ry. still hangs fire. The intending purchaser, it is stated, is desirous of securing control of the Belleville Traction Co., as well as the Kingston road.

The Berlin (Ont.) & Waterloo Ry. is to build a short extension as soon as the weather will permit. The new road will be about  $\frac{1}{2}$  mile long and will connect with the Galt, Hespeler & Preston Electric Ry., now nearing completion.

The city council of St. Catharines has granted to the Niagara, St. Catharines & Toronto Electric Ry. the franchise from St. Catharines to Beamsville. This company is applying for power to amalgamate with any other electric railway.

Application has been made by a Chatham, Ont., syndicate to have the charter granted to the Chatham & Suburban Electric Railway Co., and which was allowed to expire, renewed, the syndicate agreeing to carry out the work without delay.

The Guelph Street Ry. is seeking power to extend the road from the city to Prestons Lake, a distance of about 11 miles. This lake, which is owned by those having a controlling interest in the road, will be made a pleasure resort and picnic ground, and should prove a drawing card.

Ottawa, Ont.—The Laval Electric Co., of Montreal, is seeking incorporation with a capital of \$100,000. The object of the company is to supply light, power and heat. The power house is to be located at Riviere du Prairie, where 10,000 horse power can be readily developed at a low cost.

The Ottawa & Gatineau Valley Ry. is applying for power to acquire or amalgamate with the Pontiac & Pacific Junction Ry. Co., the Hull Electric Co., the New York Ry. Co., the Ottawa Inter-Provincial Bridge Co., the Ottawa Electric Ry. Co., the Kingston & Pembroke Railway Co., or any one or more of them.

At a meeting of the executive committee of the Canadian Electrical Association, to make preliminary arrangements for the annual convention, to be held in Ottawa, Ont., it was decided that the dates of the convention should be the 19th, 20th and 21st of June. A committee was appointed to arrange for papers and topics

for discussion, and a strong local committee was also appointed to make the necessary arrangements here for the meeting, which gives promise of being a most successful one.

A somewhat unusual sight was witnessed at St. Johns, N. B., on the day of the queen's funeral. Enough horses were not available to drag the big guns and the men had to move them with ropes. One gun was attached to a trolley car and taken to the place designated. This is said to be the first case on record.

The annual receipts of the Cataract Power Co. showed gross receipts of the company, including the Hamilton Street Ry., the Hamilton & Dundas Ry. and the Radial Ry., for the year 1900 to be \$421,311.38. After payment of operating expenses, interest on bonds, franchises, taxes, etc., as well as two dividends on the preferred culminate stock, a balance of \$29,689.58 remained at the credit of profit and loss.

Mr. Wm. MacKenzie, of MacKenzie & Mann, owners of the Canadian Northern Ry., who are largely interested in both steam and electric roads throughout the northwest, stated in a recent interview that they expected to increase their electric power by more than one-half during the coming summer, and had under contemplation the construction of one and possibly two new street railway lines this year.

The report submitted at the annual meeting of the Canadian General Electric Co. showed the net profits on operating accounts amounted to \$262,903, and the premium on the new stock to \$75,000. These items with the balance of \$58,437 from last year, making a total of \$396,340. The dividends, 10 per cent on the preferred and 6 per cent on the common stock, amounted to \$127,623; \$125,000 has been added to the reserve, and some \$12,000 has been placed to the credit of profit and loss.

This has been the hardest winter the Montreal companies have experienced since their incorporation. Sweepers and plows have been out every night since the cold spell set in, not so much on account of the heavy snow falls, but for the reason that the heavy team and sleigh traffic fills the track beds with slush, snow and ice, which, if allowed to remain and freeze, would damage the motors. The snow service has been costing the company about \$200 per week all winter.

Mr. L. Robinson, for some years past superintendent of the Montreal Park & Island Ry., who has resigned that position to accept a more responsible one with one of the tramway companies of Paris, France, was tendered a banquet by the employees of the road on Feb. 27th, and was presented with an address and a gold locket, set with diamonds. Mr. Robinson is to be married before entering upon his new duties, and double congratulations are the order of the day. Mr. W. H. Douglass will probably be appointed superintendent to succeed Mr. Robinson.

The rivalry between the Montreal Street Ry. and the Montreal Terminal Ry., over the application of the latter road (an interurban company, for entrance into the city of Montreal, is attracting a considerable amount of attention. The Terminal company has come before the city council with a number of very flattering inducements for the privileges desired and has submitted routes through the city covering about 25 miles of streets. The Montreal St. Ry. has demanded extension privileges on practically all the streets upon which the Terminal Co. desires to build.

The Montreal Street Railway Co. has just placed in service 25 new cars on the St. Catharine St. line, the old cars thus replaced being used on other lines throughout the city. The new cars are much longer, and somewhat wider than those in general use and are equipped with wide vestibules and hot air heating apparatus. They are bright and comfortable and are giving general satisfaction to the patrons of the line. It is understood that orders have been placed for 25 summer cars of similar dimensions to be ready in June next, and that the company is also arranging for other equipment.

All kinds of rumors are afloat at St. Catharines, Ont., concerning the purchase of the local electric power stations by Hamilton

people. The recent purchase of the Cooke & Sons power plant by Mr. Babt of the Packard company, Mr. Duncan and Mr. Morgan, of Hamilton, and the rumored purchase of the St. Catherine's Electric Light Co., by Mr. Nihan, have given rise to the belief that the Cataract Power Co., of Hamilton is behind these deals, and is seeking to obtain control of all the power plants in this city. The purchasers of the Cooke & Sons plant intend enlarging the flume, putting in a 350 horse power water wheel and extending the lighting circuit.

The Divisional Court at Hamilton, Ont., recently decided that the word "riding" incorporated in many insurance policies did not imply motion. The case was that of a policy holder against the Ontario Accident Insurance Co. Plaintiff was getting on a Hamilton street car, and in climbing from the first to the second step, he slipped and fell. In his action he claimed that the provisions of the policy entitled him to double the sum which he would ordinarily be entitled to, because the injury was received "when riding as a passenger on a public conveyance." The court held that passengers may be said to be "riding" from the time they board until they have alighted from the car.

The city council of Halifax has decided not to renew its contract with the Halifax Electric Tramway Co., but will establish a municipal plant. At present this will be used for furnishing light and power only, but upon the expiration of the tramway company's lease the city will take hold of the transportation business.

The Sarnia Street Ry. is negotiating with council of that place for certain concessions to enable it to carry out the projected extension from Sarnia up to Lake Huron. The right of way outside the town limits has already been secured, and it rests with the town council to say whether the work shall proceed.

Right of way has been secured for the extension of the St. Thomas Street Railway from this city to Port Dover, and work will be commenced as early as weather will permit. This will give the town a much-needed quick service to the lake, and it is confidently expected that both the passenger and freight traffic will be very large.

A number of Montreal capitalists, headed by Sir Wm. Van Horne, have recently secured a charter from the British Colonial office, giving them the privilege of constructing an electric tramway, and an electric light plant in the city of Port of Spain, Island of Trinidad. A company has been formed under the name of the Trinidad Electric Co., and has already secured control of the existing tramway lines and light plants, and will proceed immediately to make large extensions to all parts of the city and suburbs. The present street railway line consists of about eight miles of mule car line, and this will all be reconstructed to an overhead trolley system. The new company is capitalized at \$1,500,000 and will have headquarters at Montreal, Canada. Mr. W. B. Chapman, who represents the company in Trinidad, states that the island is the most prosperous of all the British West Indies and offers a good field for the installation of an up-to-date railway and light plant. Practically the same gentlemen have just completed the road in Georgetown, Demerara.

A large number of complaints have been received by the Road Department of Montreal because of the street railway company putting salt and sand on the streets. The cartage companies in the city allege that the salt was ruining their horses' feet and that, together with the sand, it was spoiling the sleighing and rendering teaming very difficult. Mr. Wanklyn, the manager of the Montreal Street Ry., appeared before the committee and stated that no more salt was being used than was absolutely necessary. Mr. Wanklyn contended that salt was the only thing that would make the wheels stick to the rails in such weather and during the cold, frosty weather it was impossible to move the cars without its use. The coating of ice which formed on the rails and filled up the flange grooves had to be removed, and salt was the only thing that would do this. If some one would devise another method of getting rid of the ice the company would be pleased to adopt it. As regards sand, he stated that in a city like Montreal it was impossible to get along without it on the many steep hills, but it was never used on the level save when starting or stopping.

## COMPARATIVE COST OF COMBINATION AND ALL STEEL HIGHWAY BRIDGES.

BY H. G. TYRRELL, C. E.

The bridge in question was designed for the Pacific coast. The dimensions are as follows: Span, 190 ft.; road, 24 ft.; two walks, each 6 ft. wide; total width, 41 ft.; depth of truss, 27 ft. to 33 ft.; wood joist; uniform live load on floor, 100 lb. per sq. ft.; floor, 4-in. wood block paving on 3-in. plank; concentrated live load on floor, 15-ton roller, or two electric cars on each track; live load per foot of bridge, 3,300 lb.; dead load per foot of bridge, 2,345 lb.; trusses pin connected.

For the combination designed hard pine was used for top chords, web posts, portals, lateral struts, floor beams and joist. The other parts were of steel. The estimated quantities for this case were: Eye bars, 42,180 lb.; cast iron joint blocks, 19,720 lb.; lateral rods, 5,810 lb.; machine work, 5,940 lb.; shoe plates, 5,200 lb.; loops, 3,160 lb.; manglers, 1,240 lb.; total, 83,250 lb. Cost, \$3,130.

Hard pine chords and posts, 17.50 M; hard pine lateral struts, 3.08 M; floor plank, 19.74 M; floor joist, 22.24 M; floor beams, 14.80 M; total, 77.36 M. Cost, \$2,400.

Paving, 504 sq. yd., \$750; fence, 400 ft., \$200; erection, \$1,200.

Total cost of combination span, \$7,680; this cost is about \$1 per sq. ft. of total floor.

For the all steel design the quantities were: Steel (180,000 lb.), cost, \$7,360; floor plank, (19.74 M) and wood joist (22.24 M), cost, \$1,435; fence, paving and erection as before, \$2,150.

Total cost of steel span, \$10,945; this cost is \$1.43 per sq. ft. of total floor.

This comparison applies to whole superstructures complete. Now compare the cost of substituted parts only.

In the combination design, the top chords, web posts, portals, lateral struts and floor beams contain: Hard pine, 35.3 M at \$35 per M., \$1,220. Cast iron joint blocks, 19,700 lb. at 3 cents, \$591. Total, \$1,811.

For the all steel design, the same parts contain: Steel, 118,200 lb. at 4 cents, \$4,720.

Summarizing, we have: Combination bridge cost, \$7,680. Steel bridge cost, \$10,945. Combination chords, etc., cost, \$1,811. Steel chords, etc., cost, \$4,720. Hence we may say, roughly, that the combination bridge cost one-third less than the steel one. Also that the comparative cost of wood (including necessary cast blocks) and steel for top chords, web posts, portals, lateral struts and floor beams, is as one to three.

## PURCHASE AT MADISON, WIS.

The property of the Madison (Wis.) Electric Railway Co. has been purchased by Mr. P. L. Spooner, of Madison, who, it is understood, pays par value for both stock and bonds and a little in the nature of accrued interest, a total of some \$200,000. Mr. Spooner gains absolute control of the Madison street railway system and proposes to operate it on a liberal policy best calculated for the advancement of the city's interests. The road was formerly owned by a stock company composed largely of Cleveland capitalists, chief among whom were H. R. Newcome and Mr. Hammill of the General Electric Co. The former owners, who had come into possession of the Madison property in order to protect their previous investments, had persisted in refusing an option on it, although a number of parties desired to acquire the road and opened negotiations for its purchase. The deal by which Mr. Spooner comes into possession was transacted through Oliver C. Fuller & Co., of Milwaukee. The Madison Electric Ry. is a model line, owing to the broad policy and efficient effort of Mr. George B. Shaw, who has been general manager of the line for 10 years, and has worked unremittingly for its improvement. Major F. W. Oakley, has also held a high position in the company since its reorganization three years ago, and the present good condition of the company's property and finances is in no small measure due to him. The property comprises 10½ miles of track, including switches, and 26 cars, beside an entire block of 18 lots in the eastern city limits, whereon are located two car houses. The road is operated under a franchise which will not expire for 35 years, and which is practically an exclusive one.

## MASSACHUSETTS REPORT.

## STATISTICS.

From the reports submitted to the Massachusetts Railroad Commissioners by the street railways for the fiscal year ending Sept. 30, 1900, it appears that there are now 118 companies in the state, 2 more than in 1899, 14 new companies having been added and 12 dropped because of consolidations, abandonments and a receivership. Of the 118 companies reporting, 72 were operating their railways; the roads of 14 companies were operated by other roads; 9 had organized and were constructing their roads; 3 had not yet commenced building; 20 had been consolidated during the year.

During the year there were added 170.16 miles of main track, 7.58 miles of second main track and 14.12 miles of side track, making the total as follows: main track, 1,662.04; second track, 251.41; side track, 124.29; total reckoned as single track, 2,037.74. All of this except 22.51 miles is in Massachusetts, the 22.51 miles being in Rhode Island.

The average cost per mile of main track (including the cost but not the length of side track) on Sept. 30, 1900, was \$23,443 for construction, \$8,510 for equipment, \$11,684 for lands, buildings and other permanent property, a total of \$45,637.

The gross assets were \$98,700,075, an increase of \$12,935,230 over 1899; the gross liabilities were \$95,062,946, an increase of \$11,783,055.

The total income of the companies from all sources for the year was \$21,387,641, and the total of expenditures, including dividends, was \$20,760,012, leaving a net balance of \$627,628 to carry to surplus. The net divisible income was \$3,037,502, an increase of \$534,560 over the corresponding net for 1899.

The total dividends declared last was \$2,409,874, an increase of \$91,476 over 1899. Forty-eight companies paid dividends, while 70 companies, new and old, paid no dividends. Of the 48, 14 paid 8 per cent; 1 paid 8 per cent on preferred and 7 on common stock; 3 paid 7; 1 paid 6½; 12 paid 6; 2 paid 5; 1 paid 4½; 1 paid 4¼;

3 paid 4; 1 paid 3¾; 3 paid 3; 3 paid 2¾; 2 paid 2, and 1 paid 1 per cent.

The ten street railways shown in one of the tables represent 66 per cent of the entire capital investment, operate 55 per cent of the total mileage and carry 82 per cent of the whole number of passengers carried. The West End, of Boston, carries over 50 per cent of the street railway passengers of the state.

The table shows the average dividend rate to be lower than for any other year during the decade 1891-1900.

The net debt was \$35,743,929, as against \$35,846,071 in 1899.

The accompanying tables show data concerning the volume of traffic, comparative increase of mileage and traffic, operating expenses and gross and net earnings.

The number of employees in 1900 was 12,766; the number of

## Percentage of Operating Expenses to Gross Earnings, 1891-1900.

YEARS.	Gross Earnings from Operation.	Operating Expenses.	Percentage of Expenses to Earnings.	Net Earnings.
1891. . . . .	\$8,861,841	\$6,746,304	76.13	\$2,115,537
1892. . . . .	9,798,060	7,029,479	71.74	2,768,581
1893. . . . .	10,832,174	7,501,845	69.26	3,330,329
1894. . . . .	11,119,846	7,729,059	69.51	3,390,787
1895. . . . .	13,184,342	9,088,086	68.93	4,096,256
1896. . . . .	14,844,262	10,563,371	71.16	4,280,891
1897. . . . .	15,815,267	10,904,040	68.95	4,911,227
1898. . . . .	16,915,405	11,672,731	69.01	5,242,674
1899. . . . .	18,151,550	12,378,488	68.20	5,773,062
1900. . . . .	19,939,640	13,159,947	65.90	6,839,693
Averages. . .	\$13,952,239	\$9,677,335	69.36	\$4,274,904

## Gross and Net Earnings from Operation per Mile of Main Track Owned and per Round Trip Run, 1891-1900.

YEARS.	AVERAGE PER MILE OF TRACK.			AVERAGE PER ROUND TRIP.		
	Gross Earnings.	Expenses of Operation.	Net Earnings.	Gross Earnings.	Expenses of Operation.	Net Earnings.
1891. . . . .	\$13,178	\$10,032	\$3,146	\$2 24	\$1 70	\$0 54
1892. . . . .	12,980	9,312	3,668	2 35	1 69	0 66
1893. . . . .	12,392	8,582	3,810	2 41	1 67	0 74
1894. . . . .	11,972	8,321	3,651	2 39	1 65	0 73
1895. . . . .	12,127	8,359	3,768	2 55	1 75	0 80
1896. . . . .	11,627	8,274	3,353	2 47	1 76	0 71
1897. . . . .	11,187	7,713	3,474	2 41	1 66	0 75
1898. . . . .	10,998	7,589	3,409	2 45	1 69	0 76
1899. . . . .	10,459	7,132	3,327	2 55	1 74	0 81
1900. . . . .	10,452	6,878	3,574	2 56	1 68	0 88
Averages. . .	\$11,450	\$7,942	\$3,508	\$2 46	\$1 70	\$0 76

## Gross and Net Earnings from Operation per Car Mile Run and per Passenger Carried, 1891-1900.

YEARS.	AVERAGE PER CAR MILE.			AVERAGE PER PASSENGER.		
	Gross Earnings.	Expenses of Operation.	Net Earnings.	Gross Earnings.	Expenses of Operation.	Net Earnings.
1891. . . . .	Cents. 32.03	Cents. 24.38	Cents. 7.65	Cents. 5.03	Cents. 3.83	Cents. 1.20
1892. . . . .	33.01	23.69	9.32	5.05	3.62	1.43
1893. . . . .	31.39	21.74	9.65	5.07	3.51	1.56
1894. . . . .	30.28	21.05	9.23	5.04	3.50	1.54
1895. . . . .	30.20	20.82	9.38	5.07	3.50	1.57
1896. . . . .	27.69	19.70	7.99	5.08	3.61	1.47
1897. . . . .	25.68	17.71	7.97	5.12	3.53	1.59
1898. . . . .	24.80	17.11	7.69	5.11	3.52	1.59
1899. . . . .	24.74	16.87	7.87	5.09	3.47	1.62
1900. . . . .	24.46	16.10	8.36	5.06	3.33	1.73
Averages. . .	27.32	18.95	8.37	5.08	3.52	1.56

## Operating Expenses and Net Earnings (Ten Railways) in 1900.

RAILWAYS.	Percentage of Operating Expenses to Gross Earnings.	NET EARNINGS PER			
		Mile of Track Operated.	Round Trip Run.	Car Mile Run.	Passenger Carried.
Brockton. . . . .	62.27	\$2,010	\$0 71	8.49	1.91
Globe (Fall River). . . . .	56.64	3,948	0 88	11.80	2.09
Holyoke. . . . .	66.76	2,418	0 66	6.69	1.72
Lowell, Lawrence & Haverhill. . . . .	57.46	3,498	1 33	12.07	2.11
Lowell & Suburban. . . . .	56.02	3,226	0 78	10.06	2.23
Lyons & Boston. . . . .	58.62	3,472	1 18	10.38	2.09
Springfield. . . . .	69.94	3,045	0 59	5.77	1.50
Union (New Bedford). . . . .	60.40	4,258	0 58	9.07	2.15
West End (Boston, etc.). . . . .	67.33	10,262	0 98	8.68	1.65
Worcester Consolidated. . . . .	73.52	3,434	0 46	7.08	1.31
Averages. . . . .	65.31	\$5,234	\$0 91	8.84	1.75

## Capital Stock, Net Income and Dividends, 1891-1900.

YEARS.	Capital Stock.	Net Divisible Income.	Dividends Declared.	Percentage on Total Capital Stock.
1891. . . . .	\$19,553,952	\$1,299,153	\$1,100,015	5.63
1892. . . . .	23,590,536	1,905,680	1,582,697	6.71
1893. . . . .	25,883,575	1,993,399	1,716,637	6.63
1894. . . . .	26,971,275	1,812,668	1,610,886	5.97
1895. . . . .	27,906,685	2,257,355	1,606,196	5.76
1896. . . . .	30,727,818	2,280,776	1,802,847	5.87
1897. . . . .	32,670,273	2,593,147	1,965,243	6.02
1898. . . . .	38,933,917	2,534,092	2,076,233	5.33
1899. . . . .	41,380,143	2,502,942	2,318,398	5.60
1900. . . . .	48,971,168	3,037,502	2,409,874	4.92
Averages. . . . .	\$31,658,934	\$2,221,662	\$1,818,903	5.75



cars, 6,531; the number of other vehicles, 2,371; the number of horses, 455, and the number electric motors 9,545.

The whole number of persons injured in connection with street railways during the year was 2,604, of whom 69 received fatal injuries. The fatalities are thus classified: passengers, 18; employees, 3; other persons, 48. Non fatal injuries: passengers, 1,695; employees, 84; other persons, 756.

The commissioners also report upon four subjects which are of wide interest at the present time—grade crossings, new legis-

lating to some temporary derangement of the electric equipment, is not an infrequent occurrence while the car is approaching or passing over the railroad location. A collision at such a time might have appalling consequences. The benefit which the street railway today receives from the abolition of the grade crossing is apparent in the increased safety, freedom from interruption to travel, and, in the exceptional cases where new crossings are sanctioned by this board, exemption from expense in maintaining safeguards.

The opposition of the companies to the proposed measure is based chiefly upon the claim that their rights in the streets rest upon an insecure footing. In theory this is true. The ordinary street railway location may be revoked at any time after it has been in use a year, if it is decided that the public interests require it. Practically, however, these franchises rest upon what must always be a permanent need of the public,—convenient facilities for travel. As a result of the policy established in this commonwealth, capitalists who are content with a reasonable return upon money actually expended in railway property have come to feel that they can safely invest in street railways. Nothing can better attest the essential permanency of street railway franchises than the faith which conservative business men express in them by their readiness to purchase the stocks and bonds and to loan money to the companies at moderate rates of interest. To all intents and purposes the power of revocation of location is little more than a power to punish a street railway company for offences that nothing but reckless or arbitrary management would permit. As far as we can learn, this right has never been exercised in this state. It may occasionally have been used by local boards as a whip or spur; but under the present laws the true remedy for evils existing in street railway operation is the enforcement of a better service rather than the discontinuance of a poor one.

As street railways have developed from local enterprises into the broader field of interurban service, the tendency of legislation has naturally been toward more uniform regulation, larger State supervision, and a greater degree of security for the street railway franchise. While the tenure of the street railway location is very unlike that of the railroad location, there is at the present day no general feeling in business circles that it is insecure.

We cannot avoid the conclusion that street railway companies ought to bear some part of the burden connected with the abolition of grade crossings in which they are interested. The propriety of this has been recognized in certain instances by the voluntary act of contribution brought about by agreement of parties, and, in some cases, upon the suggestion of the board.

The extent to which a street railway adds to the danger existing at a specific crossing or receives benefit from its elimination may vary widely in different cases. The character of the privileges enjoyed and obligations imposed under their different grants of location from different boards of selectmen or aldermen, with their dissimilar views as to what the public interests require, the amount of traffic and the present and prospective conditions of operation distinguish one company from another. No two crossings are physically alike in character or surroundings. Accordingly, the amount which a street railway company ought in justice to contribute in a given case can best be determined by a tribunal that can inquire into the facts and circumstances peculiar to each case. An equitable decision will be more probable if reached in this way than it would be under the application of any arbitrary general rule fixing the amount of contribution.

Moreover, it is to be borne in mind that the street railway is not like the steam railroad and the public highway—a constant factor in every grade crossing.

We therefore recommend that the special commission appointed under the present law to consider the abolition of a grade crossing, determine the expense to be assessed upon any street railway company that may be interested in the improvement. Before such tribunal all matters relating to the tenure of location and special conditions of operation can be fully presented and fairly considered.

The general law apportions 65 per cent of the expense of these improvements upon the railroad and 35 per cent between the commonwealth and the city or town, limiting the share of the last named to 10 per cent. The theory upon which the street railway company should be made a contributing party to this expense is that it adds to the sum total both of the peril at these crossings

*Volume of Traffic for Ten Years, 1891-1900.*

YEARS.	Total Passengers Carried.	Total Car Miles Run.	Total Round Trip Run.	Average Passengers per Round Trip.
1891.	176,090,189	27,670,166	3,958,455	44
1892.	194,171,942	29,678,036	4,168,458	47
1893.	213,552,009	31,507,282	4,481,171	48
1894.	220,464,099	36,722,978	4,662,786	47
1895.	259,794,308	43,655,560	5,179,234	50
1896.	292,358,943	53,613,685	6,004,809	49
1897.	308,684,224	61,577,917	6,557,183	47
1898.	330,889,629	68,206,418	6,887,976	48
1899.	356,724,213	73,367,235	7,104,243	50
1900.	395,027,198	81,750,768	7,818,427	51

*Volume and Density of Street Railway Traffic in 1900.*

RAILWAYS.	Total Passengers Carried.	Average Number per Mile of Main Track Operated.	Average Number per Round Trip.
All Massachusetts railways.	395,027,198	200,262	51
Brockton.	17,132,752	105,300	37
Globe (Fall River).	8,832,505	188,640	42
Holyoke.	4,926,820	140,381	39
Lowell, Lawrence & Haverhill.	11,016,707	166,124	63
Lowell & Suburban.	9,145,957	144,408	35
Lynn & Boston.	40,388,359	166,116	56
Springfield.	13,746,813	202,992	39
Union (New Bedford).	4,590,934	197,988	27
West End (Boston).	201,124,710	622,990	59
Worcester Consolidated.	14,298,120	261,181	35
Averages (ten railways).	32,520,368	299,480	52

lation, anti-stock watering laws, and consolidations—and we give here extracts which show the position taken on these questions by the commissioners.

#### GRADE CROSSINGS.

Although the propriety of calling upon street railway companies to bear a proportion of the cost of separating grades was suggested in the report of the special commission appointed to recommend a grade crossing act, the legislature, in passing the statute, in 1890, did not then deem it wise to require such contribution. The recent remarkable growth of the street railway through the use of electricity as a motive power has given this subject a new importance and presented it in a new light. The apportionment of expense, under the above-named statute, would seem too rest upon an estimate of the degree to which the railroad and the public highway are respectively contributing factors to the perils connected with grade crossings and the recipients of benefits from their elimination.

The street railway stands today in a different position with respect to these crossings from that occupied by it 10 years ago. As the operation of the electric car has grown more and more to resemble that of the railroad train, it has added to the dangers previously encountered at the grade crossing. The record of accidents proves that loss of control over the car,

and of the benefits received from their removal. In other words, it is not a theory under which the share of the railroad or of the public in creating the peril or receiving the benefit is newly distributed. We recommend, therefore, that the percentages named in the general law, which have come to be recognized as fixing an equitable proportion between the railroads and the public, be maintained as the basis of distribution of the amount of expense remaining after deducting from the entire cost of elimination the amount assessed upon the street railway company.

It has been urged that, if street railway companies are called upon to contribute to the expense of separating grades, there should be some provision of law to secure to the company reimbursement of the amount of contribution in the event of a revocation of location. Although this proposition might seem a fair one at first glance, upon reflection we are of the opinion that it would create an unwise precedent, and that there is no real demand for such legislation. It is a common thing for local boards to exact from the street railway company to which it grants a location a considerable outlay for highway improvement rendered necessary by the introduction of the railway into the streets, without any agreement for reimbursement in case of the revocation of the grant. The contribution to the abolition of a grade crossing is of the same character. It is a highway improvement in some appreciable degree rendered necessary by the presence of the street railway. In a number of instances this board has required substantial improvements in the roadbed of a company, involving considerable expenditure; and this has been done without thought of or reference to reimbursement in the unlikely event of a revocation, nor has there been any suggestion made by the companies that a requirement of this kind should accompany such agreement.

In the opinion of the board, therefore, there is no sufficient reason for legislation looking to the reimbursement of a street railway company for the amount of its contribution toward the expense of the abolition of a grade crossing. It is sufficient that such outlay should be subject to capitalization as a proper part of the cost of street railway construction.

We further suggest that it would be advisable, if the street railway company is made a contributing party to the expense of eliminating grade crossings, that it should, like the railroad company, the commonwealth, or city or town, have the power to institute proceedings in the interest of the public safety, and that it should therefore be given the same right to bring its petition in court that is now possessed by each of the other contributing parties.

#### NEW LEGISLATION.

The present street railway laws are a patchwork, some sections inoperative, others confusing if not conflicting. This is not surprising when it is considered that the earlier of these statutes were adapted to a horse-car service. In fact, it is a proof of the strength and elasticity of those laws that they apply as well as they do to the many new and different conditions affecting electric-car service.

We have been urged to recommend a general change in the laws relating to street railways. A partial change was accomplished under chapter 578 of the Acts of 1898, based upon the report of a special commission. (See St. Ry. Rev. July, 1898, page 433.)

Following this report, the statute of 1898 adopted the fundamental principles that the street railway belongs in, over or under the street, and that the franchise should not be given a fixed tenure, but should remain subject to revocation whenever the public interests demand. The statute further conforms to the report in establishing a state supervision in certain instances over the action of local boards, and in making a radical change in the method of taxation.

One reason, then, why a general revision of these laws may be postponed, is the fact that a special revision has recently been made by men of distinguished ability, as a result of whose work certain principles have been reaffirmed and certain important changes made in the law. It would be well to let experience keep school awhile longer.

It has been urged that the time has come to give the street railway companies generally the power to carry on a freight business, and to construct and operate their railways outside the highway over private lands. We are not ready to admit that the doctrine that street railways belong in the street, so long held and so

emphatically reiterated in the report of the special commission above referred to, should be hastily abandoned. \* \* \* \* We still believe that the street railway should be distinguishable from the railroad, and remain for the present at least one of the new uses for which the highway in its development under the original design is well suited. Working with, rather than as a substitute for, the railroad, the street railway furnishes traveling facilities that the public cannot well do without. In its useful service of transportation from town to town, as well as from house to house and from street to street, the large and commodious modern car can be and is safely operated at a reasonable rate of speed over innumerable highways within the state without serious interference with other methods of travel. There is no call for the attempt, too often made, to rival the speed of the railroad train. The modern avenue is constructed in many cases with a view to the presence of the railway, and can usually be readily adapted to it. There are, of course, exceptional instances where in the public interest the railway ought to be permitted to go upon private lands, as an incident of the general use of the highway. The law already permits it for the purpose of avoiding grade crossings.

It has been argued that street railways should do a freight business, and that to do this they must be operated outside of the public highway. A freight service over the streets is incompatible with the conduct of a satisfactory passenger service at the same time, and in itself is objectionable on other grounds. But we do not believe there is any such demand that street railways should do a freight business as to warrant so radical a change in operation as a removal from the streets to private lands. Undoubtedly there are localities in which the conduct of a freight business in part over particular streets or ways, or in part over private lands, may be desirable. We think that these cases should be considered as exceptions to the general rule, and even as such should be permitted only where the communities affected by them approve it.

If new ideas as to the ordinary method of operation of the street railway are to be seriously considered, it would be wise to experiment with them in some individual case before making a general change in the laws to carry them into effect. The continuance of a body of laws that lacks symmetry and perfection is less productive of evil than frequent changes in important provisions.

While, therefore, we cannot now recommend any general revision, on the other hand, there is need of certain specific changes in the statutes. It does not matter so much that the law as to compulsory joint use of tracks practically applies only to horse cars, of which there is but one relic left; but it is important that, if the board is to regulate fares, it should be given full opportunity to exercise this power. Under section 23, chapter 578, Acts of 1898, reductions in fares are limited to the average fare charged by other companies rendering similar service. The difficulty of establishing in any given case just what is a similar service has seriously embarrassed parties who have sought a regulation of fares under this section. The theory that fares should depend upon what the companies themselves establish and practice, either with or without agreement, is clearly untenable. If the authority to recommend changes which the board has under its general power of supervision over railways needs to be strengthened in relation to fares, the additional authority given should be without restriction other than the requirement that action be based upon what is reasonable under all the circumstances.

We further suggest that the law be changed so as to require the roadbed, tracks and structures of newly organized companies to be inspected by the board before the railway is opened to travel, as is the case with railroads. The heavier cars and higher speed characteristic of the present service demand more careful construction of roadbed and the use of heavier rails than were formerly necessary. Wherever the single track is in use by cars running in opposite directions, some simple but effective signal system should be required.

#### CONSOLIDATION.

Through purchase and sale thirteen street railway consolidations have been effected during the year. In each case this has been accompanied by specific reductions in fare and extensions of rights of transfer. These consolidations tend also to afford larger opportunity for equalization of fares, improvement in service and the exercise of supervision over operation. There must, however, be a limit to the extent to which it is advisable that street railways should be brought under one management. Hav-

ing this in mind, there is no reason to doubt the beneficial effects of the union thus far made without increase of capitalization of several smaller companies into one stronger system, with its less expensive methods of operation and larger facilities for the conduct of a satisfactory public service.

### WHEELAGE AND SPECIAL WORK ON THE CHICAGO UNION LOOP.

The number of wheels passing over the Chicago Union Elevated (Loop) R. R. is said to be greater than for any other piece of railroad track. Mr. E. W. Richey, superintendent of the loop, has kindly furnished us the following table showing the car-miles run during the year 1900.

Month.	South Side.	Metro-politan.	Lake Street.	North-western.
January .....	65,182	110,504	35,070	60
February .....	59,914	99,679	31,764	.....
March .....	67,234	111,156	35,418	.....
April .....	64,739	108,072	34,934	.....
May .....	62,210	110,080	34,592	54
June .....	60,650	107,088	35,322	45,698
July .....	60,474	107,528	34,266	50,684
August .....	61,484	112,030	37,222	52,200
September .....	58,540	106,108	35,006	50,100
October .....	63,508	118,812	37,200	54,506
November .....	63,304	114,112	34,500	53,126
December .....	66,094	118,382	35,884	57,458
Total.....	753,414	1,324,142	460,428	363,886

The greatest difficulty encountered with frogs and switches is the unequal wear due to the traffic being different on the four roads. The inner loop is used by the Metropolitan and the South Side, and during the last calendar year, 1900, at the frogs where these lines enter the inner loop were crossed by 1,500,000 wheels in one direction and 2,650,000 wheels in the other direction. Where the Metropolitan crosses the outer loop there were 2,650,000 wheels in one direction and 1,560,000 wheels in the other direction, the conditions being a trifle more severe than at the other frogs mentioned. At

rails adjacent to the points was so much greater than the wear of the points themselves that shoulders formed and made a rougher riding track than the quicker wearing rolled frogs. The rolled steel frogs now used wear for about seven months.

In 1898 one cast steel frog was put down but had to be removed after 48 hours because it began to chip on the points.

June 1, 1900, two frogs having movable wings were installed at the northwest corner of the loop, where the Northwestern and the Lake Street tracks intersect. These frogs were designed by the engineering department of the Northwestern under the direction of Mr. C. V. Weston, the details being worked out by Messrs. R. B. Stearns, superintendent of the Northwestern, and E. S. Nethercut, engineer of the Paige Iron Works. The frogs were made by the Paige Iron Works which has built most of the special work for the loop.

The wings are pivoted at one end and normally their motion is controlled from the signal tower. The frog is automatic, however, and if the rods break or the wings are set in the wrong position the first wheel of the train will throw the wings. The distance between points is 8½ in., while the segment of the wheel flange made by a plane tangent to the tread is about 13 in. long, thus obviating danger of a derailment. A spring connection is provided in the rod so that if a train should make the crossing when the signals were set against it there would be no derailment. After nine months' use these frogs are but comparatively little worn, and it is believed they furnish a very satisfactory solution of the problem.

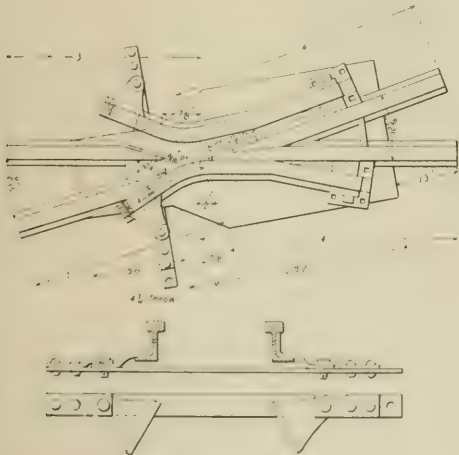
At the three corners of the loop where special work is necessary the outer rails on the curves cannot be properly elevated, and consequently the wear is very rapid. The rails used are of a T-section and weigh 80 lb. per yd., the carbon being from .45 to .53 per cent; these rails wear from six to eight months. March 11, 1900, some special rails with .60 per cent carbon were installed on the inner loop, where traffic is heaviest, and after nine months appear to be good for two or three months more. The management would prefer to continue the use of the high carbon rails at curves, but cannot get them from the mills except in lots of 500 tons; the .60 carbon rails now down were part of a special order rolled for the Chicago & Western Indiana.

### DESTRUCTIVE FIRE IN PROVIDENCE, R. I.

Fire destroyed two of the Elmwood car barns of the Union Railroad Co., of Providence, on the night of Feb. 18. The total loss is estimated at \$175,000, of which rolling stock constituted about \$100,000. The loss is amply covered by insurance. Besides the two buildings there were 30 cars burned, 7 snow plows, among which was a large rotary plow, and the lockers containing the uniforms of about 250 employees. There were but four men employed in the barns when the fire broke out, and it was not discovered until the flames had gained a tremendous headway. When the firemen arrived the entire roof of the first barn was ablaze and being of wood was quickly consumed. An office building adjoining was totally destroyed and the next building, a brick car barn, was left with only its side walls standing when the progress of the fire was finally arrested. The cause of the fire is unknown, but is ascribed to defective insulation.

### WRECK AT GRADE CROSSING AT XENIA, O.

A car of the Dayton & Xenia Traction Co. was wrecked by a freight train on the Pittsburg, Chicago, Cincinnati & St. Louis railroad on February 4th at a grade crossing in Xenia, O. The car was badly damaged, but neither the crew nor the one passenger in the car was hurt. There is a derailing switch at this point, the lever of which is obliged to be held in order that the trolley cars may cross the track of the steam railroad. As the car approached the crossing there was no train in sight, and the gates were up, so the conductor held the switch lever for the car to cross. While he was holding the lever the trolley jumped from the wire, bringing the car to a standstill when nearly across the track, and at this instant a freight train rounded the curve at this point, striking the car and throwing it from the tracks. The trucks and iron work under the car were completely destroyed.



MOVABLE WING FROG AND SHIFTING BAR.

the Lake Street and Northwestern intersections the number of wheels is 840,000 one way and 720,000 the other.

When the loop was opened for traffic rolled steel frogs were used; under the somewhat lighter traffic these frogs would wear for about ten months. In an effort to reduce the unevenness of frogs due to the wide differences in the number of wheels crossing in the two directions, the experiment was tried of using frogs with machine steel points. With these frogs, however, the wear of the



### THE ELECTRIC RAILWAYS OF DETROIT.

The Detroit United Ry. was organized Jan. 1, 1901, and bought the property of the Detroit Citizens Street Railway Co., the Detroit Suburban Railway Co. (leased to the Citizens company), the Detroit Electric Ry. and the Detroit, Ft. Wayne & Belle Isle Ry. February 20th the Wyandotte & Detroit River Ry., 16½ miles, formerly owned by Messrs. J. C. Hutchins and A. B. du Pont, was bought by the United company.

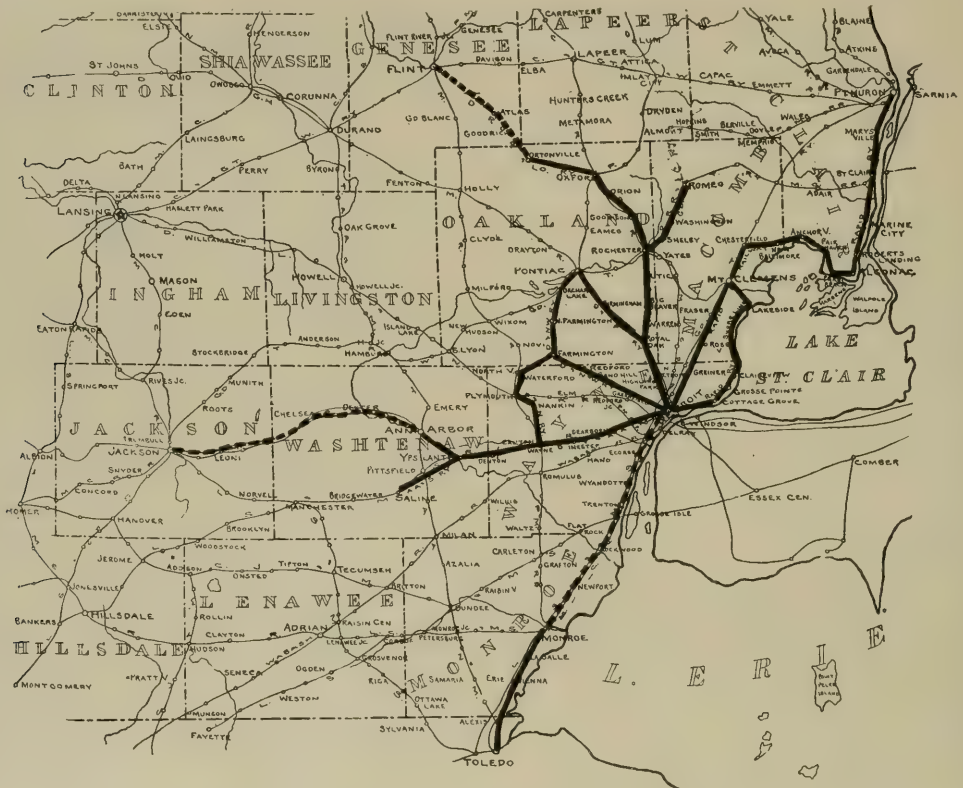
The new company has \$12,500,000 of stock and \$11,425,000 of bonds.

The Detroit United Ry. now has a total of 200 miles of track, the acquisition of the Wyandotte road giving it a line extending all the way from Grosse Point, on Lake St. Clair, to Trenton, opposite

and Mt. Clemens there are two routes, one an air line and one following the lake shore.

Between Port Huron and Detroit the distance by the shorter route is 73 miles, of which 5½ miles is over lines of the urban company in Detroit.

Upon the completion of the through line it was decided to use three phase transmission lines, and the work of altering the power station at New Baltimore was begun in the fall of 1899. The road was operated from the new plant Apr. 1, 1900. There are five transformer stations located at Roseville, Mt. Clemens, New Baltimore, Algonac and St. Clair. The transmission potential is 16,000 volts, and the line voltage 600; the line pressure is soon to be changed to 700 volts, however. The apparatus is Westinghouse throughout.



MAP OF THE INTERURBAN ELECTRIC RAILWAYS OF DETROIT.

Lake Erie, a distance of 25 miles. The route is in the streets adjacent to the river and lake.

The officers and operating staff are: President, Henry A. Everett, Cleveland; vice-president and treasurer, J. C. Hutchins; secretary, J. F. Van Name, New York; assistant secretary and purchasing agent, A. E. Peters; consulting engineer, A. B. du Pont, St. Louis; superintendent, A. H. Stanley; superintendent of motive power, Thomas Farmer; superintendent of tracks and wires, E. J. Dunne; auditor, Irwin Fullerton.

The Rapid Railway system has 107 miles of track, and comprises the lines of six companies, the Rapid Ry., the Detroit, Mt. Clemens & Marine City Ry., the Port Huron, St. Clair & Marine City Ry., the Detroit & Lake St. Clair Ry., the Mt. Clemens & Lakeside Traction Co., and the City Ry., of Port Huron. Between Detroit

The company is now operating 22 interurban passenger cars which are 51 ft. long and a number of smaller local cars in the cities. The equipments of the motor cars vary, the cars being of different weight; four 75-h. p. motors are used under cars weighing 36 tons with live load, four 50-h. p. under 32-ton (loaded) cars and two 75-h. p. motors under 26-ton cars.

Passenger stations with local agents are maintained at all the important points, and in Detroit the company has for several years had a freight depot. This freight station is also now used by the Detroit & Pontiac and the Detroit, Rochester, Romeo & Lake Orion. We understand there is under consideration a plan for the Detroit United Railway Co. to erect a union freight and express station for the use of all the interurban roads entering the city.

The electric freight service of the Rapid Ry. is now handled by three motor cars which haul trains of flat cars, making two round

trips daily between Detroit and Marine City and one round trip between Detroit and Port Huron. In addition to the rolling stock already mentioned, the company owns three steam locomotives and hauls freight trains between Chesterfield and Marine City, 35 miles, usually making two trips daily.

Some of the largest salt plants in the world are located on this line, and the product is delivered to the Grand Trunk Ry. at Chesterfield by the Rapid Ry. Sugar beet factories and grain elevators located on the route further increase the freight traffic.

A regular railroad freight classification is used, the Rapid Ry. making its rates, which vary with weight and distance, the minimum being 15 cents for packages under 100 lb.

The officers and department heads of the Rapid Ry. are: President, C. J. Reilly; general manager, F. W. Brooks; general superintendent, W. O. Wood; Chas. M. Swift, treasurer; H. S. Swift, auditor; A. C. Marshall, chief engineer; George M. Henry, freight and passenger agent.

The Detroit & Pontiac Railway Co. has 35 miles of track, 16 of which is double, extending from the terminus of the city lines in Detroit to Pontiac. The power house is at Birmingham. From Royal Oak to Detroit the tracks of this company are used by the Detroit, Rochester, Romeo & Lake Orion cars. The company operates 12 passenger cars and 2 express cars, the latter being run in a single train and making one round trip per day. After making a trial of tickets they have been abandoned and now only cash fares are collected. The fare one way is 20 cents, and may be paid at one time or in installments of 5 cents each as the passenger chooses; Ohmer fare registers have been used for three months.

The officers of this company are: President, George Hendrie; vice-president, Stephen Baldwin; general manager, secretary and treasurer, Strathearn Hendrie; superintendent, John Busby.

The Detroit, Rochester, Romeo & Lake Orion Ry. is now operating from Detroit to Romeo and Oxford. Between Detroit and Royal Oak cars are run over the Detroit United Ry. for six miles, and over the Detroit & Pontiac Ry. for six miles; from Royal Oak, via Rochester, to Romeo is 27 miles, and from Rochester to Oxford, 13 miles, making 40 miles of its own track now operated by the company with six passenger and two freight cars in service.

There is now building by the Detroit Construction Co. for the Detroit, Lake Orion & Flint Railway Co. (both of these companies are controlled by the parties interested in the Detroit, Rochester, Romeo & Lake Orion) a 30-mile line from Oxford to Flint, Mich. This route is all over a private right of way. The grading is all done, 10 miles of overhead work completed, and the track laid from Oxford to Ortonville. Work was begun in October last and it is expected that the road will be opened for traffic in June next. The section between Oxford and Ortonville is now being operated with a steam locomotive and a passenger coach as rolling stock.

The power house of the Detroit, Rochester, Romeo & Lake Orion road is at Rochester, and at present is a direct current station, the three lines radiating from it being each about 13 miles long. The present equipment comprises two 200-kw. units.

The extension to Flint will be operated from sub-stations at Oxford and Atlas, in each of which, as well as in the main power house, there will be a 250-kw. rotary converter built by the Stanley Electric Manufacturing Co., of Pittsfield, Mass. The transmission potential is 15,000 volts. A 400-kw. alternator will be installed in the Rochester station, and the rotary in this station will then serve to equalize the load between the alternator and the direct current generators.

The officers and operating staff of the Detroit, Rochester, Romeo & Lake Orion Ry. are: President, John Winter; secretary, Oliver H. Lau; treasurer, Frank C. Andrews; superintendent, G. R. Johnson; electrical engineer, W. D. Ray.

The Detroit, Plymouth & Northville Ry. since March, 1899, has been operating 15.3 miles of track extending from Wayne, on the Ann Arbor line, to Northville. Through tickets are sold, good over either end of the Ann Arbor line. The company has four single truck cars used for passenger service only, but expects to go into the freight business soon. The officers are: President, J. A.

Russell, 608 Union Trust Bldg., Detroit; secretary, H. P. Wickham; treasurer, J. H. Cullen. Don. M. Dickinson is a director.

The North Detroit Electric Ry. is a four-mile line, built by the parties interested in the Detroit, Rochester, Romeo & Lake Orion Ry., from the Shaw St. terminus of the Detroit United Ry. to North Detroit; one car is operated.

The Detroit & Northwestern Ry. owns 57 miles of track, 15 of which is double track, and in addition to this operates its cars over about 4 miles of the Detroit city lines. The route is in a north-westerly direction from Detroit to Farmington; thence one branch runs north to Pontiac, via North Farmington and Orchard Lake, and one branch southwest to Northville. The company also operates the local lines in Pontiac.

The rolling stock comprises 12 closed cars 52 ft. long with toilet rooms and smoking compartments, 8 small closed cars, 8 flat cars, 2 freight cars and a steam locomotive.

The power house is at Farmington, and has Babcock & Wilcox boilers, three 700-h. p. Allis simple non-condensing engines, three 500-kw. Siemens-Halske generators, boosters and on air compressing plant for the Magann system of air brakes used on the cars. It is the practice to charge the car reservoirs once each round trip of 61 miles. Since January 1st, the Ohmer fare registers have been used.

The general offices of the company are at No. 717 Hammond Bldg., Detroit. The officers are: President, E. W. Voight; president pro tem, and treasurer, Hoyt Post; secretary and general manager, N. W. Goodwin; auditor, Charles Gifford; superintendent, R. R. Canfield.

The Detroit, Ypsilanti & Ann Arbor Ry., which was described at some length in our issue for January, 1900, page 5, has, together with the Ypsilanti & Saline Ry. operating a 10½-mile line between those towns, 55 miles of track, the distance between Detroit and Ypsilanti being 40 miles; six miles of the route are over Detroit United Ry. lines. The company now operates twenty 50-ft. inter-urban cars and local cars in Ann Arbor.

The officers are: President and general manager, J. D. Hawks; vice-president, M. J. Griffin; secretary, F. A. Hinchman; treasurer, S. F. Angus; manager, F. E. Merrell, Ypsilanti.

All arrangements have been made for the consolidation of this road and the Ypsilanti & Saline Ry. with the Detroit, Ypsilanti, Ann Arbor & Jackson Railway Co. which was organized Jan. 23, 1901, though the consolidation has not yet been consummated. The new company is capitalized for \$2,600,000.

Between Ann Arbor and Jackson the route is via Leoni Center, Chelsea, Leona, Grass Lake and Michigan Center, a distance of 40 miles. Jackson is a good manufacturing town with a population of 30,000.

This will give a 75-mile electric line from Jackson to Detroit. Five miles of track is laid and 15 miles more of the route is graded and it is expected that the road will be in operation by July. Steel rails have been ordered for March and April delivery, and ten 50-ft. cars ordered from the Barney & Smith Co.

The contract for changing the Ypsilanti power house of the Detroit, Ypsilanti & Ann Arbor road from direct current to three-phase has been let to Westinghouse, Church, Kerr & Co.; the Dearborn station will also be removed to Ypsilanti.

The Central Construction Co. has been organized to do the outside work; the line will be of side pole bracket construction with Ohio Brass overhead material. With the exception of the route through Ann Arbor and a part of that through Jackson, the whole of the extension will be over a private right of way 33 ft. wide, lying along the highway, which was purchased from the abutting owners.

The officers of the Jackson company are: President, J. D. Hawks; treasurer, S. F. Angus; vice-president, H. A. Haigh.

The Toledo & Monroe Ry., which is to form a part of the Detroit & Toledo Electric Ry. to connect Detroit, Mich., and Toledo, O., is now nearly completed and it is expected that the line will be in operation not later than April 1st. An extension from Monroe to Monroe Beach is to be completed and in operation by July.

This road was planned and is being built by J. G. White & Co., of New York, who secured the contract through their Michigan

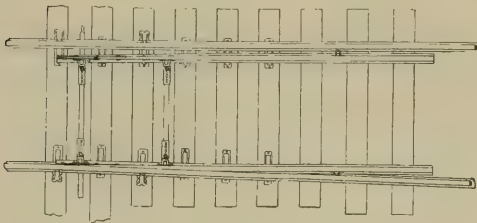
agent, Jos. E. Lockwood, president of the Michigan Electric Co., Detroit. The road has been built with the idea of making it the best electric railway in the country. The rails are 70-lb. with "Continuous" joints, laid on cedar ties, except at curves where the ties are oak, and rock ballasted. The roadbed is said to be in every respect equal to that of the Pennsylvania R. R. Good drainage is secured by making the roadbed about 2 ft. higher than the surface of the adjacent ground. Almost the entire line is over a private right of way.

The length of the Toledo & Monroe line is 22½ miles, including the extension to Monroe Beach. When the line to Detroit is completed, the company will have 47½ miles of track, and operate over the Detroit urban lines for 7½ miles, the distance from the center of Detroit to the center of Toledo being 55 miles. The schedule speed including stops is to be 30 miles per hour, making the maximum running speed about 55 miles per hour.

The officers of the company are: President, C. A. Black; vice-president, E. M. Fowler; secretary, A. E. F. White; treasurer and general manager, J. M. Mulkey; superintendent, A. F. Edwards.

### IMPROVED SPLIT SWITCH.

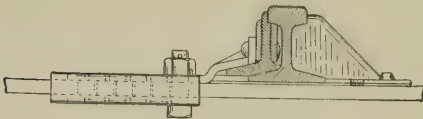
The accompanying illustrations show the Weir Frog Co.'s latest design of reinforced split switches with adjustable head rods. Since it first introduced this type of split switches to the attention of the railroads in this country, the company has devised a number of different styles of these popular switches, and it claims that this



WEIR SPLIT SWITCH.

pattern, the design No. 58, is the best. The switch rails are reinforced on both sides so that if the switch rail should break, the reinforcing will hold the parts together with safety for operation until a new rail can be put in. It is claimed that the double form of reinforcing is superior to other methods where the switch rail is reinforced on one side only; with this latter method should the switch rail break, the broken parts are apt to project from the line of the rail and present an obstruction which may cause derailment.

The adjustment of these switches is made at the switch lugs, the



SECTION OF SWITCH.

latter are drilled with 1¼ in. centers and the switch rods are drilled with 1½ in. centers, and owing to this difference in drilling an adjustment of ½ in. is obtained at each movement of the switch rod. When adjustment is necessary, the bolts are withdrawn, the rods are moved as occasion requires, lengthening or shortening, thus providing for any change of gage or wear of parts. This form of adjustment is easy and rapid. Either switch rail may be adjusted independent of the other, or both may be adjusted at the same time. Midway between the heel of the switch and where the heads of the rails diverge, a stop lug is bolted to the switch rail; this keeps the switch rail in perfect line when thrown against the stock rail. The Weir Frog Co. also makes this design with one adjustable rod.

### CHICAGO "L" ROADS REORGANIZE.

The sale last month by Mr. Yerkes of his controlling interests in the Lake Street, Northwestern and Union (Loop) elevated roads to eastern capitalists, for a sum somewhat in excess of \$5,000,000, was followed by a temporary reorganization of these companies which, it is generally predicted, is but the first step towards the ultimate consolidation of all the elevated railway interests in Chicago.

In view of Mr. Yerkes' departure for Europe the new officers of the different companies were somewhat hurriedly chosen, some of the positions being only temporarily filled. The present changes leave the officers and directors of the three companies as follows:

Northwestern Elevated—President, Clarence Buckingham; general council, Clarence A. Knight; secretary and treasurer, W. V. Griffin; directors, Charles Counselman, W. W. Miller, Clarence A. Knight, Clarence Buckingham, W. V. Griffin, Charles F. Ayer and J. B. Dennis.

Union Elevated—President, J. B. Dennis; general counsel, Clarence A. Knight; secretary and treasurer, W. V. Griffin; directors, J. B. Dennis, Clarence Buckingham, H. M. Brinkerhoff, J. J. Mitchell and D. MacAllister.

Lake Street Elevated—President and general counsel, Clarence A. Knight; secretary and treasurer, W. V. Griffin; directors, William G. Adams, W. V. Griffin, Clarence Buckingham, Harvey T. Weeks, Clarence A. Knight, W. W. Shaw, W. W. Miller, Frank Hedley and J. C. Hutchins.

No one man will hold the commanding position in these companies held by Mr. Yerkes, and it is officially stated that in the future the boards of directors will dominate the management of their respective roads.

### ITALIAN EXPERIMENTS IN ELECTRIC TRACTION.

A comprehensive system of experiments in electric traction is being made in Italy by the commission which was appointed last year to investigate the subject of electrical operation of railroads in that country. The commission has undertaken experiments with four different electrical systems each of which is installed on railways of considerable size having a regular freight and passenger traffic, and the experiments are to cover a sufficient period of time to determine data of practical operation. Two systems of storage battery propulsion are among the subjects of these experiments, in which different types of accumulators are used to drive electric locomotives. The third system is the three-phase high tension system with overhead wires, the high tension current being used directly on the cars. This system has been in use since 1896 in Switzerland and in a few other places in Europe. A fourth system which will be included in the commission's experiments is now about to be equipped. This is a third-rail system using a 600-volt direct current. The direct current is obtained from transformer sub-stations along the route, which are fed by three-phase currents. The line is about 60 miles long and the cars will be operated in trains which it is contemplated will make 50 miles an hour including stops. The latter system is already in use in the United States on a comparatively small scale, and gives promise of a satisfactory solution of the problem of long distance electric railways. These comparative tests of the Italian commission should yield accurate data of great importance.

### NEW VIRGINIA LINE.

The Richmond (Va.) & Petersburg Electric Ry., which is to be 26 miles long, will be built by the Cleveland Construction Co. The equipment will comprise air brakes made by the Christensen Engineering Co., of Milwaukee; Jackson & Sharp cars and trucks; Westinghouse motors and car seats made by the Hale & Kilburn Manufacturing Co., of Philadelphia. Power for the operation of the projected road will be rented. Mr. J. F. Petch is general manager of the system.

The Lakeside, Napoleon & Western Ry. is projected to connect Lakeside, O., with Port Clinton, Fremont, Bowling Green, and Napoleon. Private rights of way are being secured.



### THE OMAHA FIRE.

February 8th the Omaha Street Railway Co.'s car house, shops and offices at Harney and 20th streets in that city were burned, the loss, including 20 closed and 3 open motor cars, 20 open and 2 closed trail cars, 2 sweepers, 1 air compressor car, 2 salt cars and 2 grip cars, amounting to \$100,000, approximately. No power was generated in the burned building, and the Omaha Street Railway Co. had all its lines running on time, with full equipment, the next morning. It is believed that the fire started from an overheated car stove.

We are indebted to Mr. W. A. Smith, general manager of the Omaha Street Railway for the photographs reproduced herewith, showing the ruins of the building. The burned car house was built 13 years ago to serve as a power house for the old cable lines. When the cables were discarded the machinery was removed to new quarters, leaving the old cable power house to be used for offices, repair shops and barns. Thirty-five men were employed in the building during the day as painters, carpenters, car cleaners and laborers, while about 60 men were employed as conductors and motormen on the cars housed there.

The company will rebuild on a new site, at Vinton and 16th Sts. The building to be erected there will be modern and fire proof with a greater capacity than that of the burned building for the housing of rolling stock.



OFFICE AND SHOPS OF OMAHA STREET RY., BURNED FEBRUARY 8th.

### INTERURBAN ROADS AT TOLEDO.

The city of Toledo has become quite a center for interurban electric railways, there being three lines already in operation, the Toledo & Maumee Valley and the Toledo, Bowling Green & Fremont lines which are several years old, and the Toledo, Fremont & Norwalk R. R., opened for passenger traffic in the fall of 1900. In addition, two other electric lines will be in operation by April 1st, and one of these may have been opened for traffic before this issue of the Review is published.

This latter road is the Toledo & Western Ry., organized to build from Toledo to Sylvania and thence west to the Indiana line. The line from West Toledo to Sylvania, 8 miles, is practically completed, and one 400-h. p. unit in the power house at Sylvania was ready for operation March 1st; three cars built by the Jewett Car Co., were delivered in February. These cars are illustrated elsewhere in this issue. The power house is to have two 500-kw. three phase General Electric generators in addition to the unit now in place; the contract for the power house was let to the Arbuckle-Ryan Co., of Toledo. The route is over a private right of way everywhere except through towns and villages. From West Toledo to Toledo, 2½ miles, the tracks of the Toledo Traction Co. will be used. On the overhead work Roebblings' Figure 8 trolley wire and Ohio Brass Co.'s hangers, brackets, etc., were used; the feeders are of aluminum furnished by the Pittsburg Reduction Co. The cars have four 50-h. p. Lorain "Steel" motors.

The officers of the Toledo & Western Railway Co. are: President, Luther Allen, Cleveland; vice-president, J. R. Seagrave, Toledo; secretary, treasurer and manager, F. E. Seagrave, National Union Bldg., Toledo. The consulting engineer for the company was Frederick B. Perkins, formerly with the Toledo Traction Co., as electrical engineer.

The parties interested in the Toledo & Western have also incorporated the Toledo, Adrian & Jackson Railway Co., to build from Sylvania to Adrian, Mich.; franchises having been secured from Adrian to Jackson, also. As soon as the work of construction is completed the two companies will be consolidated, giving the new company some 75 miles of track. The officers of the Toledo, Adrian & Jackson Ry. are: President, C. M. Stone, Cleveland; vice-president, F. C. McMillin, Cleveland; secretary, A. P. Southworth, Adrian, Mich.; treasurer, C. E. French, Cleveland.

The Toledo, Bowling Green & Fremont Ry., has recently extended its line 5½ miles southeast of Bowling Green to Cherry City, with the prospect of extending to Findlay and Fostoria. The company has also recently built new car houses and shops at Bowling Green. The president of this company is J. A. Huston, and the general manager, Robert E. Hamblin.

Mr. C. E. Dennman, general manager of the Toledo & Maumee Valley Railway Co., has organized the Toledo, Waterville & Southern Ry., which will build six miles over a private right of way from Maumee to Waterville. The road will be operated in con-

nection with the Maumee Valley. Orders for material and equipment will be placed at once.

The Toledo & Monroe Ry., which is mentioned in connection with the Detroit interurbans elsewhere in this issue, is the second of the new Toledo electric railways mentioned as to be in operation before April 1st.

Some preliminary work has been done by the Toledo, Port Clinton & Lakeside Railway Co. and the company will in the spring commence the construction of lines from Genoa, on the Toledo, Fremont & Norwalk, to Lakeside via Port Clinton, and to Ottawa Bay. The distance from Genoa to Lake Side is 38 miles, and the branch from Port Clinton to Ottawa Bay is 6½ miles.

The question of a union depot for passengers and freight is under consideration by the managements of the various Toledo roads and while no definite proposals have been made, there is no doubt that such a building will soon be erected.

Mr. Comstock, one of the principal stockholders in the Toledo, Fremont & Norwalk R. R., has bought a lot 80 x 150 ft. in Toledo for \$18,000, and it is only a question of a short time until this property will be utilized for a transfer station.

The Spring meeting of the American Society of Mechanical Engineers has been definitely assigned to the city of Milwaukee, probably for the last week in May or an early week in June. The exact date is a matter of later announcement.

# MECHANICAL DEPARTMENT

## REPAINTING STREET RAILWAY CARS.

BY LOUIS GRATON.

It is well known that a practical man is not always a writer of theories and that the theoretical man is not always practical. It is true that we get occasional golden thoughts from theorists, yet it is a safe rule to accept theories with some allowance. So when the progressive painter wishes to submit well written formulas to practical tests I should always advise the addition of a grain of allowance. I shall try to avoid theories and write of actual experience as clearly as possible.

In repainting a car, the first thing to consider is the place in which the work is to be done. Street railway companies, except those that operate large lines, seldom provide suitable quarters for painting. This important work is usually done in the barn over a pit, where the footing is unreliable and unsafe. In such a place the light is seldom good and is often one-sided and the frequent opening and shutting of doors, causing drafts and dust, make it impossible to do neat work. If the painter is fortunate enough to have a shop especially for his work, there are many things to consider in regard to its arrangement. If the windows are so disposed as to admit strong sunlight on the cars a coat of white kalsomine on the inside of the glass will insure sufficient light and will prevent the sunlight from blistering the varnished work.

A bench should be built at a north window, if possible, as that quarter of the compass provides the softest and best light. On this bench the designing and sign writing is done. Near this bench the shelves and cupboards should be placed. If the shop is all in one compartment and a little scant as to room, an annex to one of its sides is very desirable, as in this annex all the sash and sign work can be done, and in addition it can contain the bench, shelves, etc., leaving the main shop for the cars and scaffolds.

Our next consideration is that of heating. If this is done by stoves the shaking and refilling of them should be done long enough before coloring or varnishing to allow the dust to settle. Ventilation is so very essential and is so well understood that it need not be dwelt upon here. I will say, in passing, that the shop I work in is very comfortable during the hottest summer months from the fact that the windows all swing outward (being hinged at the top outside) providing a current of air regardless of the direction of the wind.

The successful car painter will be found to be an all-around man, although he may not be a finished artist in all the departments of his trade. It has been said that men who can do anything are white crows among artists, yet a car painter should have some knowledge of drawing, should know something of the harmony of colors, should be able to detect good from poor material, and should be informed as to the best sources from which materials can be purchased, as his advice is sometimes sought in regard to this. He should know how to do a fair job of gainting, and should understand lettering and striping. It need hardly be added that he must be sober and industrious.

### BRUSHES AND APPLIANCES.

We will next take up tools and appliances. For applying rough stuff a cheap grade of bristle brush may be used, though a good brush is never too good for any purpose. For lead priming I prefer a black, chiseled, 6-0 Chinese bristle brush in connection with a 1-in. chiseled brush for narrow places, edges, etc. The 6-0 brush just mentioned, if of good quality, also makes an excellent varnish brush, but the brushes set apart for varnishing should never by used for other purposes until they get stubby. When brushes are not in use they should be suspended in oil, turpentine or varnish. Varnish is preferable for varnish brushes, as turpentine is apt to make

the bristles harsh and oil necessitates so much care to remove every vestige of it from the brush that the additional first cost of the varnish is scarcely to be noticed. Color brushes should be kept in turpentine. If kept in oil great care is necessary to wash out all the oil with turpentine or benzine, as oil left in the brush will retard the drying, or rather will make the drying irregular, which gives rise to the liability of varnish crawling. For coloring, double thick camel's hair brushes of  $2\frac{1}{2}$  in. and 1 in. in width are used.

Very serviceable brush keepers can be made by cutting off the tops of varnish cans at the right height to allow brushes to swing clear of dregs—say an inch or so from bottom. One or more brushes can be strung on a wire, and the hole in the brush handle should be large enough to prevent violent jerking from the wire that holds the brushes in suspension across the top of the keeper. These keepers can be provided with covers, and if not, they should be kept in a box or cupboard away from dust.

Dusters that are used to prepare the surface for varnishing, and for that reason are called varnish dusters, should never be used for any other purpose, so a double set of dusters should be provided. Striping and lettering pencils are made of camel hair, ox hair and sable hair, and may be used in ferrules or quills with equal effectiveness. Sword pencils are preferred by many, as the pressure of the hand regulates the width of the stripe. For wide stripes a swan's quill pencil is very useful.

For lettering in thin, flat colors, camel's hair is best. When oil colors, and especially those containing lead or gold size, are used, the red or black sable or ox hair brushes are best. These should be graded from Nos. 1 to 12, and should be in lengths of from 1 in. for the smallest to  $1\frac{1}{2}$  in. for the largest.

A few presses fixed to solid posts for pouring color out of cans are handy, and no shop is complete without a paint mill.

The subject of knives and scrapers is too well understood to require mention, although I will say in regard to scrapers that the best kind for removing paint or varnish from wood is that made of an old file, with an inch and a half or two inches of the end bent at right angles with the main part or handle. The short end should be ground like a chisel, with the straight edge toward the operator. This form of scraper is operated with a pulling motion. To scrape paint from iron, such as dashes, a square file is ground straight and square at the end, thus affording two or four scraping edges. This scraper is effective only by pushing.

### SCAFFOLDS.

As we pass on to scaffolds let me emphasize the fact that strength does not always consist in great bulk. A straight grained pine or basswood plank,  $1\frac{1}{2}$  in. thick and 8 in. wide, and long enough to reach the length of a car, will be found to be strong enough. The same principle is applicable to trestles. When not in use trestles can be hung up on a strong spike or peg in the side of the shop, and planks, when not in use, may be disposed of by placing flat against the side of the shop at just the right height for convenient reaching, the lower edge being placed on two slight projections and the upper edge being held by turning a button over it.

This tedious description of appliances may not be quite useless, as no satisfactory results need be expected without intelligent and painstaking preparation.

### BURNING OFF.

The burner need not be described, but if it is the usual brass automatic affair care should be taken to keep all its parts perfectly clean. After refilling the bottom screw should be turned very tight to prevent leakage, and when shutting off the blaze the thumbscrew should be turned just enough and no more. If it is shut off too tight the needle point that regulates the blaze is apt to be blunted. Gasoline is the usual fluid for the torch.



Two or three knives of different width should be at hand to remove the blistered paint while it is still soft. For the concave panels it is well to have one of the knives ground slightly round to fit the surface. In this operation care must be taken not to hold the torch too long in one place, as scorching of the wood should be avoided as much as possible. Digging into the wood with the knife must also be avoided.

#### PAINTING.

The burning being finished, the car should be looked over scraper in hand (the bent scraper before described) to scrape off any remnant of paint from the corners.

Next comes a thorough rubbing with No. 1 sandpaper and dusting off, and we are then ready for priming.

As the burned off surface is quite different from new wood, in that it is quite well filled, a flat coat—that is, one having but little oil—should be used. The priming is made of keg lead with enough lamp black to make a lead color, thinned principally with turpentine, enough raw oil to bind it and a tablespoonful of good coach Japan for each quart of the paint. This should be well brushed out, not flowed on, to avoid "fat" edges and corners.

If any new panels are put in, it will be advisable to make the priming coat with the raw oil predominating over the turpentine, the amount of Japan dryer being the same as in the other instance.

The priming should be allowed two or more days to dry according to the quantity of oil it contains. When thoroughly dry the new panels should be treated to a coat of the flat lead color used on the burned surface. When this is dry and sandpapered we are ready for the "rough stuff."

I have before me Noble & Hoare's formula for their English filler which is as follows: "Mix 4 lb. of this filling, 1 lb. ground white lead and  $\frac{1}{4}$  pints turpentine into a stiff paste, then either 1 pint each of gold size and varnish bottoms, or  $\frac{3}{4}$  pint gold size and about  $\frac{1}{2}$  pint of boiled oil. No grinding is necessary. Give the wood first one coat of lead color (rather dead than oily) then apply five or six coats of this mixture, two to four coats per day. Only the last coat, after having stood one or two days, is rubbed down."

Nothing is to be added, as I have proved this formula to work well. If this filler cannot be readily procured, paste fillers can be had that work very well by the addition of turpentine. It should be stated here that five or six somewhat thin coats will give better results than fewer coats of heavier filler, as this last is apt to be brushed out in ridges, which will add to the labor of reducing to a level. The levelling is done with the old-fashioned lump pumice stone, or with prepared stone. If lump stone is used the lightest in weight will cut fastest. This can also be said of the prepared stone. While rubbing, the surface is kept constantly wet with water from a sponge. Great care must be exercised to rub no more than is necessary to secure a smooth and level surface, and there is always danger of rubbing through to the wood. The wood thus exposed, coming in contact with water, will swell, causing not a little trouble. If this should happen sufficient time should be given to thoroughly dry the bare spots, which are then sandpapered and rubbed with a little boiled oil. The whole surface is next to be sandpapered with No. 0 paper and well dusted, and the car is then ready for the color.

#### HOME MADE SNOW PLOW IN SYRACUSE.

We present in the accompanying illustration a view of a home made snow plow that has been in use for some time on the lines of the Syracuse Rapid Transit Co., with excellent results. Upon the top of each side frame of the truck is fastened, by means of U-bolts, a 45-lb. girder rail 25 ft. long. These two rails are bound together by cross tie rods and form a rather unusual but very substantial side-sill construction. Resting upon and extending the full length of the rails, is a heavy wooden flooring, and upon this floor is rigidly fastened an old 16-ft. horse-car body. Within the car body is placed a false or second floor, about 1 ft. above the lower floor, and the space between the two is filled with old axles, rails, etc., to give weight for traction.

There is a nose or plow-piece at each end of the car, this piece comprising two arms, 12 ft. long, and meeting at an angle of about 45 degrees. The arms are heavy 2-in. oak planks, 14 in. wide, and bound with iron straps, bolted to their surfaces, to protect the wood and enable the plow to buck solid drifts.

The snow plow is designed to clean both tracks at one opera-

tion, and to accomplish this, a removable wing is hinged to the end of any one of the 12-ft. arms, as the direction in which the plow is to travel may require. The wing is a 2-in. oak plank, 16 ft. long and bound with  $\frac{1}{2}$ -in. iron plate. It is fastened to the shorter arm by heavy eye-bolts and a pin, forming a hinge practically the same as an ordinary door hinge. The wing may be swung in toward the car body, and when extended is held firmly in position by two heavy iron bars, having hooks at each end, which fit into sockets or eye-bolts fastened to the truck frame and to



SNOW PLOW, SYRACUSE.

the wing. For convenience in handling, the wing has iron grab handles, as shown in the illustration.

The nose is raised and lowered by a hand chain-windlass on the platform, comprising an iron bar, on which the chain is wound by revolving the bar with the aid of a lever working in a ratchet wheel on the end of the bar.

The Rapid Transit company owns one snow plow for every six miles of track.

#### MAXIMUM TRACTION CARS.

The maximum traction truck suggested to Mr. Strathearn Hendrie, general manager of the Detroit & Pontiac railway, the idea of mounting the two motors on the rear truck and then placing that truck nearer the center of the car so that it carries more than half the weight, thus making a "maximum traction" car. The cars are 33 ft. long over the corner posts, with  $4\frac{1}{2}$  ft. platforms; the front platform is completely vestibuled and contains the car heater and coal box. The body has cross seats long enough for four persons, placed against the left hand side of the car, leaving an aisle at the right; two doors are provided, one at the rear end and one at the middle of the car side.

The forward bolster is placed 10 ft. from the end and the rear one 11 ft.; it is estimated that by this arrangement the rear truck which, as already stated, carries both the motors, has about 60 per cent of the total weight. The motors are 50 h. p. each

#### NOTES ON CENTRIFUGAL FANS FOR CUPOLAS AND FORGES.

Extracts from a paper before the American Society of Mechanical Engineers by William Sangster.)

In hardly any other class of machinery is the method of application of so great importance as it is in the case of centrifugal fans. The conditions of one installation are usually so different from those of any other that hard and fast rules are out of the question.

The writer, however, offers the following formulae for the power required by centrifugal fans in cupola and forge practice with the hope that they may prove of service when laying out the power plants of shops, etc. They will be found fairly reliable, with the error as a rule on the side of safety.

The amount of air required to melt one ton of iron in an ordinary cupola is variously estimated at from 30,000 to 45,000 cu. ft. In order to obtain a safe formula the writer has assumed this value 40,000 cu. ft. per ton. By ordinary cupolas are meant those which



melt up to 6 or 8 tons per hour. Since the pressure of blast increases with the diameter of the cupola, and the power required to deliver a given quantity of air increases with this pressure, the formula is expressed in unit terms of 1 ton of iron melted per hour with a blast pressure of 1 ounce per sq. in.

Assuming that a cubic foot of air at atmospheric pressure and at a temperature of 50° F., weighs .078 lb., we obtain for the height of a column of air corresponding to a pressure of 1 ounce per sq. in., 1,154 ft. The velocity of air in feet per minute due to that pressure or head is  $V=5,160$  ft. per minute. As each ton of iron melted per hour requires 40,000 cu. ft. of air, that is, at the rate of 667 ft. per minute, we shall require as the necessary area of orifice to deliver this amount at 1 ounce pressure, 18.6 sq. in.

The horse-power required will be expressed by the formula:

$$H.P. = 1.1 P \div (16 \times 33,000 \times C) \text{ in which}$$

$V$  = velocity of the air in ft. per minute.

$A$  = area of the orifice in sq. in.

$P$  = pressure of the blast in ounces per sq. in.

$C$  = coefficient of efficiency, allowing for friction of belting, air in piping, etc., in this case assumed at 60 per cent.

Substituting the proper value in the formula gives 0.3 h. p.

Since the velocity of air varies as the square root of the pressure, and the area of the orifice for a constant quantity varies inversely as the velocity, it follows that the horse-power required to deliver a given quantity of air will vary directly with the pressure, or since  $VA$  is a constant, the power will vary directly as the pressure  $P$ . To obtain the horse power required by a cupola fan we may therefore use the formula,  $H.P. = 0.3 TP$ , in which  $T$  = tons of iron melted per hour.

$P$  = pressure of blast in ounces per square inch.

For ordinary forge fires an allowance of 140 cu. ft. per minute is ample. The usual pressure of blast is about 4 ounces per sq. in. The velocity of air under this pressure, calling that of 1 ounce 5,160 ft. per minute, will be 10,320 ft. per minute.

The area of discharge orifice is 1.95 sq. in., and the power required is 0.25 h. p. per forge.

Modern forge shops are equipped with exhaust systems for removing the smoke and gases from the fires, and delivering them at some convenient point outside the building. In order to accomplish this result it is necessary to remove a larger quantity of air than is supplied by the blast, and the fan should be run at a low peripheral velocity.

A safe approximation will be to exhaust four times the air supplied by the blast, and to drive the fan at a peripheral velocity corresponding to a pressure of  $\frac{3}{4}$  ounce per sq. in. Since the horse power required by a fan under constant pressure varies as the quantity of air delivered, and, as the pressure of blast when the quantity is constant, we find that if the fan removes 560 cu. ft. at  $\frac{3}{4}$  ounce pressure we shall require 0.19 h. p. for each forge, or a total allowance of .44 horse-power per forge.

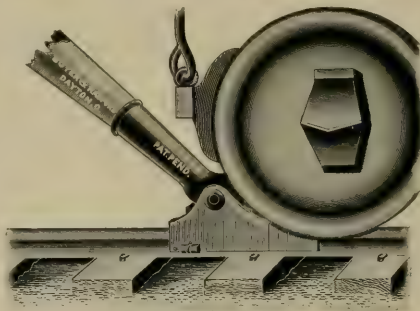
On account of the diminished first cost some installations have been provided with but one fan for both the blast and the exhaust systems. Such an arrangement is not economical, since a much larger volume of air must be raised to a high pressure than if a separate fan had been used for the exhaust system. In the case given above we should have to handle five times 140 cu. ft. of air at 4 ounces pressure, requiring 1.25 h. p., instead of .44 h. p. for each forge. Even in a small system the power saved by the extra fan will pay for its cost in less than a year's time.

When used as a blower the ratio of outlet to inlet of a centrifugal fan should be so proportioned that air enters the fan with the least possible velocity. Up to a certain area of outlet, varying with the style of the fan, the pressure of the outlet remains nearly constant. Beyond this point the pressure gradually drops until the full area of the fan outlet is reached. This drop in pressure is partly caused by the resistance of the air passages of the fan, but more particularly by the vacuum within the fan inlet. This vacuum is necessary to maintain the velocity of the incoming air and represents a loss in effective pressure as well as in the efficiency of the fan.

To help keep the oil room clean—place the oil barrels on low trucks so they can be pulled out into the center of the room occasionally and the rubbish cleaned from back and under them. If you haven't taken a look behind your oil barrels recently, do so, and see what a fine stock of material is there for starting a conflagration.

## THE BOYER & RADFORD CAR PUSHER.

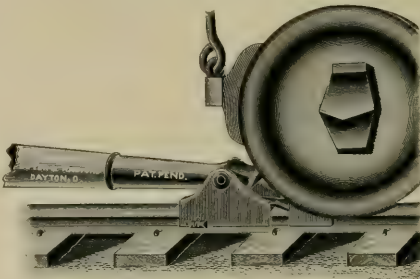
The tool herewith illustrated is designed to move cars along the tracks where it is not convenient to use the regular motive power. By the movement of the lever the cars are moved forward and at the same time a sliding wedge moves forward, following under the



BEFORE OPERATING.

wheel, and holds it in its forward position until another hold is taken with the lever. The same movement is then repeated. This feature of holding the car after it has been pushed forward is very essential when the cars are being moved over a slight up grade.

It will be seen that the pusher is so constructed that the lever takes its hold upon the wheel at quite a distance above the track.



AFTER OPERATING, SHOWING SLIDING WEDGE.

This makes the work of pushing easier than when the lever engages the wheel near the track as with this tool there is very little tendency to lift the car. It can be used on any style of track and is light and easily handled. This car pusher is made by Boyer & Radford, Dayton, O.

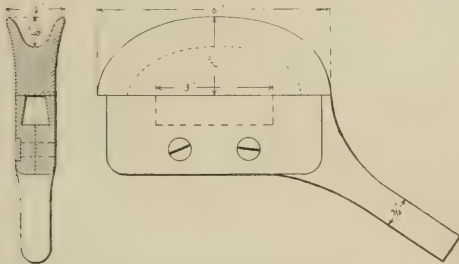
## VARNISH FOR STREET CARS.

On January 1st the well-known firm of Berry Brothers, Ltd., manufacturers of varnishes, installed its office force in its new office building recently completed at Lieb and Wight Sts., Detroit, Mich. The new office building is situated directly opposite its factory in Detroit, and is a handsome and substantial structure of brick with stone trimmings, covering an area of 90 ft. x 110 ft. This company, which has representatives in most of the leading cities throughout the country, makes an excellent line of varnishes for both outside and inside finishes also for coach bodies and running gears. In the manufacture of its coach varnishes the company is not only aided by an experience extending over forty years, but its factory is equipped with a laboratory and a testing room second to none in which its products are tested both chemically and mechanically. Special attention is given to the clearing and aging of varnishes, the latter being made possible by the company's exceptionally large tankage facilities. For finishing natural wood floors a material called liquid granite is highly recommended, and the company publishes an instructive pamphlet on the care and finish of hardwood floors.

### OVERHEAD TROLLEY SHOE.

The standard motor equipment of the interurban cars of the Union Traction Co., of Anderson, Ind., consists of two 50-C Westinghouse motors, and the current required at starting is often in excess of 300 amperes. It is found that even with the two trolleys which are used to take these heavy currents the trolley wheels will not last for more than 2,000 or 3,000 miles. The wheels do not wear out but are burned up.

In an endeavor to reduce the cost of renewing the wheels and also do away with the annoyance of having two trolley poles to watch, the company is now experimenting with a sliding shoe, which



TROLLEY SHOE, ANDERSON, IND.

the electrical engineer, Mr. A. S. Richey, states he thinks will prove to be very satisfactory.

The new device comprises a malleable iron harp and a copper shoe, which are shown in the accompanying drawings. The shoe is 6 in. long and semi-elliptical in side elevation with a groove  $\frac{3}{4}$  in. deep along the upper edge. On the bottom of the shoe is a dovetail lug 3 in. long by  $\frac{3}{4}$  in. deep which is gripped by the harp.

The harp has a round shank  $\frac{3}{4}$  in. in diameter to slip inside the trolley pole, the inclination of the shank to the body being such the base of the shoe is horizontal for the average height of the trolley wire. The harp is in two pieces, one of which includes the whole length of the shank, and the two are clamped on the lug of the shoe by two flat-head  $\frac{3}{4}$  in. screws counter sunk. The front end of the harp is brought out flush with the end of the shoe so that there will be no hook to catch on the span wires in case the shoe leaves the trolley wire. The shoe runs without sparking and no trouble has yet been experienced by reason of its leaving the wire either on straight track or curves. Accurate measurements of the trolley wire show the wear there to be negligible.

### LARGE AIR BRAKE ORDER.

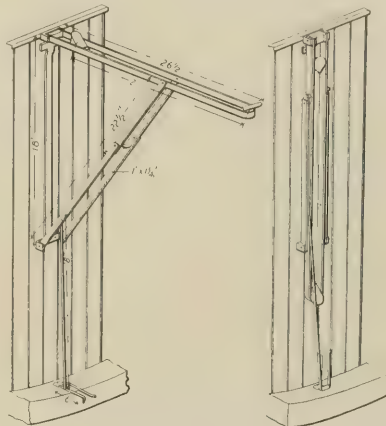
One of the largest orders for air brakes ever placed has just been received by the Christensen Engineering Co., of Milwaukee, Wis., through Mr. F. C. Randall, eastern sales agent of the company. Mr. Randall closed the order for 300 air brake equipments for the International Traction Co., of Buffalo, N. Y., and all the cars of this company, which operates all the roads in and around Buffalo, will be equipped with these brakes.

The use of automatic power brakes has been advocated generally for electric railways, and their use is especially to be commended on large systems operating in crowded cities, where a high rate of speed is desirable but where safety often imposes the necessity of very quick stops. The better the braking apparatus on a car the higher may be the speed with which it can be safely operated, and this large order for brakes shows the tendency of city roads to adopt the most modern, improved and effective brake systems.

All of the 225 shopmen employed at the electrical repair shops of the Union Traction Co., of Philadelphia, commenced work with the company as helpers at 50 cents per day. Many of them are now making \$2.50 per day. All vacancies are filled by promotion and all new men have to begin at the bottom. Mr. F. H. Wampler, the master mechanic, believes that by this system he has developed the finest lot of repair shop men to be found anywhere.

### A STREET CAR BICYCLE CARRIER.

Each car of the Denver City Tramway Co. is equipped with at least three of the bicycle carriers illustrated herewith, which were invented by Mr. J. C. Kulp, foreman of the company's wood working shop. Fig. 1 shows the carrier attached to the vestibule of a



BICYCLE CARRIER, DENVER.

car in its open position ready for receiving a bicycle, and Fig. 2 shows it closed down against the vestibule when not in use. Its construction is very simple and strong, and will be readily understood by reference to the illustrations. In height the carrier is made so as to extend up to the casing of the vestibule sash, and when open it projects 26  $\frac{1}{2}$  inches out from the vestibule. It is built so as to remain securely in position either open or closed.

### GARL TELEPHONE INFRINGED.

We are informed by the Garl Electric Co. that the telephone device shown in the Street Railway Journal, Jan. 5, 1901, page 78, as being the invention of Mr. J. D. Houseman of the St. Louis, St. Charles & Western Railroad Co., is a direct infringement of the Garl patents. This system of street car telephone was exhibited by the Garl company at the American Street Railway Conventions held at Niagara Falls, Chicago and Kansas City. This device has been in use by the Garl Electric Co. under its patent for about five years, both the application of one wire above another and the cross arm wires, the ordinary coupled pole device also being part of the system.

The Garl Electric Co. has notified Mr. Houseman of his infringement and that legal action would be taken if its use was not discontinued.

A large road in the East is placing wooden grab handles instead of metal on its closed cars. They are cheaper, can be made sufficiently strong and are much cleaner.

The Wyandotte & Detroit River Ry. (recently purchased by the Detroit United Ry.) operates its cars with the two motors in parallel at all times. The object of this arrangement is to prevent unequal distribution of current to the motors and secure more rapid acceleration.

During a recent visit to a large repair shop just at the noon hour a representative of the "Review" had the pleasure of attending a graphophone concert given to his fellow workmen by one of the employees of the shop. The men were perched around on the benches and the half-finished cars, eating their lunches but enjoying the music to the utmost. Perhaps there is a suggestion here for some manager who is endeavoring to foster a more cordial relation between the management and the employees.

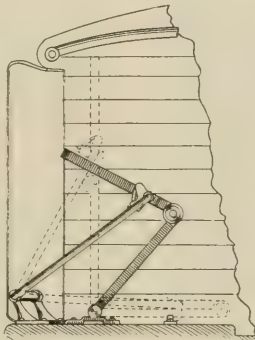
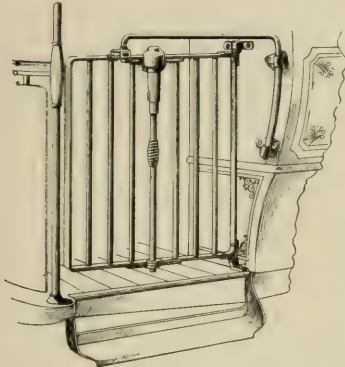




### FOLDING GATES FOR STREET CARS.

A new type of folding gates has been introduced by the R. Bliss Manufacturing Co., of Pawtucket, R. I., which is especially adapted to cars with wide platforms or vestibules and double center doors. The use of gates is rapidly increasing and the one described has been designed to fulfil the requirements of safety and easy manipulation, and to take up a minimum of space.

The gate, which is double, is swung from upper and lower bulkhead brackets, the lower one of which is made in two designs,



BLISS FOLDING CAR GATE.

either to fasten to the car body or to the platform, as shown. The center post of the gate is controlled by a spring which holds a clutch securely fastened when the gate is closed. A handle on the center post is raised, which releases the clutch, when it is desired to open the gate, and it is held by a catch in its open position. The connecting rod, which gives the gate its rigidity, forms the platform grab handle when the gate is open.

When closed the gate spans the entire distance from the end of the car to the dash board, and its construction is such that the gates are absolutely prevented from opening by passengers leaning on or against them. This is a most important consideration for safety. The illustration showing the plan of the gate explains the facility with which the gate may be opened, even when the platform is crowded with passengers, as in opening it slips in behind the standing passengers without giving them any inconvenience.

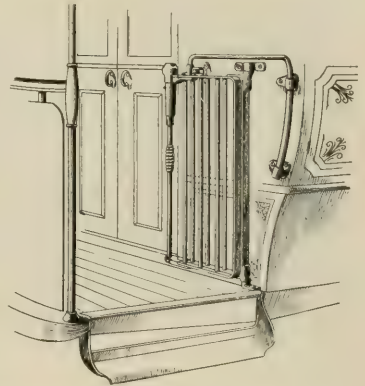
The gates are made of rolled iron with brass fittings or completely nickel-plated, as desired, and give a handsome finish to the cars upon which they are used.

### PROTECTION OF GEARING AND WIRE ROPE.

The protection of gearing and wire cables is a subject of special importance to both electric and cable railway men as the value of anything which will reduce the wear and increase the life of these parts is obvious. Several materials designed to prevent metallic contact, noise and wear of moving parts have been produced by the Ironsides Co., of Columbus, O., among which may be specially mentioned the Ironsides gear shield and the Ironsides wire rope filler. The former of these products has now been in use for some time on street railways, and the Ironsides Co. has published a leaflet which contains many flattering indorsements of its gear shield by a large number of railway men who have tested its value. This material acts as a lubricant, is waterproof and cannot be washed off. It also lessens the noise of gearing which is of great advantage in motor cars. This material is also used with excellent results on high speed or heavy journals, car axles, etc., in which cases only may a small amount of petroleum be added.

Ironsides wire rope filler is adapted for cable railway service, wet mines, steel hawsers, tow lines and other service where the cable is liable to be water-soaked. It is used not only in assembling the

strands around the core, but also in making the individual strands. This material is claimed to be free from destructive acids and forms a flexible lubricating cushion between the separate strands, thus preventing abrasion of the wires. It is pliable, readily accommodating itself to short bends of the rope, and seals it against water and acid attacks. The filler exuding between the wires forms a foundation on which the company's wire rope shield is built up by external application. The shield lubricates the grooves of sheaves and drums, protects high points of wire rope, and prevents chafing of wires and strands.



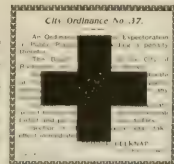
### ANNOUNCEMENTS IN CARS.

We reproduce herewith an extremely neat and compact sign, posted by the Rochester Railway Co. in its cars, for bringing to the attention of passengers various regulations of the company. The placard is 18 1/2 x 9 3/4 in. and combines a warning against getting

## PASSENGERS—NOTICE!

#### WARNING.

To insure personal safety you are warned not to project ANY PART OF BODY beyond the SIDES of car.  
Do not get ON or OFF cars while in MOTION, or on the FRONT end of cars.  
ANY VIOLATION of above rules will be at your OWN RISK.  
Cars STOP only on FURTHER chalking.



#### SMOKING.

SMOKING IS NOT ALLOWED on CLOSED CARS and only on THROUGH REAR SEATS of OPEN CARS.

#### TRANSFERS.

If desired, ask for TRANSFER slip when you pay your fare—UNWIND, date, hour and line transferred to as soon as received. If in error, NOTIFY conductor at once.

ROCHESTER RAILWAY COMPANY.

on or off cars in motion, or projecting any part of body beyond the sides of the car; the ordinance against expectorating on the car floor, and the regulations for smoking and transfers. The cross in the center, the headlines and the more important words in the text are printed in red.

The railway property of the Freeport (Ill.) General Electric Co. will be sold by order of the federal court. Foreclosure proceedings were commenced two years ago, and an order to sell was entered February 14th. W. A. Johnson, the present receiver of the company, will act as special master in holding the sale.

The bonds of the new Pittsburg, McKeesport & Connellsville Street Railway Co. were placed with a number of Pittsburg banks, Thursday, January 31st. At the close of the day's business on the following Saturday the bond issue had been over-subscribed \$1,655,000. Pittsburg bankers predict that in three or four years the present bonds will be selling at from 8 to 12 points in advance of the subscription price.

## THE JEWETT COMPANY'S SUBURBAN CARS.

The Jewett Car Co., of Newark, O., is taking a leading position among car builders in the matter of first-class workmanship, originality of designs and handsome finish of its electric car bodies. An interior and an exterior view of one of its latest cars are shown here, the car being one of an order recently completed for the Toledo & Western Railway Co., of Toledo, O. These cars are pronounced by all who have seen them to be models of suburban car



INTERIOR OF TOLEDO & WESTERN CAR.

work. They are thoroughly modern in every detail of design, construction, finish and equipment.

In the construction of these cars the builder has made a considerable departure from the ordinary types and styles and has incorporated in them some new and original features, and it has been the aim of the Jewett company to introduce in every detail the newest and best ideas in street car construction. A unique and perhaps the most noticeable feature of these cars is the adoption of the Pullman type of gothic or upper side sash. This is the first deviation that has been made from the old style of sash as applied to electric street cars, and the effect is novel and very attractive.

That the cars have fulfilled every expectation is attested by the

strength begin with the framing of the floor timbers and continue throughout the entire construction of the body, and at the same time nothing cumbersome obtrudes itself upon the eye.

The interior finish also deserves attention. It is of Canada cherry, finished in imitation of mahogany and is polished equal to a piano finish. Although equipped with the best machinery made for finishing cabinet work, the Jewett company makes it a rule to have all its interior work finally finished by hand, thus producing a perfect surface for the varnish. These cars are provided with toilet rooms, drinking fountains, electric calls and every device for the convenience of passengers. They are very handsome in appearance and the builder has every reason to be proud of the work.

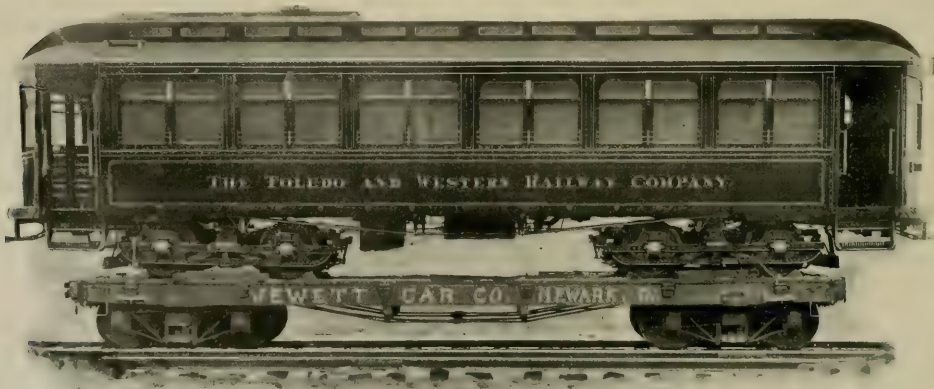
Some extensive additions to its new plant at Newark, O., are now in progress, and the Jewett company expects to do a good share of the suburban and elevated railway car work of the coming season. The company's work in the past is its best advertisement, which will undoubtedly be appreciated by prospective customers.

## A GOOD RECORD.

The Consolidated Car Heating Co., of Albany, N. Y., in 1892 equipped 88 cars in the city of Albany with its electric heaters. These were mounted in wooden boxes, which have recently been replaced with improved metal cases, but the old heaters themselves are still in service, and as far as examination and tests show are in as good condition as when they were first put in. There are also a large number of Consolidated heaters in Chicago that have been in constant use every winter since 1893. These are records of which Mr. R. P. Scales, general manager of the Consolidated Car Heating Co., is justly proud. And Mr. Scales energetically affirms: "The 1901 model of the Consolidated heater, in workmanship, finish and details, is nine years better than the 1892 model, although the general principle remains the same."

## SANTA BARBARA ROAD TO BE EXTENDED.

February 20th, the United Electric Power & Gas Co. of Santa Barbara, Cal., acquired all the property and franchises of the Santa Barbara Consolidated Electric Co., and on March 1st, the United company assumed the management and control of the Santa Barbara road. Franchises for extensions of the present system of electric lines and for an electric lighting and power plant are



JEWETT SUBURBAN COACH.

fact that the Jewett company has been awarded two more contracts for this style of cars, practically without competition. The cars were designed to be especially strong in the body, and the inspectors who carefully watched the progress of the work in the shops in the interests of their respective railway companies, state that the work of the Jewett Car Co. has about it a peculiarity of its own in the matter of strength just where it is needed. The provisions for

included in the purchase. Messrs. C. W. D. and A. P. Miller, respectively president and manager, and secretary and treasurer of the company under the old regime, have succeeded in establishing a very modern and efficient street railway service in Santa Barbara. The purchasers of the system will further their plans for its improvement, and it is announced will expend \$500,000 during the year in various suburban extensions.

## FOREIGN FACTS.

The Manchester (Eng.) corporation has purchased 17 acres of land as a site for car works.

The corporation tramways of Huddersfield, England, were opened for traffic last month.

The London (Eng.) Tilbury & Southend Railway Co. is about to purchase the Corringham Light Ry.

It is reported that an electric line is to be run from Teheran to a port on the Caspian sea, about 100 miles distant.

An American company has purchased the Manila Street Ry., which it proposes to convert to the electric system.

The municipality of Ploesti, Roumania, has invited tenders for the construction and operation of electric tramways in the city for 30 years.

A dozen new cars will soon be placed on the electric railway in Bolton, Eng., and plans are being prepared for an extension of the generating station.

Part of the street railways in Newcastle, Eng., are being changed over to electric traction and the work of relaying and bonding the tracks is in progress.

The Siemens & Halske electric railway, which is the most important street railway line in Berlin, has been purchased by the municipality for the sum of £500,000.

The Light Railway Commissioners have granted an order to the North Wales & District Light Railway syndicate to construct an electric railway between Pwllheli and Nevin, Wales.

The South-Eastern Metropolitan Tramway Co., of London, has made application to reconstruct its lines from Greenwich to Catford upon the Schuckert surface contact electric system.

The corporation of Manchester, Eng., will probably abandon its opposition to the Liverpool-Manchester monorail express route which it is proposed to equip with the Behr electric system.

The city of Chester, Eng., has practically purchased the present street railway system in that place for £18,000 and is promoting a bill to obtain parliamentary authority to operate the system.

The ancient Grecian city of Piræus is to be the center of an extensive street railway system connecting it with other cities. The contract for the cars has been awarded to the J. G. Brill Co.

The street railways of Manchester, Eng., will become the property of the city on April 1st. It is estimated that it will be three years before the system is entirely converted to electric traction.

The British Columbia Electric Railway Co. has suffered an unusually large loss this winter from excessive snowstorms at Westminster and Vancouver. The company expects the loss to amount to about £1,200.

The minister of public works, Herr von Thielen, has been sharply attacked in the Prussian diet for renewing the charter of the Berlin Street Railway Co. for 50 years without consulting the municipality.

The employees of the Cardiff (Wales) Tramway Co. have a provident organization which has paid out £397 in sick benefits during the past year. The provident fund still contains a balance of £623 to which the company has contributed liberally.

The street railways of Sydney, Australia, of which there are 60 miles owned by the government, are rapidly being converted to

the electric system. At the present time 27 miles of road are operated electrically, 31 miles by steam motors and 2½ miles by cable. A three-phase alternating current plant is being installed with converter sub-stations at different points.

A project is on foot to unite all the street railways in Antwerp, which are at present operated by horses. It is desired to install the electric system on the combined roads and a charter for this has been applied for to extend to the year 1945.

The Irish Electric Railway Co. has applied for permission to construct an electric railway in county Kerry connecting Castle-townbere with Kenmare. The construction would mean an expenditure of £700,000, and has been approved by the council.

A tramway mail service has been inaugurated in Frankfurt-on-the-Main, Germany, which operates its own railway lines. Special cars have been put in service which transport the mails between the postoffice building and the union railway depot in the city.

The municipality of St. Petersburg, which controls three of the street car lines of the city, was to take possession of the remaining lines about March 1st. The authorities will advertise for bids for the conversion of all the lines to an electric system.

A consular report from Auckland, N. Z., states that a New York firm is to build an electric tramway there to cost about \$1,000,000. The equipment, as well as the force of men necessary to put the road in operation, will be brought from the United States.

The electric tramway and lighting committees of Blackpool, Eng., witnessed a public exhibition last month of an automatic cut-out used on the tramway company's lines which shuts off the current either in the event of a break in the trolley line or when any other overhead line comes in contact with it.

A number of accidents occurred on the occasion of a heavy fall of snow in Liverpool, Eng., last month. The weight of snow on the wires caused a number of them to fall in a crowded street, where they hung in contact with the overhead trolley wires. Two persons and several horses were killed and 14 people were more or less injured. The accepted explanation of the fatalities and the injuries received by those persons who were caught by the fallen wires is, that owing to contact with the main supply wires of the electric car system at a point near one of the feeders, the fallen wires received a heavy charge of electricity, and that it was the electricity and not the falling of the wires or their weight which caused the deaths and injuries.

The direct current three-wire system has been installed on a rural line in France which is 26½ miles long. It connects Grenoble and Chapareillan and is described by a foreign contemporary as being the longest line in existence operating on this system. The power for this road is supplied by a waterfall which drives three 350-h. p. turbines. These run at 325 r. p. m. and are direct coupled to the generators of 600 volts. Two of these are run in series to supply the two outside lines of the system and the third unit is held in reserve for accidents. Three feeders only are used, each having a booster. The latter must be of considerable service as on two of the feeders the drop is 250 and 225 volts respectively. The cars weigh 9 tons and are equipped in the ordinary way. They are also provided with electro-magnetic brakes.

## REPORT WINNIPEG RAILWAY.

The directors of the Winnipeg Electric Street Railway Co. have submitted a statement for the year ending Dec. 31, 1900, showing a net profit of \$54,437.76 as compared with \$37,163.06 for the previous year. Out of this amount one half-yearly dividend at the rate of five per cent per annum has been declared on the old issue of \$600,000 fully paid up stock, amounting to \$15,000, leaving a surplus of \$39,437.76. The earnings of the road show an increase of 29.79 per cent as compared with last year, while operating expenses show an increase of 16.13 per cent.



## INAUGURATION DAY IN WASHINGTON.

In response to a request, Mr. D. S. Carll, chief engineer and superintendent of the Capital Traction Co., of Washington, D. C., sends us the following interesting account of how the crowds were handled by his company during inauguration week:

"The strangers and troops began arriving in Washington for the inauguration on March 1st, and Sunday, the 3d, was our heaviest day. On that day the Capital Traction Co. hauled about 180,000 people. On the 2nd, 3rd, 4th and 5th we had a two-minute service on all lines and this gave us, on Pennsylvania Ave., from 15th St. to Peace Monument, a minute service. It is unnecessary to say that a large part of the time, cars were running very much crowded.

"At 10 a. m. on the 4th, cars were cleared from Pennsylvania Ave., from 23rd St. West to 3rd St. East, and it was 5:30 p. m. before the parade was entirely off of Pennsylvania Ave. This interruption reduced our receipts for the 4th, so that they were only a little over two-thirds that of the 3rd.

"Of course on the breaking up of the parade, and the resumption of service, our cars were crowded to their fullest capacity.

"Our riding during the first seven days of the month, which practically embraces the extra riding for the inauguration, was about 20 per cent greater than that for the inauguration four years ago. Our facilities for handling people were in many respects better this year than then, but the weather was hardly suitable for open cars so that we did not handle them as easily as we would had it been a little warmer. Everything worked smoothly during the entire time. There was no break in the power or service other than that caused by the parade and a few interruptions by troops on the 3rd and 5th in marching to and from the depots."

## THREE IMPORTANT PATENT DECISIONS.

The Lorain Steel Co. sends us the following statement concerning patent litigation in which it has been interested:

The United States Court of Appeals for the Second Circuit last week handed down its decision in the suit of the Thomson-Houston Co. against the Lorain Steel Co. for alleged infringement of letters patent to Walter H. Knight, No. 428,169 for electric motor regulators, commonly known as the "Interlock" patent. The complainant in this suit contended that this patent covered broadly the use of a stop or lock, controlled by the regulating switch of a motor controller, for preventing the operation of the reverse switch except when the regulating switch was at its off, or open circuit position; or in other words, that the patent covered all forms of the devices now in use in motor controllers which make it necessary for the motorman to operate his controller handle to shut off the trolley circuit before he can operate his reversing switch.

In an opinion by Judge Wallace, the Court of Appeals reverses the decision of the court below, which held the defendants liable under the patent, and declares the patent to be invalid as to all the claims involved in the suit.

Judge Wallace says: "The patent cannot be broader than the real invention, and that is measured by the novelty of the particular contrivances which constitute the locking mechanism. \* \* \* We are of the opinion that the broad claims of the patent (claims 1, 2, 3 and 4) are not warranted by the scope of the real invention by Knight. As it is not asserted by the complainant that infringement of the 5th claim has been established, it is unnecessary to advert to the differences between the devices employed by the defendant and the patented devices. We conclude that the first four claims of the patent are invalid, and in the absence of any proof of infringement by the defendant of the 5th claim, the court below should have dismissed complainant's bill with costs."

The same court has also rendered its decisions in the suit of the Thomson-Houston Electric Co. against the Nassau R. R. and the Lorain Steel Co., and in the suit of the Thomson-Houston Electric Co. against the Bullock Co. et al. These two suits, which were heard together on appeal from the Circuit Court, and in which the Lorain Steel Co. was the real party defendant, involved two letters patent to Elihu Thomson, No. 283,167, of Aug. 14, 1883, and No. 401,085 of Apr. 9, 1889, commonly known as the "magnetic blow-out" patent, the suits being for alleged infringe-

ment by the defendant in the manufacture, use and sale of its motor controllers.

The earlier Thomson patent was framed to cover broadly the application of a magnet to an electric switch for the purpose of extinguishing arcs formed at the switch contacts. In the opinion by Judge Shipman, the court affirms the decision of Judge Thomas in the Circuit Court, and declares the patent to be devoid of patentable novelty in view of the prior art.

The later Thomson patent involved the use of insulating material in an arc-rupturing device for the purpose of protecting the metal surfaces of the switch contacts or electrodes and of the blow-out magnet from the action of the electric arcs.

The Court of Appeals reverses the decision below which sustained the patent, and declares it invalid. The court says: "We cannot perceive that the effect of the insulation in an arc-rupturing device was anything more than the old effect which had always accompanied insulation."

These decisions of the Court of Appeals dispose of three patents claiming principles which lie at the foundation of the manufacture of the modern electric car controller, and terminates the protracted litigation which has been carried on under the patents against the controllers manufactured by the Lorain Steel Co.

## NEW CITY NEAR BINGHAMTON.

It is authoritatively stated that \$1,000,000 will be expended during the present year in laying out and developing a new town site near the city of Binghamton, N. Y., just east of the village of Union. The plans include the erection of what will be one of the largest boot and shoe factories in the world, and the first buildings to be erected will be dwellings for the several thousand workmen who will be employed in the big shops. The town will be christened Endicott, after H. B. Endicott of Boston, who is at the head of the syndicate that is backing the movement.

Mr. G. T. Rogers, president, and Mr. J. P. E. Clark, general manager, of the Binghamton Railroad Co., are heavily interested in the enterprise, and the street railway company will play an important part in the proposed plans. The single track line now running to the site will be double tracked, and \$125,000 will be expended in improvements and extensions. Agreements have been signed with the owners of the shoe factory, whereby the railway company will issue workmen's books of 12 round trip tickets for \$1.50, good from Binghamton to Endicott and return, upon special trains and during the morning and evening hours.

## CHICAGO CITY PLANS.

The double truck cars built for the Chicago City Railway by the St. Louis Car Co. and described in our issue for February, page 131, were put in service on February 23d, when the company invited a large number of guests to make the initial trip. On this occasion President Hamilton made some informal statements concerning the policy of the company; he said in part: "These cars were built and placed in the service of our company as an experiment. If the public approves them and desires them on all our trunk lines we are ready to build them and operate them. It is impracticable to operate them by cable power. To erect a new power plant and put in new feed wires, and provide an entire new equipment, would require an outlay of nearly \$500,000. This we are prepared to do if terms fair and reasonable to the investor and the municipality alike can be had. That plan contemplates the use of the overhead trolley, but with the new system of feed wires underground, which removes danger to life and property and at the same time solves the single car problem."

## A SECOND SEATTLE-TACOMA INTERURBAN.

The Seattle (Wash.) & Tacoma Railway Co. has selected the route and commenced the construction of its proposed electric railway between these cities. Many of the rights of way for the valley route have been secured by Mr. H. D. Hanford, the company's chief engineer, and no delay in the completion of the road is anticipated. Mr. Jacob Furth is the president and most active promoter of the company.

## NEW PUBLICATIONS.

A THIRD EDITION of Walter B. Snow's lecture on "The Influence of Mechanical Draft Upon the Ultimate Efficiency of Steam Boilers" has just been issued by the B. F. Sturtevant Co., Boston, Mass. It treats of the different methods of application of fans for producing boiler draft, of the relative cost as compared with a chimney, of the possible economy in first cost of boilers, running expense for fuel, etc. Copies may be obtained upon application.

THE ST. LAWRENCE POWER CO., of Massena, N. Y., has issued a handsomely illustrated book descriptive of its successful undertaking of cutting the Massena Canal through the territory dividing the Grasse and St. Lawrence Rivers and of harnessing the enormous power thus rendered available by erecting and installing one of the most perfect electrical power houses in the world. Work on this project is successfully nearing completion.

"IN THE TRENCHES" is the title of a very artistic pamphlet published by G. M. Gest, general contractor, of New York and Cincinnati. The book contains 16 pages handsomely illustrated on enameled paper, enclosed in a tastefully decorated cover. The subject matter relates to the laying of underground conduits and ducts which is a specialty of this company, and many of the illustrations exhibit extensive and difficult constructions in this line which have been installed by this company.

SCIENCE ABSTRACTS for January 25, 1901, is the first issue of the fourth volume of that monthly, and contains, among other interesting matter, valuable articles on general physics and general electrical engineering. Science Abstracts is published in London. Its New York representatives are Spon & Chamberlain, 12 Cortlandt St. The annual index to Volume III for 1900 has also appeared. The index is free to annual subscribers, or may be obtained from the New York office of Science Abstracts, 12 Cortlandt St., for 50 cents net, the price of the regular monthly issues.

THE PROGRESS OF INVENTION IN THE NINETEENTH CENTURY, by Edward W. Byrn, A. M., has just been issued by Munn & Co., 361 Broadway, New York, publishers of the Scientific American. In this comprehensive work the author has accomplished a most important aim; to record a history of scientific discovery and development with indisputable accuracy, and to this purpose every statement is based on the official records of the United States and other governments. The author's style is calculated to make history unequalled as agreeable reading. A chronological table of the leading inventions is an important feature of the work, enabling the reader to ascertain at a glance the principal inventions and discoveries of any particular year. This list is, of course, quite separate from the general classification by subject matter which forms the principal part of the work. The book is large octavo, 480 pages, and is illustrated by 300 engravings. Its price is \$3.00 by mail postpaid to any country in the world. A special edition, half red morocco, with gilt top, is sold for \$4.00.

ELECTRIC RAILWAY MATERIAL CATALOG, No. 2, has just been published by The Mayer & Englund Co., of Philadelphia. The compilation of this catalog, which is very complete, involves an enormous amount of labor as it contains nearly everything pertaining to the building and equipment of an electric railway as well as the tools which are used in its construction and the instruments required in its operation and maintenance. The book, which is printed on heavy woodcut paper, is profusely illustrated and contains 555 octavo pages with an illustration, code word, number, description, dimensions and price of each of the thousands of pieces of railway material and general supplies handled by this company. The book also contains a special telegraphic code, a number of useful tables and a well arranged index. Besides the complete alphabetical index there is a condensed general index for the purpose of finding any general line of material quickly. The catalog is arranged in three general sections—viz.: Line construction material, car, station and general supplies, and standard and special tools. The publishers have commenced to send this book to every street railway company in the world, and it will be found of great service in ordering this class of supplies. Mr. A. H. Englund personally supervised the work and he is to be congratulated upon the result.

## TWIN CITY COMPANY'S REPORT.

The annual report of the Twin City Rapid Transit Co. of Minneapolis and St. Paul, for the year ending December 31, 1900, shows gross earnings of \$2,839,355.78, an increase of 13.62 per cent, and net earnings of 910,341.04, an increase of 23.4 per cent over 1899. The expenses for the year are reported as follows: Maintenance of way and structures, \$61,086.45; maintenance of equipment, \$159,834.60; operation of power plant, \$170,661.74; car services, \$641,195.90; general expenses, \$156,472.35; legal expenses, \$22,999.91; injuries and damages, \$82,948.61; insurance, \$9,489.55. The passenger earnings for the year amounted to \$2,814,205.10. Dividends on preferred stock to the amount of \$204,750, and on common stock to the amount of \$450,300 were paid, making the total of dividends paid, \$655,050.00. The capital stock of the company is \$18,010,000, of which \$15,010,000 is common and \$3,000,000 preferred stock; the funded debt is \$9,838,000, and current liabilities are \$1,089,170.28.

## NEW COMPANY AT LA FAYETTE, IND.

The La Fayette, Purdue & Northern Traction Co. has perfected its organization and has raised all the funds necessary for the proposed purchase of the La Fayette (Ind.) Street Railway. The transfer of the property is expected to take place between March 15th and April 1st. The La Fayette line will be made to connect with the Fort Wayne & Toledo Railway, which is being promoted by Philadelphia capitalists, and a direct route between Fort Wayne, Indianapolis, La Fayette, Toledo and Detroit will ultimately be established.

The officers of the La Fayette, Purdue & Northern are: President, H. A. Holmes, Detroit; vice-president, J. T. McNary, Logansport; secretary, A. A. Furrman, Ft. Wayne; treasurer, W. R. Brown, Detroit.

## YERKES IN LONDON.

London dispatches under date of March 11th state that ever since last summer Mr. C. T. Yerkes' London agents have been purchasing stocks and bonds of the Metropolitan and District railways, the necessary funds being for the most part furnished by Mr. Yerkes and his American associates. English capitalists represented by Mr. Robert W. Perks, M. P., are also interested with Mr. Yerkes. It is understood that the District line will effect a junction with the Charing Cross, Euston & Hampstead line at Charing Cross.

It is further absolutely denied that Mr. Yerkes has pooled or intends to pool his interests with those of the Johnsons of Cleveland.

## CINCINNATI TRACTION COMPANY.

The stockholders of the Cincinnati Street Railway Co. on February 21st ratified the lease of the company's property to the Cincinnati Traction Co. on the terms given in our last issue. The directors of the new company are: Jacob C. Schmidlapp and Charles E. Proctor, of Cincinnati; William T. Sheehan and Harry M. Levi, of New York; William K. Schoepff, of Pittsburg, and Randall Morgan, of Philadelphia.

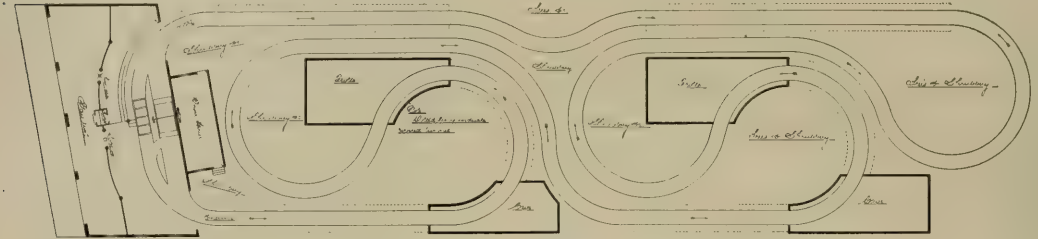
## PECULIAR ACCIDENT.

February 15 an electric car bound for Cincinnati from Dayton, Ky., on the Bellevue & Dayton division of the Cincinnati, Newport & Covington Railway, plunged over an embankment, landing in a creek 50 ft. below. There were 24 passengers aboard, and while all but one were more or less injured, no one was killed. The cause of the accident is unknown; the car was not moving at an unusually high rate of speed, and there was apparently no obstruction on the track. The frame of the car was unbroken by the fall, though the wheels and parts of the truck were driven through the floor. The fact that the car did not turn over in its fall, in which event many of the passengers must surely have been killed, is regarded as very remarkable. The motorman remained at his post in the hope of stopping the car, and suffered severe injuries.



### THE "ACQUARAMA."

The new amusement plant brought out this season by the Acquarama Co., of 150 Nassau St., New York, bids fair to become one of the most popular attractions for parks and pleasure resorts that has ever been devised, and the company is now filling orders



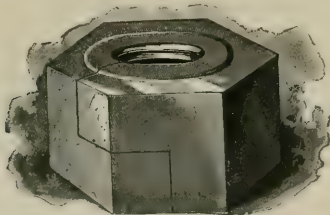
PLAN OF ACQUARAMA.

from Pittsburg, Atlantic City, N. J.; South Beach, N. Y.; Rock-away Beach, N. Y.; Pan American Exposition, Buffalo; Woodside Park, Philadelphia; Washington, D. C., and two from Europe.

As mentioned in the "Review" for last January, the attraction consists of a slightly inclined, covered sluice-way, 5 ft. wide, with sides 24 in. high, through which runs a current of water sufficiently swift to move boats seating from four to six persons. The river winds its way in a sinuous course, and along its banks are placed interesting scenes, tunnels and novel lighting effects, which arouse delight and interest at every turn. The accompanying drawing shows how a river over a half mile long may be laid out in a plot of ground about 600 ft. long.

### ELASTIC SELF-LOCKING NUTS.

This nut, which is illustrated herewith, is manufactured by the National Elastic Nut Co., of Milwaukee, and is designed so as to lock itself firmly on the bolt, simply by being screwed on, without any accessories such as split washers or lock-nuts. The method of manufacture explains the locking action of the nut. A blank is first cut from a flat bar of steel, and this is bent round so as to leave a small lap where the ends of the blank come together. This round piece is pressed hot into a hexagonal die making a perfectly shaped hexagon nut. The blank is then tapped slightly smaller than the bolt thread so that when put on with a wrench the



ELASTIC SELF-LOCKING NUT.

split side is forced open about one-hundredth of an inch causing a firm grip on the bolt which prevents it from working loose.

The nut thus acts like a spring, and as the pressure is always towards the center of the bolt it puts no extra end stress against the thread. It can be put on and off repeatedly and will pass over rusty or battered threads on the bolt which would often prevent the use of common nuts.

These nuts are made of steel, and they are furnished either rough, semi-finished or finished, according to the character of the work on which they are to be used. The self-locking feature is obtained merely by tapping the nut with a special scant sized tap and these are made in sizes from  $\frac{3}{8}$  in. to  $1\frac{1}{4}$  in. with U. S. standard

threads. Where the locking feature is not required they are tapped to full standard thread.

The "Elastic" nuts have been adopted by a number of machinery, bridge, and car builders and have been found very efficient for track fastening, tie rods, etc. They are highly endorsed by many manufacturers and engineers.

### SEVERAL OUNCES OF PREVENTION.

At a recent meeting presided over by the Austrian Minister of Railways the following regulations were agreed upon to provide against the alleged dangers of overhead tramway wires:

(1) Telephone and telegraph wires, which at present cross the overhead tramway lines at numerous places, must be altered as soon as possible so that they only cross the tramway underground in cables. Crossing overhead is to be allowed, however, in exceptional cases, and with the employment of special safety devices. (2) Until this re-laying of telegraph and telephone lines can be carried out, in all cases where such wires cross the overhead tramway lines, a guard wire is to be erected at once about 40 cm. (16 in.) over the overhead wire and connected to earth. (3) The public is to be informed by numerous notices what to do in case of breakages of wire on the electric tramway routes, and this is also to be taught in the schools. (4) It is considered desirable that the police should carry insulated pliers, with which they can cut away any fallen wire. The Fire Brigade and the Salvage Corps are also to be provided with such insulated pliers. (5) Those streets in which overhead wires are suspended shall be illuminated as much as possible at night time in order that traction wires can be seen with greater facility. (6) Those section switches which can only be operated by means of a pole are to be replaced by switches within reach.

### ANNOUNCEMENT BY BULLOCK CO.

The Bullock Electric Manufacturing Co., Cincinnati, announces that it is prepared to receive orders for alternating current generators and motors of any size. The machines made by the Bullock company will not be experimental, inasmuch as the company has purchased the designs of the Oerlikon Co., of Zurich, Switzerland, which was the pioneer in the development of alternating current machinery abroad, and is today a leader in the field. The Bullock company's products in the direct current line are recognized as being of the highest possible grade, and the new alternating current machinery will be of equal quality.

### PROGRESS OF THE DETROIT-CHICAGO LINE.

W. A. Boland, of New York, the principal promoter of the Detroit & Chicago Traction Co., is quoted as announcing that work on the eastern section of the Detroit-Chicago line is progressing satisfactorily, and that cars will be running between Jackson and Grass Lake within 60 days, and to Ann Arbor from these points by the middle of the summer. It is confidently expected that the line will be completed to Detroit by the early fall. The contract for the erection of a steel bridge over the Michigan Central tracks just east of Michigan Center has been awarded the American Bridge Co., of Pittsburg.



### THE SHAW LIGHTNING ARRESTER.

The "Universal" non-arcing lightning arrester invented by H. M. Shaw will hereafter be made by H. M. Shaw & Co., 115 Broadway, New York, a firm recently organized to do a general street railway supply business. The firm has also purchased all the patents covering the well known "Medbery" insulation and overhead materials, and will hereafter make and sell these specialties. Medbery insulation has been in use for nearly 10 years on a number of electric roads in this country.



SHAW LIGHTNING ARRESTER.

The Shaw arrester is designed to take advantage of the principle that when a lightning discharge finds in its course a number of paths of equal resistance it tends to divide itself among them all. The instrument is made up of a number of circular disks of non-arcing metallic composition, separated from each

other by thin disk sheets of mica, slightly larger in diameter than the metallic ones. A discharge jumps readily through and over these thin sheets of mica, as their combined resistance is much less than a single sheet of aggregate thickness. The discharge divides itself into thousands of fine sparks disintegrating the static current proceeding to the earth while the discs check the following dynamic current. There are no moving parts, magnets or fuses, and the action is entirely automatic. Mr. Shaw, the inventor of the arrester, has been interested in street railway supply work for years and is well and favorably known to the trade.

The new company has purchased a large and well equipped factory and has added the latest improved machinery, which will enable it to turn out first class work in every respect.

### THE NEW STEEL COMPANY.

An official statement concerning the United States Steel Corporation, organized under the laws of New Jersey, was issued March 2d by J. P. Morgan & Co., managers for a syndicate which has been formed by subscribers to \$200,000,000 of the new company's securities. The capitalization of the United States Steel Corporation now authorized is \$425,000,000 of 7 per cent cumulative preferred stock, \$425,000,000 common stock, and not to exceed \$304,000,000 in 5 per cent gold bonds.

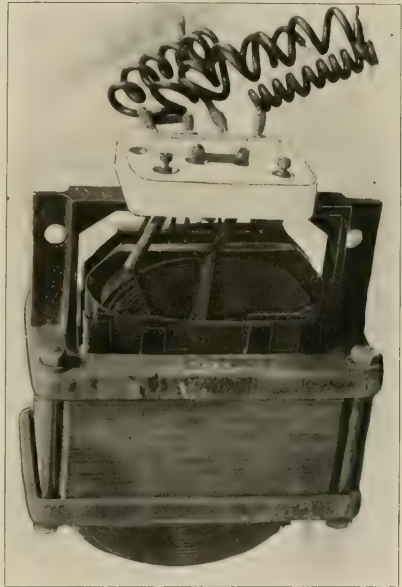
The syndicate has arranged for purchase of substantially all the bonds and stock of the Carnegie Steel Co. The bonds of the United States Steel Corporation are to be used only to acquire bonds and 60 per cent of the stock of the Carnegie company. J. P. Morgan & Co. offer in exchange for each \$100 par value of the preferred stocks and common stocks of the other large steel companies certificates for preferred stock and common stock of the United States Steel Corporation upon the following basis, the exchanges to be made at par: Federal Steel preferred, \$110 preferred; common, \$4 preferred and \$107.50 common. American Steel & Wire preferred, \$117.50 preferred; common, \$102.50 common. National Tube preferred, \$125 preferred; common, \$88.12 preferred and \$125 common. National Steel preferred, \$125 preferred; common, \$125 common. American Tin Plate preferred, \$125 preferred; common, \$20 preferred and \$125 common. American Steel Hoop preferred, \$100 preferred; common, \$100 common. American Sheet Steel preferred, \$100 preferred; common, \$100 common.

The Iron Age says concerning the new company: "The fact is realized that the success of the new corporation in the long run depends upon the strength of the persons at its head. That the executive committee will consist of men of wide experience and profound knowledge of the iron industry is not doubted. Nor is the fact questioned that for years to come the earnings of the new corporation will be on a liberal scale, since it will take a long time to build up an effective opposition, even if the management encourages it by maintaining prices at a tempting level. Some of

the associations in the past, and even some of the recent consolidations, have erred in that extreme, so that it will require a strong man to keep what seems a natural tendency in check. On all ordinary rolled products cost plus a liberal profit to meet charges should be well within 1.50 cents per pound to those who control everything from the ground up."

### WESTINGHOUSE O. D. TRANSFORMERS.

The Manhattan Railway Co., of New York City, has recently ordered a large number of Westinghouse O. D. transformers which are to be used in lighting the elevated railroad stations throughout New York City. These transformers are of a relatively new design and contain a number of new and valuable details. One feature of the transformer is the use of a surrounding body of oil, enclosed in a metal outer case. This oil is valuable both as a cooling medium and because it increases both the life



WESTINGHOUSE O. D. TRANSFORMER.

of the insulation and its lightning resisting power.. The O. D. transformer has been given a considerable range of e. m. p. by winding it for two primary and three secondary voltages. Individual sections of the windings are supplied with terminal contacts which by a simple change of connections give a range of voltage covering all practical requirements.

The secondary coils for all transformers are wound with copper of square cross-section, which gives about 30 per cent more available cross-section than similar coils wound with round copper, thus reducing the loss due to the resistance of the windings. Every transformer before leaving the factory is run at overload with the normal potential, at three times the normal voltage without load, and insulation tests are made at voltages ranging from four to eight thousand. Subsequently the coils are immersed in oil, which greatly increases their insulation resistance.

Foreclosure proceedings have been brought against the Chicago General Railway Co. by the Merchants Loan & Trust Co., of Chicago, as trustee for the holders of \$500,000 of the bonds of the West and South Towns Street Railway Co., issued in 1892 and assumed by the Chicago General Railway Co. at the time of its incorporation.

### THE AMERICAN RAIL BOND.

The American Rail Bond Co., a new corporation with offices in the Monadnock Block, Chicago, has brought into the market a rail bond constructed upon an entirely new principle. Fig. 1 shows a sectional view of the new bond in place in the rail. The



FIG. 1.

terminal of this bond consists of a copper rivet in the center of which a double-headed steel rivet is cast. This steel pin, it will be observed, is used in an entirely different manner from those in the older form of bonds. The heads of these steel pins are hardened and the shank between the heads is soft, the softest



FIG. 2.



FIG. 3.

part being exactly at the center of the pin. When first made the pins are of the form shown in Fig. 2, the shank being straight, and the ends of the heads project about  $\frac{1}{8}$  in. above the surface of the copper rivet.

After the rivet is inserted in the hole in the rail the steel pin is compressed until its protruding ends are practically flush with

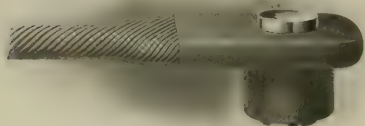


FIG. 4.

the faces of the copper rivet surrounding it. Owing to the variable hardness of the steel pin it takes the form shown in Fig. 3 after compression, or in other words, the shank is bulged out largest at its softest point, the center, and it grows smaller in diameter as it approaches the hardened heads.

The compression of the pin causes a flow of the copper in the rivet in the directions indicated by the arrows in Fig. 1, and by this process the copper section of the terminal is forced with great pressure against the walls of the hole in the rail. In this manner an excellent electrical and mechanical contact is maintained between the rail and the rivet which cannot be loosened by the vibrations of the rail. Fig. 4 illustrates the complete bond terminal attached to a flexible copper strand and shows the projecting heads of the steel pin before being compressed in the rail. These bonds can be applied in any of the well established ways and can also be used under the angle or splice bars or for open or third rail work.

The arrangement of the stranded copper wire of which these bonds are made provides ample allowance for expansion or contraction without straining or weakening the bond at any point.

These bonds are made in any lengths from 3 in. up and of any required carrying capacity. They are also made in different forms for any special application. The company is under the general management of Mr. M. M. Wood, who has been identified with the electrical industry since 1879 and engaged in electrical engineering work since 1884.

### OHIO NOTES.

Columbus is to have another electric line within the near future. The Columbus, Delaware & Northern Railway, with a capital stock of \$10,000, has been incorporated by J. M. Loren, O. J. Mitchell, Hermann G. Dennison, James M. Schooler and L. M. Baker, all prominent business men of Columbus. Columbus is to be the southern terminus of the road, while the northern terminus will be either Marion or Mt. Vernon. It is the intention of the company to make the line the connecting link with either the Cleveland or Toledo lines, which are being rapidly extended to the south. The company will use the interurban loop in Columbus.

A line from Findlay in to Columbus by way of Delaware, where it is intended to connect with the proposed extension of the Columbus, Worthington & Clintonville, is being promoted by R. Rostenstock, of Cleveland, and J. Ogdenbaugh, of Sandusky. The extension from Findlay will pass through the towns of Mt. Blanchard, Forest, Kenton, La Rue and Richwood.

The Cincinnati, Hillsboro & Milford Electric Railway Co. was recently incorporated with a capital stock of \$10,000 by H. L. Wiggins, J. B. Worley, M. McKeehan, W. F. Roundbush, G. U. Roundbush, Jos. Higgins, Ed. L. Watson and G. W. Murphy, who propose to build a line from Hillsboro to Milford, passing through the counties of Highland, Brown, Clermont and Hamilton.

The city council of Youngstown, O., has unanimously passed an ordinance granting a franchise to the Youngstown & Sharon Ry., over certain streets. The line has been building for some time, and this action was in reality but a formality. The company will contribute \$10,000 toward the erection of a bridge over the tracks of the Erie and the Lake Shore railroads. Cars will be running on the electric line by June 1st.

The county commissioners of Portage county, Ohio, have taken favorable action on the application of the Northern Ohio Traction Co. for a franchise from Ravenna, the county seat, to Kent. The Portage Lake Traction Co., which secured a franchise last fall for a Cleveland line from Ravenna and Kent to connect with the Northern Ohio Traction Co., has dissolved its alliance with that company and will change its route to go from Ravenna to Streetsboro, Aurora, Geauga Lake and then to connect with the Chagrin Falls and eastern lines. This company also expects to build a line from Ravenna to Kent, thence via Twin Lakes to Streetsboro, where connection will be made with the Cleveland line. Ravenna may have two lines to Cleveland within the next year.

The Columbus, London & Springfield Ry. has leased a large building near the center of Columbus which will be used as general offices and waiting station. The company proposes to have its cars in operation in Columbus in April.

### HALF FARES.

The endless chain ticket swindle is said to be still flourishing in Brooklyn.

The new electric railway between Lancaster, Pa., and Ephrata has been put in operation.

The Colorado Springs Rapid Transit & Railway Co. has equipped all its cars with two 58-h. p. motors.

The Montgomery (Ala.) Street Railway Co. has absorbed and will operate the West End Railway in Montgomery.

The St. Louis, St. Charles & Western R. R. will shut down until the completion of the route to St. Charles, in 1902.

An ordinance has been introduced in St. Louis, providing that the St. Louis Transit Co. shall place clocks in its cars.

The Metropolitan Street Railway Co. of Kansas City has prepared plans for its new car barns at Ninth and Washington Sts.

The upsetting of a stove in a waiting room destroyed the down town station of the Fifth Ave. elevated road at 16th St., Brooklyn, February 19th.

The application of the promoters of the proposed Des Moines-Indianola Railway for a franchise in Indianola, Ia., will be submitted to public vote in that city.

The street railway service in Los Angeles, Cal., was crippled in February by the unusually heavy storms. Fifty cars at one time were removed to the repair shops.

The Kansas City-Leavenworth Ry. will be extended from its present terminus at Fourth St. and State Ave., in Kansas City, Kan., to the business center of Kansas City, Mo.

The Youngstown (O.) & Sharon Street Railway Co. has awarded the contract for the erection of a two-story brick and iron car house, in Brookfield. The car house will be completed May 1st.

The application of the Mount Holly & Carlisle Electric Railway Co. to cross the tracks of the Philadelphia & Reading R. R. at grade has been denied. The electric line will cross beneath the tracks.

A bill has been introduced in the New York Legislature providing that vestibules must be used on street cars in New York City during the months of November, December, January, February and March.

The Brooklyn Rapid Transit Co. has placed in a conspicuous position in its cars signs printed in English, German, Italian and Hebrew which warn the reader of the danger in alighting before car is stopped.

Fire destroyed the Cold Springs machine shop of the International Traction Co., Buffalo, on March 9th. The loss was \$20,000, but of this perhaps one-quarter can be recovered as salvage on the old metal.

The Metropolitan Street Railway Co. of Kansas City has put owl cars in operation on its lines. Transfers, a half-hourly service and 5-cent fares during night hours were inaugurated by the company, February 16th.

The Denver City Tramway Co. recently disposed of a number of its old horse cars; some were bought by farmers for chicken houses, one was sold for a night lunch wagon, and the others were stripped of metal work and burned.

The railroad and warehouse commission has had a bill introduced in the Illinois legislature providing that its power to control electric railway companies shall be equal its power over steam railroad

companies, when the lines of the electric railroad companies are wholly or in part outside the corporate limits of any city, town or village.

The Susquehanna Traction Railway, running between Lockhaven, Pa., and Mill Hall, has been acquired by Jacob Scott and Hon. C. A. Mayer, of Lockhaven; Hon. J. H. Cochran, of Williamsport, and W. B. Given, of Columbia.

Because a car on an Indiana line was 20 minutes late a passenger has sued the company for \$90. He claims that his house was damaged to that extent by fire which might have been prevented had he been at home in due time.

The Northern Ohio Traction Co., of Akron, has made a statement of the business for January, 1901, showing gross earnings of \$32,772.14 for that month as against \$28,842.10 for the corresponding period last year. Operating expenses for January, 1901, were \$21,038.03; for January, 1900, \$18,251.69.

An ordinance has been introduced in Cleveland to extend the franchises of the Cleveland City Ry. for 25 years. The company offers six tickets for 25 cents for 12 years and seven for 25 cents for the remaining 13 years of the life of the franchise; universal transfers and a percentage of gross receipts for the city.

Plans to connect New York City and Philadelphia by trolley are said to be fast progressing. The tracks of the Philadelphia & New Jersey R. R. and the Philadelphia & Bristol company will be used. Heavy tracks will be laid and high speeds will be attained. The single fare between New York and Philadelphia is to be \$1.

The receiver of the Chicago Electric Traction Co. has made the following report of the operation of the road for the last quarter of 1900: Passenger earnings, \$17,897, and miscellaneous earnings, \$1,005; operating expenses, \$13,610; general expenses, \$2,709, and expenses for maintenance, \$3,570; total expense for the quarter, \$19,889; deficit, \$988.

The Quincy (Ill.) Horse Railway & Carrying Co. has completed and opened a two-mile line, connecting Quincy and the local factory district. Sixty-ft., 60-lb. rails, and selected oak ties bedded in crushed rock were used. Mr. H. E. Chubbuck, manager of the Quincy company, has expressed a high degree of satisfaction both with the construction work and the material used.

The franchise tax bill passed by the Missouri House of Representatives provides that every railway company receiving privileges shall pay, in addition to other taxes imposed by law, an annual tax to the state of 15 cents on each \$100 valuation of its franchises in the state, for state purposes, and a tax of 10 cents for payment of state indebtedness.

The statement of the Cincinnati, Newport & Covington Railway Co. for January, 1901, shows gross receipts for that month, of \$60,224.90, as against \$57,196.16 for January of last year; operating expenses of \$25,376.87 as against \$23,136.59; net earnings of \$34,848.03 as against \$34,059.57; tolls, taxes, damages, etc., of \$12,645.68 as against \$12,479.00; and a net profit of \$22,202.35 as against \$21,580.57.

The requisition of the Brooklyn Rapid Transit Commission for \$654,000 for work and tools for the month of January has been approved by the board, and an arrangement has been made whereby a certain number of fire badges will be issued by the fire department to those in charge of the rapid transit work, so that in case of fire along the line of the subway there may be no clash between the two departments.

February 15, at San Juan de Porto Rico the Federal court rendered a decision that the executive council cannot be enjoined in the matter of granting franchises, it being a legislative body, although it acts in franchise matters independent of the house of delegates. This decision was called forth by the application of Senor Vicente Usera for an injunction to prevent the council granting a franchise for an electric railway in Ponce. The case has been appealed.



## ECHOES FROM THE TRADE

THE MERRITT AIR BRAKE CO. has removed from 20 Broad St. to 253 Broadway, New York, with the International Power Co.

THE W. T. VAN DORN CO., Monadnock Block, Chicago, during the past two months has shipped couplings to all parts of the United States and to Europe and India.

THE BURT MANUFACTURING CO., Akron, O., has furnished a Cross oil filter to be installed by the Deep Leeds Transmission Co. of Australia in its electrical power station.

THE MAYER & ENGLUND CO., of Philadelphia, has found its business in the South increasing so rapidly that it has established an office at Atlanta, Ga. Mr. H. M. Lofton will be in charge with headquarters in the Equitable Building, Atlanta.

THE EGGLESTON LUMBER CO., 29 Broadway, New York, is prepared to make prompt shipments of poles, ties, cross-arms, brackets, pins, etc. The company ships direct from the mills and is therefore able to save its clients all brokerage charges.

THE FALK CO., of Milwaukee, has extended its steel foundry to double its former size, and it is now 130x350 ft. in dimensions. The equipment of machinery has been increased, new forges, furnaces, etc., being installed. The gear department is running night and day.

J. HOLT GATES & CO., Monadnock Block, Chicago, have recently installed a 250-h. p. electric power plant for the Grower Building, Chicago, a 2,500-light plant for the village of Blue Island, Ill., and a 1,200-light Warren inductor alternator for the town of Newberry, Mich.

THE CONSOLIDATED CAR FENDER CO., 39 Cortlandt St., New York, has just placed upon the market a new fender suitable for large interurban cars. It is modeled closely after the standard "Consolidated" fender, but is heavier and stronger, and somewhat wider.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has had three of its patents on the Tesla split-phase motor sustained in an infringement suit brought against the Dayton Fan & Motor Co. The opinion was rendered by Judge Thompson in the United States Circuit Court.

THE L. E. MYERS CO. (INCORPORATED) on March 1st assumed the management of the business of L. E. Myers, steam and street railway construction and equipment. The incorporated company will continue the business of L. E. Myers at the old location, 1116-1117 Monadnock Building, Chicago.

CHAS. HENRY DAVIS, C. E., 99 Cedar St., N. Y., and John S. Griggs, Jr., M. E., have designed and installed a new electric light and power plant for the Curtiss Publishing Co., of Philadelphia, Pa. Invitations were issued last month for an inspection of the plant during a test conducted on February 19 to 21.

THE BIERBAUM & MERRICK METAL CO., of Buffalo, N. Y., has moved into a new factory, located at the Belt Line R. R. and Sycamore St., Buffalo. The factory will have a capacity of 100 tons of castings a day. Mr. E. P. Sharp is still looking after the street railway department of the company.

THE UNDERFEED STOKER CO. OF AMERICA is distributing a novel calendar illustrating the smokelessness of the Jones underfeed system. Attached to the calendar card, 12 photographs, taken every five minutes from 2:45 to 3:45, show the Sable Iron

Works of Pittsburg, in operation with the Jones system, and substantiate by their clearness the claim of smokelessness. The Jones system is widely known as a money-saver and preventive of waste in the boiler room.

THE BUFFALO FORGE CO., of Buffalo, N. Y., has published a very comprehensive set of catalogs devoted to the mechanical forced draft, down-draft, and induced draft apparatus which it makes. Any one interested in the subject will find it of advantage to procure copies of these pamphlets.

THE CROUSE-HINDS ELECTRIC CO., of Syracuse, N. Y., has moved into a new factory at Jefferson and Walton Sts. This is a large four-story building well adapted to the needs of the company. The change was made necessary by the growing popularity of the Syracuse "Changeable" headlight.

THE TAUNTON (MASS.) LOCOMOTIVE MANUFACTURING CO. has sold two snow plows to George M. Potter of the Union Railroad Co., of Providence, R. I., who has also purchased from Arthur Field a Ruggles' patent electric rotary snow plow, made by the Peckham Manufacturing Co., of 26 Cortlandt St., New York.

THE LORAIN STEEL CO., Lorain, O., and Johnstown, Pa., has recently closed a contract, through Major Evans, to furnish the Boston Elevated Ry. with the year's supply of rails. The order will amount to about 2,500 tons. The Lorain Steel Co. has sold the Union Street Railway Co., of New Bedford, Mass., 10 No. 20 steel motors for the equipment of its new road now under construction.

"DRAFT WITHOUT A CHIMNEY" is the title of an interesting little booklet of which the fourth edition has just been issued by the B. F. Sturtevant Co., Boston. This brings the total number of copies printed up to 50,000. It relates to the experience of the Sturtevant Co. in the use of a fan to produce draft without a chimney in its own works. Copies will be furnished on application.

THE ELECTRIC RAILWAY EQUIPMENT CO., Real Estate Trust Building, Philadelphia, dealer in cars, trucks and electric equipments, has issued a descriptive pamphlet of second hand cars it now has for sale. Upon the left-hand pages appear large cuts showing various styles of cars and on the opposite pages are given descriptions of the cars and the condition they are in. The pamphlet will be sent on application.

D. L. BATES & BRO., manufacturers of electric and water fans, Dayton, O., have presented their patrons with a handsome calendar for 1901, ornamented with a half-tone etching representing a great Dane and a Newfoundland enjoying the breezes of the Bates' electric fan. The canines are thoroughbreds and are listed as prize winners. The calendar is 14x9½ in. in dimensions and is one of the neatest of the season.

THE BULLOCK ELECTRIC MANUFACTURING CO., Cincinnati, O., issued an appropriate advertising card, in February. On one side appeared, in lithograph, Washington and his soldiers at Valley Forge framed in a conventional design in green, blue, orange and gold. The reverse of the card bore the announcement that the Bullock company's product now embraces a full line of alternating current machinery, including all sizes from the one-half horsepower motor to the 2,000kw. generator.

THE WESTERN ELECTRICAL SUPPLY CO., St. Louis, Mo., is mailing a seasonable pamphlet entitled "How Shall I Spend the Summer," and exploiting the advantages of the electric fans made by the Emerson Electric Manufacturing Co. for all persons, who, from the requirements of their business, are compelled to spend the dog days attending to their usual duties in town. The various

types of the Emerson fan are illustrated, and the respective merits of desk, bracket or ceiling fans discussed in a book of 16 pages.

**THE SCHAFFER MANUFACTURING CO., OF ROCHESTER,** reports that orders for its hydraulic press for pressing wheels off and on axles, are coming in from every hand. The simplicity, economy and efficiency of this machine make it an almost indispensable part of a car shop equipment. The company now furnishes an attachment to the press for straightening axles which is meeting with great favor. Mr. S. C. Mackeye has recently been appointed general manager of the company.

**THE FILER & STOWELL CO., Milwaukee, Wis.,** will furnish two 1,200-h. p. engines to the Union Street Railway Co., of New Bedford, Mass. The engines now in use by the street railway company will be transferred to a new power plant in course of erection to supply the proposed branch line which will be 25 miles long. This order was obtained through Filer & Stowell's eastern agent, Mr. Phillips, who has also closed a contract with the Rhode Island Suburban Railway Co., of Providence, for three engines of 2,500 h. p. each, to be built by Filer & Stowell.

**THE J. G. BRILL CO., of Philadelphia,** is presenting its patrons with an exceptionally beautiful and costly calendar for 1901, which is indeed an appreciable work of art. Each of the 12 pages, 18x12 in. in dimensions, bears, in effect, a group of heroic figures in bas relief. These are half-tone etchings photographed from clay models. It is evident that the Brill company has employed artists of ability and has spared no expense in issuing its latest souvenir; and in this matter has exemplified the manufacturers' principle that what is worth doing at all is worth doing well enough to beat the record.

**THE ELECTRIC STORAGE BATTERY CO., of Philadelphia,** maker of the "Chloride Accumulator," has found it necessary to open a sales office at San Francisco, California, to take care of the increasing volume of business in the Pacific Coast States and extreme western territories. An office has been taken in the Nevada Block and placed in the charge of R. B. Daggett, who has for a long period been connected with the staff of engineers at the Philadelphia office and his experience gained there will enable him to handle the different problems of modern storage battery practice arising in this district with skill and promptness.

**THE PECKHAM MANUFACTURING CO.** reports the following list of roads that have recently given large orders for Peckham trucks: Boston & Worcester Railway Co., Boston; Providence & Fall River Ry. Co., Providence; Grand Rapids, Holland & Lake Michigan Ry., Grand Rapids; Detroit, Lake Orion & Flint Ry. Co., Detroit, Mich.; Omaha Street Railway Co., Omaha, Neb.; Union Railroad Co., Providence, R. I.; Hartford Street Railway Co., Hartford, Conn.; Western Ohio Railway Co., Dayton, O.; Sandusky & Interurban Ry. Co., Sandusky, O.; Youngstown & Sharon Ry. Youngstown, O.

**THE RECONSTRUCTED GRANITE CO., 14 Dey St., New York,** has been awarded the John Scott legacy medal and premium by the Franklin Institute for "Reconstructed granite as a material for insulating purposes." The committee making the award reports that this material possesses distinct advantages for many forms of application as a material for electrical insulation. The average of several results gave the material crushing strength of about 10,000 lb. per sq. in., and a tensile strength of about 950 lb. per sq. in. The committee adds that reconstructed granite possesses a very high ohmic resistance.

**THE B. F. STURTEVANT CO., Boston, Mass.,** has published a little book of information concerning the blower system which has been adopted in the round houses of the leading railroads throughout the United States. The method of heating and ventilation adopted in the new round house of the Chicago & Northwestern Ry. at Clinton, Ia.,—said to be the largest in the world—presents many features of interest to the progressive railroad man. The essential advantages of this method lie in the facts; that the entire heating surface (far less than would be required for direct heating) is massed in a fireproof casing in the adjoining build-

ing; that the pits are kept clean and dry; that a clear atmosphere is maintained and the time of cleaning engines greatly reduced; and that the volume and temperature of the air is immediately under the control of a single individual, while local requirements can be met by the adjustment of local dampers.

**THE MORRIS ELECTRIC CO., 15 Cortlandt St., New York,** is preparing to erect a new factory at Orange, N. J., where all the specialties of this company will soon be made. The old factory has for some time been crowded beyond its capacity, but the new quarters will give ample room for taking care of the company's large and rapidly growing business. The works will comprise a main building having 8,640 sq. ft. of floor space, and a brass foundry with 3,000 sq. ft. of space, and there will be six acres of ground. During the past month the Morris Electric Co. has made shipments to Havana, Cuba; Mexico, Lisbon, and many American points.

**THE STERLING-MEAKER CO., 141 to 155 East Fifth St., New York City,** maker of electric railway supplies, is able to report a very gratifying business, particularly in the orders received for brakes and registers. Within the last few weeks there have been orders placed with this company for 1,000 of the Sterling safety brakes and for 800 of the company's registers. The prospects are also excellent for increasing this number by 600, so that the company's factory will be fully occupied in turning out the work. The Sterling brake has won an enviable reputation for the ease, quickness and certainty with which it will stop the largest electric cars.

**THE G. C. KUHLMAN CO., car builder, of Cleveland, O.,** reports that the season's business has opened up briskly, and that the factory is already pretty well filled with work. Among its recent orders are 6 large interurban cars for the Cleveland & Chagrin Falls Railway Co., which have just been delivered; 4 cars for the Citizens' Electric Railway, Light & Power Co., Mansfield, O., which are nearing completion, and 9 cars for the Western Ohio Ry., which will shortly be shipped. The company has also received an order for 2 cars for the Greenfield & Indianapolis Ry., which are for quick delivery. All these cars have steam coach roofs and are built with round vestibules at both ends.

**THE COMPRESSED AIR CO., 621 Broadway, New York City,** has issued a treatise on compressed air as a motive power for surface railways in cities and on interurban lines, which has a special interest to the holders of street railway securities inasmuch as compressed air may affect the market value of railway investments. Compressed air as a motive power has passed the experimental stage, and the success it has gained proves its practicability. What most impresses the practical railroad man, however, is the fact that the air car provides a means of returning to the independent power which was abandoned when the horse car was replaced by cable and electric trams.

**ADAM COOK'S SONS, 313 West St., New York City,** have received the following communication from Chief Engineer Y. L. Womble of the Raleigh (N. C.) Electric Co.: "I write to express my appreciation of your excellent Albany grease or compound, which, I think, has no equal in the market. I am running three high-speed engines, the cranks of which will not run 30 minutes with anything else. I can now key up rods until they will stand alone on the pin at any angle, and run the engines 24 hours without a stop. I use your No. X Albany grease in an improvised plunger feed cup and would not exchange that cup full of Albany grease for the finest nickel plated wipe feed on the market today."

**THE AMERICAN STEEL & WIRE CO., of Chicago, New York and San Francisco,** has issued a catalog for 1901, containing a fairly comprehensive list of its products, including steel shapes and bars, spring and tire steel, cold drawn shafting, flat wire, standard wire nails, woven wire fencing and other articles of manufacture. Many of the American company's products cannot be briefly listed, but enough is shown in this pamphlet to indicate the general lines. Where detail is lacking on any point the interested reader may obtain information by correspondence with the company's sales offices.





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THE BRUSH ELECTRICAL ENGINEERING CO., Ltd., of London, makes a wide range of electrical apparatus comprising almost everything necessary for complete electrical installations of lighting and power plants. The company has just issued a new catalog and price list in book form of its numerous manufactures in alternators, dynamos, engines, motors, direct-coupled units and electrical accessories. The book is handsomely printed and illustrated in colors on heavy paper and contains very conveniently tabulated data both technical and general. All the necessary general dimensions of machines, etc., are given in both the common and the metric systems, and code words are given for all machines and parts.

THE HEYWOOD BROTHERS & WAKEFIELD CO., of Wakefield, Mass., has recently secured orders from several interurban roads for revolving seats similar to these in the Brooklyn Heights car described in the "Review" for February, page 128. The fact that with this type of seat a single passenger cannot occupy more than one seat is found to be a great advantage. Orders for seats recently taken are for the following roads: Toledo, Findlay & Fostoria, walkover seats for all cars except one which has revolving chairs; Toledo & Western, three cars, walkover seats; Toledo & Monroe, six cars with walkover type and one car with revolving chairs; Youngstown & Sharon, six cars with revolving chairs; Chicago & Joliet, two cars with walkover seats.

HAROLD P. BROWN, of New York, advises us that contrary to the statement made by an Eastern technical paper, the Brown plastic bond has not been discarded in Denver. He is in receipt of a letter from Mr. A. M. Ballou, the electrician of the Denver City Tramway, stating that the Denver tramway company is still using the plastic bonds on the main trucks, and on the out-of-town lines is using the Edison-Brown solid copper bond. Mr. Ballou says that he has recently made tests with a low-reading milli-voltmeter on plastic bonds applied in May, 1896, and subsequently, and can find no appreciable resistance at the joints. He

further states that where the company does not care to take the angle bars off, it is using the Crown bonds, amalgamated at the contacts with Edison-Brown amalgam.

THE JEWETT CAR CO., Newark, O., reports a highly satisfactory business for the year just closed. At the stockholders meeting the last of January the following board of directors was elected for the ensuing year: W. S. Wright, Paul O. Reymann, H. F. Jones and Henry Schulbach, of Wheeling, W. Va., and William Lipphardt, of Martins Ferry, O. The outlook for the coming year being so promising, the company decided to still further enlarge its plant in order to take care of rapidly increasing business. Among the Jewett company's contracts on hand are the following: Cleveland Electric Ry., 25 14-bench open cars; Toledo, Fostoria & Findlay Ry., 6 large suburban coaches; Sandusky & Interurban Ry., 1 freight and shifting car; Toledo & Monroe Ry., 7 large suburban coaches; Grand Rapids Consolidated Street Ry., 10 14-bench center aisle open cars; Saginaw Valley Traction Co., 1 combination passenger and baggage car; Grand Rapids, Holland & Lake Michigan Ry., 4 large suburban closed cars and 4 12-bench open cars; Youngstown & Sharon Ry., 6 large suburban coaches and 6 15-bench open cars; Stubenville, Mingo & Ohio Valley Traction Co., 2 convertible cars; Detroit, Lake Orion & Flint Ry., 6 large suburban parlor cars.

### CHEAP RATES TO CALIFORNIA.

Each Tuesday until and including April 30th, Special Low Rate Colonist Tickets will be sold via the Southern Pacific Company's Ogden and Sunset Routes to all points in California.

The rate will be: From Chicago \$30.00, from St. Louis, Memphis and New Orleans \$27.50, from Omaha, Kansas City, etc., \$25.00. Corresponding low rates from all other points east and north.

For particulars and detailed information pertaining to the Southern Pacific Company's Routes, and these special rates to California, call upon or address W. G. Neimyer, General Western Agent Southern Pacific Co., 238 Clark St., Chicago.





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## CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

## DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to *The Review*, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our *Bulletin of Advance News*, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

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NO. 4

According to a decision recently rendered in a Michigan circuit court it is the duty of a street railway passenger to make sure that a transfer given him by a conductor is what was asked for. It may easily happen that a conductor in giving out a number of transfers to passengers for different destinations will make a mistake in punching the transfer ticket. The court holds it to be the duty of a passenger in accepting the transfer to see that it is correctly punched or reads to the destination desired, and his acceptance of the transfer relieves the railway company from any responsibility when the conductor makes a mistake and issues a wrong transfer.

Elsewhere we publish a description of the power generating and transmission system of the Union Traction Co. of Indiana which was formed by the consolidation of several urban roads and the building of connecting railways and now operates one of the longest lines of electric railway in this country. Connecting as it does points 70 miles apart this road illustrates the present tendency of the trolley to encroach more and more upon the domain of the steam railroad. This extension to greater distances has only been made possible by the introduction of the alternating current into railroad work, and the plant of the Union Traction Co. which comprises an alternating-direct system of current distribution is an interesting example of the most modern interurban railway practice. There is nothing in the equipment of this road which is an absolutely new application, as the use of step-up and step-down transformers, rotary converters and storage batteries have all been similarly and successfully installed in other places, but the plant would have been considered an experiment but a short time ago, and is of special interest on account of the thoroughness with which the engineering details have been worked out.

The method of using storage batteries with a differential booster is a comparatively new use for them and is undoubtedly the most effective way of operating a station with batteries. In this way practically the whole variation of the load whether above or below the average load may be taken care of by the battery and the engines

and generators caused to work at a nearly constant load. These conditions are also the ones most favorable to the battery, as it is kept fully charged most of the time and is charged immediately after being discharged.

Another important decision concerning the rights of electric railways to carry freight was rendered March 25th by the Supreme Court of Ohio. The keynote of the decision, which was in a case wherein the Dayton Traction Co. was defendant, was that the highways of the state are for the use of the people, that the transportation of the products of labor is quite as important to a community as the transportation of persons, and that the freight service rendered by the electric railways is therefore a proper use of the highways.

The decision will undoubtedly further stimulate the building of interurban electric lines in the state and it is of great importance to the various municipalities as well as to the railways. It has been shown again and again that the better means of communication afforded by interurban lines which follow the highways are of benefit alike to the small towns on the route and the larger termini. When the company is forbidden to handle freight and express matter the patrons are deprived of a large portion of the service they would otherwise receive. This fact is appreciated in Ohio and the jobbing houses at the interurban centers as well as the farmers adjacent to the electric lines are congratulating themselves on the decision in the Dayton case.

In discussing the plans of the syndicate, headed by Mr. A. J. Johnson, to build a system of railways in Philadelphia and connect that city and New York by an interurban electric line on which extremely low fares are to be charged, the Brooklyn Eagle says editorially: "A 1-cent fare may be possible in Detroit or in Glasgow, where the longest ride that passengers can take is not much more than five miles. The average length of ride passengers in Brooklyn is not much less than four miles and in Manhattan the elevated railroad passengers ride on an average three and one-half miles. To reduce the fare to 3 cents would cut off 40 per cent of the income of the railroads now operated and there is not a railroad man in this city who believes that the companies here could live a week under any such conditions. The men who are wildest in their talk about watered stock and its effect on railroad efficiency do not think that the companies here are earning anything like 40 per cent on a fair estimate of the cost of the roads. If we want to subsidize the rapid transit railroads, as it has been proposed to subsidize the ocean steam ships, we might get a 3-cent fare; but so long as the men who own the roads have to pay the interest on the bonds and the wages of the employees they will not cut down present fares to any such ridiculous extent. There is no use hoping for it and it is folly for a man to expect the people to believe that any such thing is likely. The people are willing to pay a reasonable fare."

A grade crossing accident which occurred a few weeks ago in Ohio serves to point out the necessity of having the most efficient means of protecting the crossings of electric and steam railways. In the instance referred to there were derailling switches in the track of the electric road each operated by a lever on the far side of the steam track, the conductor of the electric car crossing the track, lifting the lever and thus holding the derail closed until the car had passed. The car started to cross but the trolley jumped the wire and caused a delay and before the electric car had proceeded it was struck by a freight train. The freight train had been out of sight around a curve when the conductor went upon the crossing.

This occurrence shows how fallacious is the argument sometimes advanced, that interlocking signals for electric railway crossings are not necessary, and that it is sufficient for the conductor to go upon the steam track, "look and listen," and then flag his car over. Even the derailling switches are considered by some managers as needless complications.

The situation is summed up by a committee of the American Railway Engineering and Maintenance of Way Association, whose report on crossings is published elsewhere in this issue, as follows: "The most common practice is to depend on the street car conductor to safely flag his car over the crossing, presupposing a higher degree of discipline than either his training or ordinary duties tend to promote \* \* \* The tendency of advanced practice

is to require details in the street car tracks, located at a proper distance and worked by a lever on the opposite side of the crossing. The lever should be interlocked with signals on the steam railway track, or, preferably, with a track circuit block, so as to close the crossing to electric cars when the steam railway track is occupied, the levers being worked by the conductor of the electric cars."

The details in the electric track are good as far as they go, but to protect a car that may become disabled while crossing there should be interlocked signals on the steam road. The cost of interlocking apparatus is no legitimate objection, because one serious accident might cost the company far more in damages than the most expensive signal apparatus.

There is at present an excellent field for the growth of the Street Railway Accountants' Association, and Secretary Brockway, appreciating this fact, has begun a sincere and positive campaign to increase the membership, which can scarcely fail to be successful. It will be a great mistake if the many new electric railways now in course of construction do not avail themselves of the opportunity offered by the Accountants' Association to profit by the experience of the older companies in the matter of accounts. Interurban electric railway properties are now very popular with investors and a uniform system of accounting which greatly facilitates an investigation of the property cannot fail to prove of distinct advantage to those companies having securities to market. These advantages will be more apparent in the course of time, and it would be poor policy indeed for those in charge of new roads to work out systems suited to their needs rather than adopt the one already at hand. In accepting the standard system there need be curtailment of originality, but the accounting officer has only to use the standard and add to it what he deems necessary to fit his peculiar conditions.

As noted in our January issue, the subject of tramway accounting is also attracting much attention in Great Britain and a spirited discussion is now being carried on in the *Light Railway & Tramway Journal*, in the course of which the work of the Street Railway Accountants' Association of America has been cited with marked praise by a number of correspondents. It is quite apparent from the discussion that the tramway interests of Great Britain are now confronted with conditions very similar to those the American companies had to face at the time the Accountants' Association was organized four years ago. The most pressing need is for a comprehensive system of distributing expenses, and this is the very thing that has been most completely worked out in this country. This recognition of what has been done by the Street Railway Accounting Association of America is doubly gratifying; first, because the English are admitted to be the masters of accounting and authorities on the subject, and, secondly, because the American Association has been criticized by some for devoting so much consideration to the very problem now engaging attention abroad.

The Accountants' Association is quite willing that our English brethren should have the full benefit of the work it has already done and a set of the published proceedings was recently sent to the editor of the *Light, Railway & Tramway Journal*, who had requested ex-President Duffy to prepare an article descriptive of the methods of procedure and practice of the association. We predict that this broad policy will result in further increasing the membership and influence of the association abroad. In view of the fact that there are now several members in Great Britain we venture to suggest that the Accountants' Association amend its name by cutting off the "of America," which has ceased to be descriptive.

The National Convention of Railroad Commissioners has again invited the Accountants Association to be represented by committee at the former's annual meeting which will be held in San Francisco, June 4, 1901.

The question of the relative merits of two or four motors on street railway cars has been found a perplexing one on many railways for the reason that both of these kinds of equipments have advantages as well as disadvantages. For this reason it remains an open question which is the better adapted to the requirements of any particular road. A discussion of this subject arose at a recent meeting of the New England Street Railway Club during which some experimental data as to the relative current consumption of the two kinds of equipments were given. On 25-ft. box

cars the four motor equipments required about 19 per cent more current than the two motor equipments, and on 12-bench open cars the difference between the two was 23 per cent. The tests were made with the same size of motors in both cases and with 30-in. wheels. Similar tests were made on two 25-ft. box cars by the Boston Elevated Railroad Co., one equipped with two motors and the other with four. These tests were made with special reference to the subject of acceleration upon a level track about half a mile in length. A trail car weighing about 6,000 lb. was attached on which a tachometer was adjusted for reading instantaneous speeds. Readings were taken every three seconds and the results showed that the four-motor car took only about 68 per cent of the time required by the two-motor car to attain a speed of 15 miles an hour, but in doing so it consumed 64 per cent more current. This greater current was used for a shorter time, however, so that the four-motor car only required about 12 per cent more actual energy. In some of the other tests the four-motor car required 27 per cent more energy than the two-motor car to attain the speed of 15 miles per hour. These tests were made only during the time of acceleration, but it is undoubtedly a fact that the larger equipment will consume more current than the small one, as the motors are working at a point considerably under their normal capacity, in which case the efficiency of the machines is lower.

The question of traction, however, is an important one and it is in this respect that the four motor car greatly excels. In this case the entire weight of the car is available for adhesion to the rails, while with the two-motor car only about 60 per cent of this weight is available. It is for this reason that the four-motor car will perform services which will be found impossible with a two-motor car, such as climbing heavy grades or even light grades with a slippery track and running through snow. Where these conditions prevail there is no question of the superiority of the large equipment, and it is being very generally introduced for suburban service in spite of its extra current consumption, and the companies are satisfied to burn a little more coal in order to maintain their services when the tracks are covered with snow and ice.

It has been found in a number of cases that the use of four motors on a car has considerably reduced the cost of maintenance. This has probably been in cases where the load is too much for the two motors and, in consequence of overheating the windings were rapidly baked out. In adding two more motors to the car the power is practically doubled, reducing the load on each motor and the heating as well, so the life of the motors would naturally be much increased. There is no doubt but that the two motor equipment can, under favorable conditions, be operated with the greatest degree of economy, but where the conditions are harder the use of four motors is often the most desirable notwithstanding the increase in current consumption, as the increase in the cost of operation is insignificant to the losses incurred through interrupted service.

The common council of Watervliet, N. Y., recently passed an ordinance restricting the speed of street railway cars running through the city to not more than six miles an hour. Representatives of the United Railway Co., of Albany, whose cars operate through Watervliet, called on the mayor of that city in regard to the ordinance and were informed that it would be strictly enforced. The police were instructed to arrest any motorman and conductor on a car which was being propelled faster than six miles an hour after April 1st. The passage of such an ordinance at the present time borders on the ridiculous and lends to the belief that the council responsible for such a law must either belong to a former century or else have some grudge against the railway and adopt this method of venting its spite.

Whether inspired by ignorance or spite, however, the best way to kill such an law is to enforce it strictly. This enforcement will be a serious detriment to the railroad company and an equally serious inconvenience to the citizens as it will carry them back to the time when the cars were drawn by horses, or even worse, as most any well-regulated horse car line will exceed the maximum speed prescribed here. It may easily be predicted that its strict enforcement will lead to the early repeal of this ordinance, as no community of the present generation will be likely to submit to such a needless inconvenience.



## The Power Generating and Distributing System of the Union Traction Co. of Indiana.

As an introduction to the description of the new power house of the Union Traction Co. of Indiana a few words concerning the company's lines will be of interest. The system as it exists today began to take form in the minds of a number of sagacious men in the natural gas belt of Indiana nearly ten years ago, but their plans were delayed by the financial panic of 1893 and the long period of commercial depression which followed. The Anderson Electric Street Railway Co. was organized in 1892 by Messrs. Charles L. Henry, of Anderson, and Phillip Matter, of Marion, and acquired the old horse railway which had been operating in Anderson since 1887. In 1897 the property and franchises of this company were acquired by the Union Traction Co., of Anderson, which was on June 28, 1899, consolidated with the Muncie, Anderson & Indianapolis Street Railway Co., of Muncie, under the present name, Union Traction Co. of Indiana. The Muncie road was the successor of the Citizens Street Railway Co. organized in 1892 to acquire a steam dummy line originally built in 1889. Mr. George F. McCulloch who was secretary and general manager of the Muncie, Anderson & Indianapolis Co., became a director and treasurer of the Union Traction Co. of Indiana. By the purchase of local lines in Marion and the construction of interurban lines the system was extended until it now includes 163 miles of track and serves a population of from 150,000 to 175,000 people not including the city of Indianapolis (175,000).

Mr. Henry was general manager of the company until March 5, 1901, when he resigned to devote more of his time to other interests. The present officers and operating staff are: President and general manager, George F. McCulloch; vice-president, Phillip Matter; secretary, J. A. Van Osdel; treasurer, W. C. Sampson; general counsel, Charles L. Henry; superintendent, Charles Berry; assistant superintendent, Chas. A. Baldwin; electrical engineer, A. S. Richey; chief engineer and roadmaster, W. H. Bloss; master mechanic, George Skipton; chief engineer of the power station, John Richmond.

Of the total track 56 miles are local lines in Marion, Muncie, Anderson and Elwood. The accompanying map with the table of

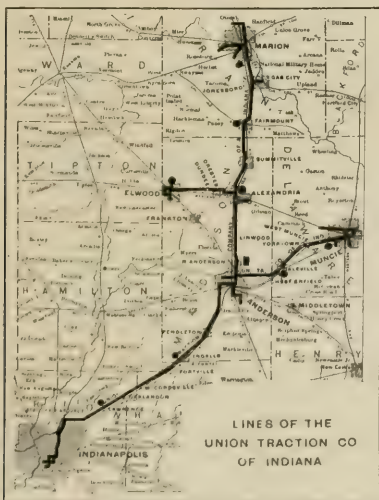
proximately one cent per mile, except that no single fare for any distance is less than 5 cents. All fares are paid in cash to the conductor on the car; the fares as given in the table are one way only no reduction for round trips being made.

Anderson to Marion, 34 miles.....	\$.35
Anderson to Elwood, 22 miles.....	.25
Anderson to Muncie, 17 miles.....	.20
Anderson to Indianapolis, 36 miles.....	.45
Muncie to Indianapolis, 53 miles.....	.65
Marion to Indianapolis, 70 miles.....	.80
Elwood to Indianapolis, 58 miles.....	.70

Twenty-five new cars for interurban service have recently been furnished by the St. Louis Car. Co. These cars are 52 ft. 6 in.



FIG. 1 EXTERIOR OF POWER STATION.



distances serves to show the territory covered. The line from Anderson to Alexandria was opened Jan. 1, 1898; from Alexandria to Summitville, July 6, 1898 and to Marion Aug. 8, 1898; from Alexandria to Elwood, June 26, 1899; from Anderson to Muncie Oct. 1, 1899; from Anderson to Indianapolis Jan. 1, 1901.

The fare charged on the interurban lines of the company is ap-

proximately one cent per mile, except that no single fare for any distance is less than 5 cents. All fares are paid in cash to the conductor on the car; the fares as given in the table are one way only no reduction for round trips being made.

The motor truck has 36-in. steel tired wheels conforming to the Pennsylvania R. R. standard. The axles are of open hearth steel  $6\frac{1}{2}$  in. in diameter with journals  $4\frac{1}{4} \times 8$  in.; at the motor gear seat the axle is enlarged to  $7\frac{1}{2}$  in. in diameter and the key seat cut in the enlarged portion. The motor gear is solid and pressed on under 50 tons pressure.

The motor truck, which is at the front end of the car, has two No. 50 C Westinghouse motors rated at 150 h. p. each. The other equipment includes L-2 controllers, Christensen motor driven air compressors, Wagenhals electric headlights, Baker hot water heaters.

The motor equipment is intended to propel a fully loaded car weighing 60,000 lbs. at a speed of 42 miles per hour when the tractive effort required does not exceed 24.5 lb. per ton.

The road is operated with the alternating-direct system of current distribution, with high potential transmission lines and rotary converter sub-stations, and is one of the most interesting railway plants that has been installed. The central station, sub-stations and transmission lines were built after plans prepared by Messrs. Sargent & Lundy, of Chicago, electrical and mechanical engineers, and constitute an example of the most approved modern practice.

### MAIN POWER STATION.

The main power station is located in North Anderson adjacent to the interurban line; its position is indicated by the black rectangle on the map. The building is of natural gas burned brick with foundation of Greensburg stone and its architectural appearance is very pleasing, the monitor roof to the boiler house relieving box-like effect that is so common with power house buildings. The architect was Mr. Philip F. Jeckel of Anderson who also prepared



the plans of the sub-stations and other buildings of the company. The general dimensions are 117 x 165 ft., the boiler room being 42 ft. by 160 ft. 9 in., and the engine and generator room 70 ft. by 160 ft. 9 in. inside. The floors of both rooms are at the same level; from the floor of the boiler room to the roof trusses is 35 ft. and from the floor of the engine room to the roof trusses 30 ft. The coal bunkers are designed to receive 1,200 tons of coal and to carry this load steel lattice columns are placed in the side walls, being bricked in so that the outward appearance is that of brick pilasters. The coal hoppers and all steel construction in the power house were built under contract by the Indiana Bridge Co., of Muncie, and O. L. Pulse & Co. of Greensburg were the building contractors.

There is a basement 10 ft. high under the entire building, that of the boiler house being for the ash conveyor and smoke flue. The south end of the basement under the engine room is used for the static transformers, and the space east of the engine and generator foundations is the storage battery room. The floors throughout are of concrete carried on steel beams; the roof of the boiler room is of 3-in. book tiles covered with 6-ply Trinidad asphalt, and that of the engine room of tiles laid on iron rafters. The ultimate capacity of the station is 4,000 kw. but only three of the 1,000-kw. units are being now installed and that portion

The boiler equipment comprises six (eight are shown on the plans) Babcock & Wilcox water tube boilers, each having 4,000 sq. ft. of heating surface; the working steam pressure is 155 lb. per sq. in. The boilers are arranged in batteries of two each, and there is room at the north end of the boiler room for installing four additional boilers when the increase of traffic on the road shall require.

The boilers are all fitted with Babcock & Wilcox chain grate stokers. The grate is an endless chain made of short cast iron bars linked together and engaging sprockets at the front and rear by which the upper portion of the grate is carried constantly forward. The whole apparatus is mounted on wheels running on rails at the sides of the ash pit and can be drawn out clear of the boiler for inspection and repairs.

Coal is fed through a hopper extending the full width of the grate, the depth of the layer being regulated by a door that is lifted or lowered. A fire brick arch 3 ft. deep at the front end facilitates the coking of the fresh coal as it enters, and also the combustion of the volatile gases. The speed of the grate is graduated so that the time of travel to the rear end is sufficient for complete combustion.

For the rapid and economical handling of coal and ashes, this plant is completely equipped with the latest design of the McCaslin conveyor, which was furnished and installed by the John A. Mead Manufacturing Co., of New York City. The general arrangement of the conveyor will be seen from Fig. 4.

The boiler room lies at right angles to the switch tracks as shown in the cut. The coal which is run of mine bituminous, is delivered from the cars directly into a receiving hopper and from there passes into a self contained, direct connected, steam driven coal crusher, where it is broken into pieces not larger than 1½-in. cubes. From the crusher the coal drops into the lower horizontal

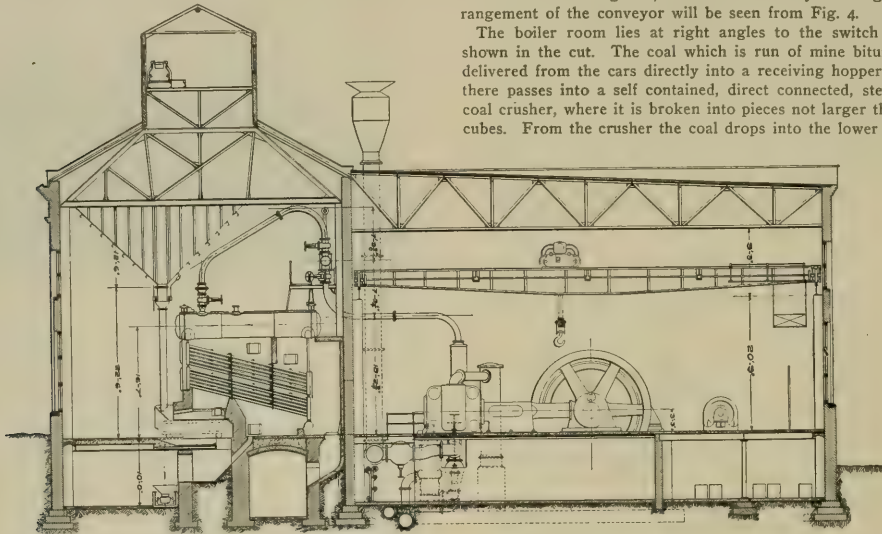


FIG. 2-CROSS-SECTION OF POWER HOUSE.

of the engine room where the fourth unit will be is not yet floored over. The stack is of brick, 180 ft. high above the grade line with a flue 10 ft. in diameter. It is located with its center line 3⅓ ft. outside the south wall of the building. The bottom course of the foundation is of concrete, 26 ft. square, and 2 ft. thick, the top of the concrete being 18 ft. below the grade line. The lower courses are stepped in so that the stack is 19 ft. square at a point 6 ft. below the grade line; the square shape is retained until a little above grade from which point the corners are tapered off so that the section becomes octagonal 11 ft. 6 in. above grade. Above this point to the top the section is circular, the taper being ¼ in. to 1 ft. The outer wall is 38 in. thick for the first 30 ft. above grade, and the succeeding sections of 25 ft. each are 34, 30, 26, 21, 17, and 13 in. thick, respectively. The inner wall is 13 in. thick; the space between the two walls at the bottom is 3 in.

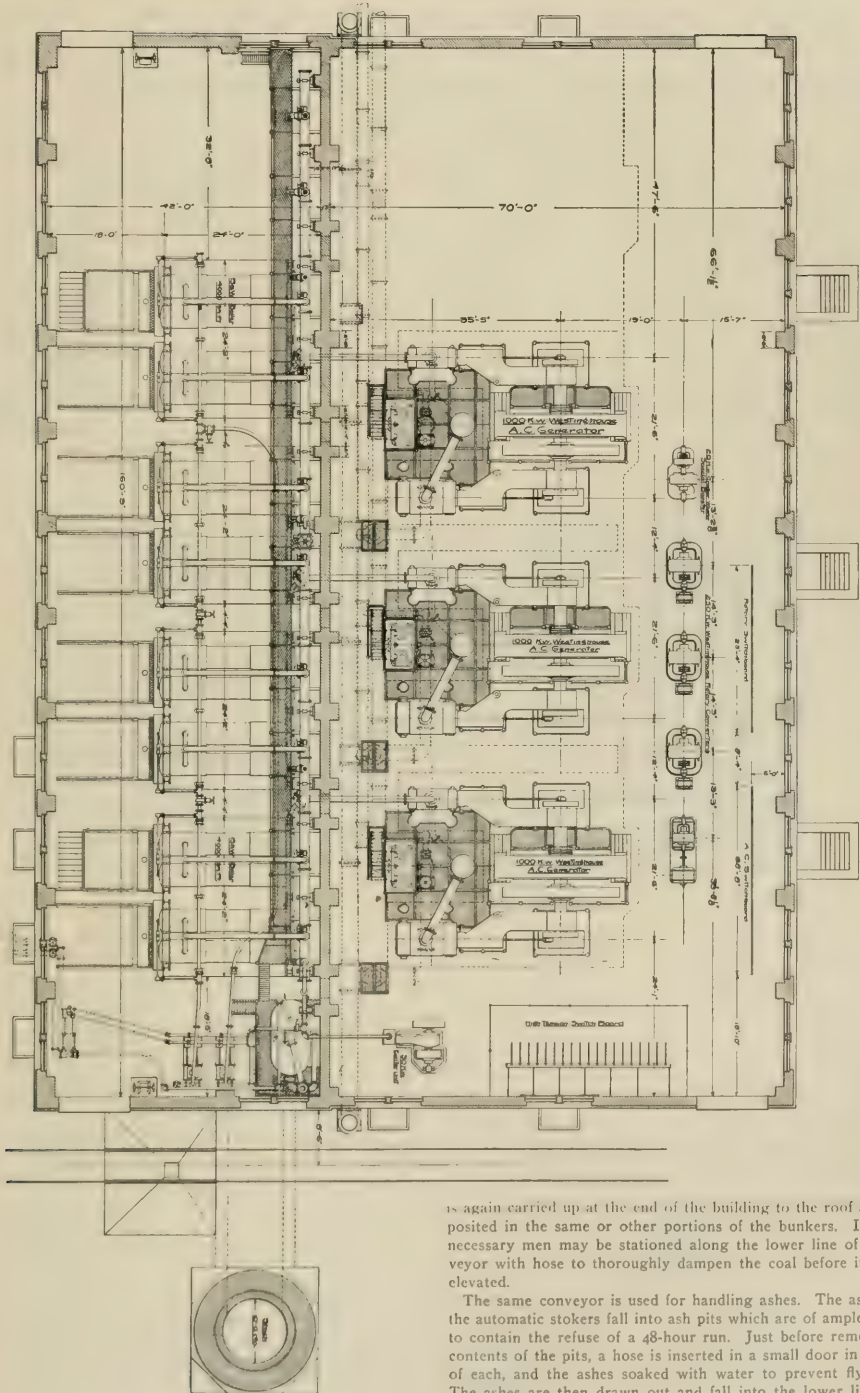
The smoke flue is below the boiler room floor and runs underground to the stack; it is 8 ft. 6 in. wide by 10 ft. 7 in. high inside. The side walls are 2 ft. and 2 ft. 8 in. thick, respectively; the bottom is of 4-in. paving brick and the top a brick arch 12 in. thick. The rods 1 in. in diameter are placed through the arch, 6 ft. c. to c. and anchored by plates 12 in. square set in the walls. Above the arch concrete is filled in to the floor level.

line of the conveyor, by which it is carried the length of the building under the boiler room floor in the direction indicated by the arrow. Thence it is carried around, up at the end of the building and is automatically dumped into any one of the 10 elevated coal storage bunkers. This automatic dumping is done by a traveling dumping block which, by means of an endless chain passing over the hand wheel shown in the upper right hand corner of the cut, may be placed at any point on the overhead trackway, causing the coal buckets to dump at that point.

The elevated bunkers which are supported on double girders from the side walls, each consists of riveted steel plates converging at the bottom to a small opening, which is fitted with a valve that may be shut or opened from the boiler room floor by means of down chains. The coal is supplied to the boilers through a down spout leading from the opening at the bottom of each bunker to the Babcock & Wilcox automatic stokers with which all the boilers are provided. Universal joints at the upper ends of these down-spouts permit of their being moved either sideways or to the front.

In the event of coal in the bunkers taking fire through spontaneous combustion, the spouts may be directed so that the coal will be discharged through openings in the boiler room floor, directly into the lower line of the conveyor beneath, whence it

FIG. 3. GENERAL PLAN OF POWER HOUSE, UNION TRACTION CO. OF INDIANA.



is again carried up at the end of the building to the roof and re-deposited in the same or other portions of the bunkers. If deemed necessary men may be stationed along the lower line of the conveyor with hose to thoroughly dampen the coal before it is again elevated.

The same conveyor is used for handling ashes. The ashes from the automatic stokers fall into ash pits which are of ample capacity to contain the refuse of a 48-hour run. Just before removing the contents of the pits, a hose is inserted in a small door in the front of each, and the ashes soaked with water to prevent flying dust. The ashes are then drawn out and fall into the lower line of the conveyor, first passing through a traveling hopper, which may be





in. water cylinders with 12-in. stroke. The well pumps are  $7\frac{1}{2}$  by  $9\frac{1}{2}$  by 12 in. A fire pump of a capacity of 500 gallons per minute is located in the boiler room.

The water supply is taken from artesian wells about 320 ft. deep located near the building. A tank of 20,000 gallons capacity and 35 ft. above the ground is erected near the stack.

An interesting feature is the arrangement of the feeder lines to the boilers. A 6-in. main is carried straight across all the boilers well up towards the front end, and from this all the connections to the boilers branch. A second 6-in. pipe line leads from the pumps and connects with the feed main between the third and fourth batteries of boilers. The auxiliary main is about 12 ft. back of the feeder main and has long curves of 8 ft. radius which take care of any unequal expansion of the two lines. By inspection of the plan view, Fig. 3, it is readily seen that no one break in the main pipe can affect the feed supply to more than one pair of boilers. This piping is extra heavy lap welded wrought iron. The main steam header, which is 26 ft. above the boiler room consists of 13 sections of cast iron pipe 15 in. in diameter with the ends faced; the header was tested to 300 lb. per sq. in. A 14-in. valve is placed near the center of the main header, and a 4-in. auxiliary header is carried from the far side of this valve back to the pumps, etc.

The connections between the header and the engines and boilers are of bent lap-welded wrought iron pipes, those from the boilers being 8-in. and those to the engines 10-in. This method of providing

best idea of the details can be had by following through the principal pipe lines, referring to the general plan of the engine room. Fig. 3, for the plan view of the main engine piping.

In the steam main to each engine is a Sweet separator below which is the throttle valve. The exhaust from the high pressure cylinder to the receiver is a 12-in. pipe. The receiver is 2 ft. 10 in. in diameter and 12 ft. 6 in. high set vertically between the engines and has reheating coils. The exhaust from the low pressure cylinder is into a 20-in. pipe one end of which heads through an automatic relief valve to a 30-in. open air exhaust main and the other to the condenser, which is of the jet type. A stop valve is placed close to the condenser. The air pump, which is of the vertical type, has steam cylinders 16 in. and water cylinders 32 in. diameter by 21 in. stroke. A 3-in. pipe leads from below the separator to the steam cylinder of the air pump. From this pipe a 1-in. branch is carried to the jackets on the heads of the high pressure cylinder, a 1-in. branch to the jackets on the heads of the low pressure cylinder, and a  $1\frac{1}{2}$ -in. branch to the reheating coils of the receiver. For the exhaust from the air pump there are three paths, one through a 4-in. pipe to a 6-in. exhaust to the heater, one through a 4-in. pipe to a 6-in. pipe connecting the receiver and a 6-in. auxiliary exhaust main, and one into the condenser direct. A back pressure valve is placed in each 6-in. connecting pipe. This 6-in. auxiliary exhaust main connects the exciter engine and the receivers of engines Nos. 1 and 2, but not the receiver of engine No. 3.

The drip from the separators, receivers and live steam mains are

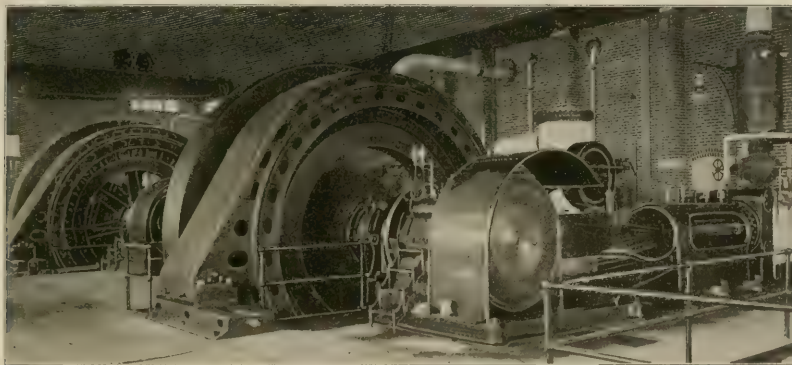


FIG. 6. 1,000-KW. WESTINGHOUSE GENERATING UNITS.

for the expansion in the piping system has been used in many of the stations designed by Messrs. Sargent & Lundy. In this plant the arrangement of the boiler and engine rooms at the same level, and the location of the boiler settings close against the dividing wall led to the peculiar form of the steam pipe lines. Near the south end of the main header a 6-in. pipe is led to supply the steam auxiliaries, a 4-in. branch leading to the exciter engine, a 4-in. branch to the feed pumps, a 3-in. branch to the low service pump and  $1\frac{1}{2}$ -in. branches to the fire pump, the conveyor engine, and the coal crusher engine.

All valves were furnished by the Crane Co., of Chicago; those above 8 in. in diameter have a by-pass. The pipes and valves are covered with carbonate of magnesia pipe covering, supplied by the Keasby & Mattison Co., of Cincinnati; the covering for the main header is 2 in. thick, that for the other piping being of standard thickness.

The water for condensing is taken from a small stream called Kill Buck Creek, through a brick tunnel 48 in. internal diameter and 870 ft. long to a brick cistern; this cistern is just outside the north end of the building and its top is seen in the half-tone engraving showing the exterior of the station. The discharge outside of the building, is through a 24-in. tile sewer 300 ft. long which empties into an open ditch leading to the creek.

Within the building the injection and discharge pipes, 20 in. and 24 in. respectively in diameter, are below the basement floor as shown in Fig. 5, which is a cross section of the basement of the engine room showing the arrangement of the main piping. The

led to either the high or low pressure headers of the Holly return system. The open air exhaust runs the entire length of the building and is carried up at each end above the roof and fitted with a Warren exhaust head. The arrangement of the boiler blow-off main, the exhaust to heater, the drip headers and the drain pipe on a pipe rack along the side wall of the basement makes all this piping very readily accessible and is an excellent feature of the design.

There are three cross-compound corliss automatic cut-off condensing engines. The specifications under which the engines were built provide that the speed shall not vary more than one per cent from no load to full load, and that the instantaneous variation shall in no case exceed 2 per cent; that the engines will not race under any load within 2,000 i. h. p.; that when operating in multiple under normal conditions the variations in angular velocity of the rotating parts shall not exceed .37 of 1°.

The economy guarantee is that the maximum steam consumption of engine, jackets, air pump, and reheating coils, when under normal steam and vacuum conditions, shall not exceed on an average the equivalent of  $14\frac{1}{2}$  lb. of dry steam per i. h. p. per hour when the engine and air pump are together indicating 1,500 h. p. no allowance being made for the heat discharged by air pump or from jackets and reheating coils.

The engines are guaranteed to operate continuously for long periods of time at or within the maximum capacity of 2,000 h. p. without undue noise or heating.

The general dimensions of the main engines are: Diameter of

cylinders, 26 and 50 in.; length of stroke, 48 in.; speed, r. p. m., 100; diameter of balance fly-wheel, 18 ft.; weight of balance fly-wheel, 120,000 lb.; diameter of shaft at middle, 24 in.; dimensions of main bearings, 22 x 38 in.; dimensions of crank pin,  $8\frac{1}{2}$  x  $8\frac{1}{2}$  in.; dimensions of crosshead pin, 7 x  $8\frac{1}{2}$  in.; length of connecting rod, c. to c., 12 ft.

Cylindrical gridiron valves without false seats are used, the area of the inlet and exhaust parts being 10 per cent of the piston

terminals, the pressure at full loading being 400 volts. The power factor is 90 per cent.

These machines are excited by a direct current at 125 volts. The armatures are star connected and are of the slotted drum type, the cores being built of laminated steel. The windings consist of bar wound coils formed and insulated before being placed in the armature slots. Throughout the armature spider, core and windings, large ventilating ducts are provided, and the design of the

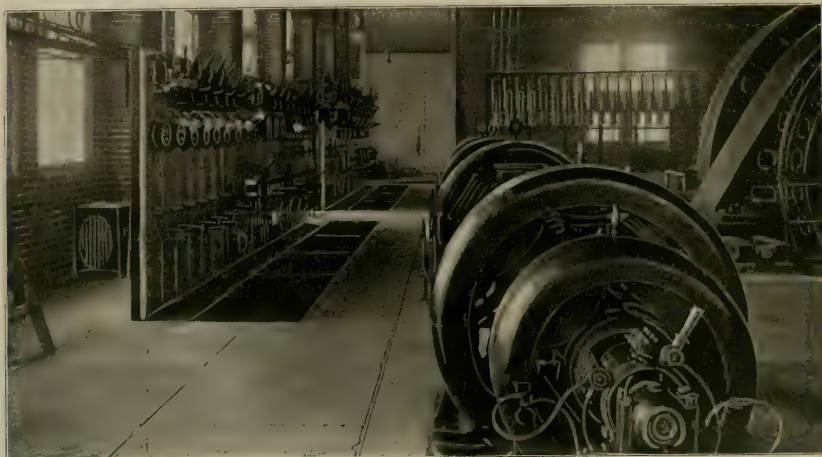


FIG. 7—BOOSTER, ROTARY CONVERTERS AND SWITCHBOARDS.

area. The governor is of the improved Rites inertia type, giving a cut-off variable from 0 to  $\frac{3}{4}$  stroke. The fly-wheel is in segments with oval arms each arm being cast in one with a piece of the rim; the joints are made with arrow-head steel keepers shrunk in flush with the rim.

The engines are piped for a gravity lubricating system. The engine oil is returned to Turner filters in the basement and is thence pumped to the storage tank. The engine room has a 25-ton traveling crane made by Pawling & Harnishfeger, of Milwaukee.

All of the electrical apparatus was furnished by the Westinghouse Electric & Manufacturing Co., excepting the booster units, the storage batteries and some switchboard panels. The three

rotating spider is such that a forced circulation of air is set up through the ventilating ducts.

For exciting the main generators there are two units, one steam and one motor-driven. The latter consists of Westinghouse "Type C" 3-phase induction motor direct connected to a 50-kw. direct current generator wound to give about 125 volts running at from 500 to 510 r. p. m. The steam driven exciter unit comprises a 9 x 14-in. high speed engine direct connected to a 50-kw. Westinghouse 6-pole direct current generator giving 125 volts. For use in an emergency or in starting when it is not desired to use the steam-driven exciter, the storage battery is tapped for a 125 volt cur-

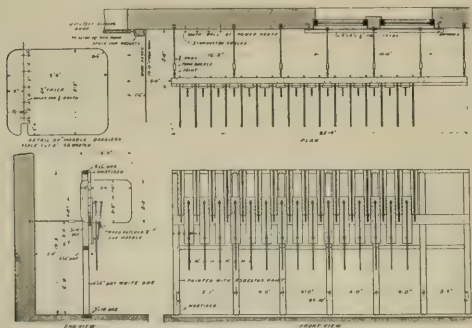


FIG. 8—HIGH TENSION SWITCHBOARD.

main generating units are direct connected to the three engines already described. Each unit consists of a 1,000-kw. 3-phase generator designed for a speed 100 r. p. m. There are 32 poles, giving 3,200 alternations per minute. These machines have rotary fields, independently excited, the fields being pressed on the horizontal shafts of the engines. Each generator has a normal capacity to generate a current of 1,600 amperes in each of the three

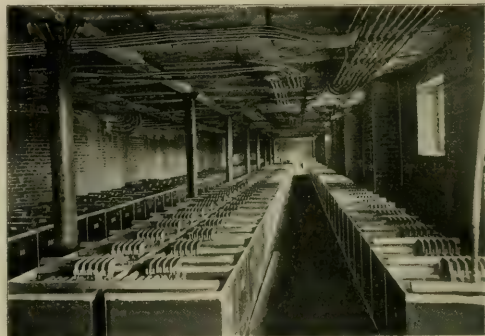


FIG. 9—STORAGE BATTERY ROOM IN MAIN STATION.

rent, there thus being three methods of exciting the main generators.

This plant also contains a sub-station, that is, a portion of the low-potential current from the main generators is led to rotary converters instead of to the static step-up transformers. The electrical equipment of this station is similar to that of all the other sub-stations except there are three rotary converters.



The rotary converters are 250-kw. Westinghouse standard three-phase machines. The armature winding of the rotary is similar to that of an ordinary direct current generator, but it is tapped at certain points from which connections are carried to the collector rings at one end, while the ordinary commutator is at the other end. The ratio of conversion, a. c. to d. c., is about .62. These rotaries run at 533 r. p. m. and deliver 455 amperes at 550 volts. For starting the rotaries a small induction motor mounted on the same shaft is used; this is the standard practice of the Westinghouse company.

The other features of the sub-station are the storage battery and the boosting unit used in connection therewith.

All of the storage batteries were supplied by the Electric Storage Battery Co., of Philadelphia. The battery in the main station

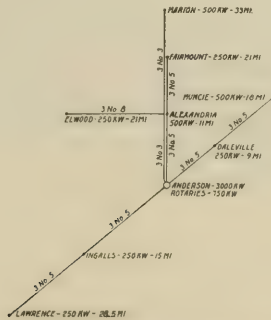


FIG. 10—HIGH TENSION FEEDERS.

consists of 264 cells "Chloride" accumulator, type 11-G, in tanks to hold 21-G plates, thus permitting of the capacity being doubled by adding more plates. The capacity of this battery is 211 kw. at the one hour, or regulating rate, or 100 amperes at the 8 hour rate. The battery is in the basement under the generator room as already mentioned; Fig. 9 is a view of this battery room.

Each of these batteries operates in connection with a specially wound motor-driven booster which regulates the battery, causing it to charge or discharge as the conditions vary. The booster series field windings are such that the demand for current on trolley lines and direct current feeders determines whether the rotary converter current charges the battery or the battery discharges into the line. The limits of charge and discharge within which this automatic action is effective may be varied by manipulating the shunt field of the booster.

The booster units for the nine sub-stations were made for the Electric Storage Battery Co. under its specifications by the Crocker-Wheeler Co. The Crocker-Wheeler Co., whose works are at Ampere, N. J., has had great success with its boosters and has installed them for use in keeping up the pressure on long direct current feeder lines as well as for storage battery regulation.

The booster units in all the sub-stations are similar in construction and action, the difference being in capacity only, 20-kw. in the Anderson sub-station, 16 kw. in the double, and 8-kw. in the single sub-stations.

#### SWITCHBOARDS.

The engine room contains two switchboards of marble mounted on a frame work of angle irons. One of these boards contains the instruments and regulating apparatus for the alternating current for the entire plant and the other is a rotary converter switchboard for supplying direct current to the lines adjacent to the station, and also the current for the station auxiliaries. The two boards are in a line 5 ft. from the wall of the building and their ends are 8 ft. 4 in., apart. A set of low-potential 3-phase bus bars are carried behind both switchboards and the connection between the bars for the two boards is made through 2,800,000-c. m. cables for each phase. The alternating current board contains five low-potential transformer feeder panels. The current from each machine is carried direct to its corresponding generator panel. Each leg of the circuit is connected through a single pole single-throw 2,000 ampere switch to the low-potential bus bars and two of the legs are

provided with 2,000-ampere non-automatic circuit breakers. There are three alternating current ammeters on each generator panel reading up to 2,500 amperes, one connected to each phase of the circuit, and two 750-kw. indicating wattmeters are connected between the phases of each machine. The field circuit of each generator is led to its corresponding panel and has in its circuit a field rheostat, and a 200-ampere direct current ammeter. The standard Westinghouse synchronizing arrangement, ground detector and pilot lamps are also placed on each generator panel. The load panel, which comes next to the generator panels, contains the instruments for reading the total current on the bus bars. There are three ammeters reading up to 10,000 amperes, one on each leg of the circuit, two direct reading Niagara type wattmeters and one 5,000-kw. integrating polyphase recording wattmeter reading the total station output.

A three-phase circuit is tapped from the low potential bus bars to each of the feeder panels, each leg of the circuit running to a single pole switch, and two of the legs having automatic circuit breakers in series. These circuit breakers are set a little lower than the fuse circuit breakers on the high potential switchboard so that the switching is practically all done on the low potential board. The lines then run through ammeters to the 250-kw. step-up transformers in the basement where the current is raised to 15,500 volts. This high potential current passes through circuit breakers on leaving the transformers and goes out over the four high potential feeder lines. A lightning arrester is connected on each high potential line as it leaves the building.

The two remaining panels on this board are for the exciters, one being motor-driven and the other driven by a steam engine. The engine-driven exciter panel contains a 150-volt scale voltmeter and an ammeter reading up to 500 amperes for the field circuit. The exciter line then passes through a circuit breaker to the pair of 125 volt field bus bars which run behind the generator panels. From these bus bars the circuits are lead to each generator field through a pair of plug switches, an ammeter and a field rheostat. This exciter panel also contains a rheostat for the shunt field of the exciter and a double throw two-pole switch the function of which is to connect either the exciter or a 125-volt storage battery current to the field bus bars as desired. The motor driven exciter panel contains a switch for the induction motor, a rheostat for the exciter field, an ammeter and two 2-pole knife switches.

The main station rotary converter switchboard receives its current from the three alternating polyphase low potential bus bars of the switchboard already described. This switchboard contains 15 panels as follows: 3 alternating rotary panels, 3 direct current rotary panels, 1 storage battery panel, 1 booster plug and 1 station panel, and 6 direct current feeder panels. The three alternating current rotary panels each contain two circuit breakers, three ammeters, one 3-pole double throw starting motor switch, one 3-pole single throw rotary transformer switch, and one rheostat. The current from the alternating current bus bars passes through the ammeters, two of the legs of the circuit passing through automatic circuit breakers, and is then led through the three pole switches, one to a starting motor and the other to the rotary converters.

From the direct current commutator of each rotary the circuit passes to its corresponding direct current panel on the switchboard. Each of these panels contains one 900-ampere circuit breaker, a 750-ampere ammeter, a voltmeter plug and a three pole single throw switch, through which the current enters the bus bars. The total current on the three direct current rotary panels is measured by a Thompson recording wattmeter. The direct current rotaries are all connected with an equalizer bus on the direct current board.

The station panel which controls the lighting and power circuits of the building contains circuit breakers, ammeter, two 2-pole switches and a recording wattmeter. Each of the direct current feeder panels contains a circuit breaker, an ammeter and a single-pole single throw switch.

There remain a storage battery, and a booster panel on this switchboard to describe. The battery plant at the main, as well as at the sub-stations, is arranged to operate automatically, the battery feeding into the line when the demand for current reaches a predetermined amount, and the rotary charging the battery when the line demand falls below the point. The storage battery panel contains one circuit breaker, a double reading ammeter, reading the charging or discharging current of the batteries, a double throw 2-pole line and booster switch, a single pole double throw battery line and booster switch and a starting motor rheostat. The booster panel has a motor circuit breaker and voltmeter, a booster field





is 13 in. thick and strengthened with pilasters. The roof is carried on steel I-beams spaced about 5 ft. apart; on these are  $2\frac{1}{4}$  by  $2\frac{1}{4}$  in. T's 18 in. c. to c. which support book tiles 3 in. thick, and over these is laid a tar and gravel roof. The roof girders are 12-in.,  $31\frac{1}{2}$  lb., I-beams except that in the converter room, which is served by a six-ton trolley, alternate roof girders are 18-in., 55-lb.

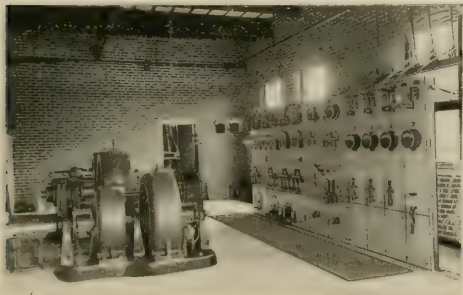


FIG. 12—INTERIOR OF MARION SUB-STATION.

I-beams. The floors are of concrete except in the battery room where bricks are laid on edge in asphalt on the concrete foundation. This is the standard practice for battery rooms where it is necessary to protect the concrete from the acid. Fig. 13 shows an exterior view of the Elwood sub-station and Fig. 12 an interior view of the Marion sub-station.

In addition to the rotary converters and Crocker-Wheeler booster units already mentioned, each double sub-station has four 175-kw. static step-down transformers to reduce the line current from high to low potential, one transformer being held in reserve; four high tension lightning arresters; and a battery of 264 cells with type 9-G, in tanks to hold 17-G plates, the capacity being 168 kw. at the one hour rate and 80 amperes at the 8-hour rate. Fig. 14 is from a photograph of the battery room of the Muncie sub-station.

For the single stations there are four  $87\frac{1}{2}$ -kw. static transformers, one 250-kw. rotary, set in the location of No. 2 in Fig. 11, and an 8-kw. booster unit. The storage battery for the single sub-station has the same number of cells 264, as in the double one, but the capacity is only 84 kw. at the hour rate and 40 amperes at the

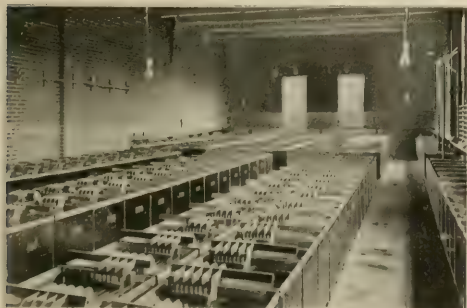


FIG. 14—STORAGE BATTERY, MUNCIE SUB-STATION.

8-hour rate; the cells are type 9-F in tanks to hold 17-F plates.

Fig. 15 plotted from data taken at the Alexandria sub-station, gives a very good idea of the work the batteries are doing. The dotted line shows the total output of the station, and the solid line shows the rotary, or generator load, the difference between the two being the work done by the battery. From studying these curves it will be seen that the battery takes almost the entire

fluctuation, the rotary load changing very little. It will readily be understood what an effect the regulation of these batteries at the eight sub-stations must have on the generator plant at the power house.

During certain hours of the night, in many cases, the load is



FIG. 13—EXTERIOR ELWOOD SUB-STATION.

carried entirely from the batteries, enabling the generating plant to be shut down. The current for lighting the car barns, etc., is also taken from the batteries during this time.

The operation of the batteries on this system has proved a very great success, and demonstrates very plainly the value of a storage battery equipment on suburban lines of this nature.

By installing batteries in the sub-stations in this manner the rotary capacity can be reduced considerably, and what is installed can be run under the very best conditions and with the highest load factor. There is also great safety in having such a large reserve in the case of any temporary interruption of the supply. This has proved of the greatest value in several instances during the starting up of this plant.

As will be noted from the plan all the leads from the transformers and battery to the switchboard are carried in underground conduits with trenches covered by floor plates at the rotaries and transformers. The conduits that will be needed for the additional transformers, indicated by dotted lines, have also been installed.

In the plan view, Fig. 11, a track 23 ft. long is shown in the converter room. This track is the end of a branch from the main line and is for the accommodation of the portable sub-station car shown in Fig. 16. This car has been designed and built for use in case of an emergency arising from an accident to one of the sub

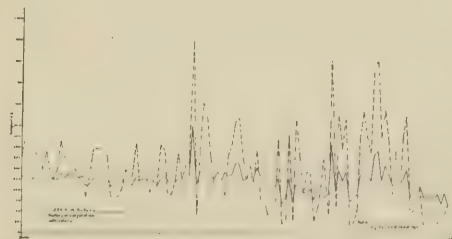


FIG. 15—BATTERY LOAD DIAGRAM.

station rotary converters or for temporarily increasing the capacity of any station. In such case the car will be hauled to the station, run into the converter room and connected to the battery, feeders and line.

The car has a body 21 ft. 6 in. long by 8 ft. 8 in. wide and the peak of the roof is 10 ft. 6 in. above the rail. The equipment includes a 250-kw. rotary converter, three  $87\frac{1}{2}$ -kw. static trans-

formers, and high and low tension switchboards. The estimated weight of the rotary and static transformers is 26,100 lb.

The high tension feeders are shown diagrammatically in Fig. 10. It will be observed that from Anderson to Fairmount the line

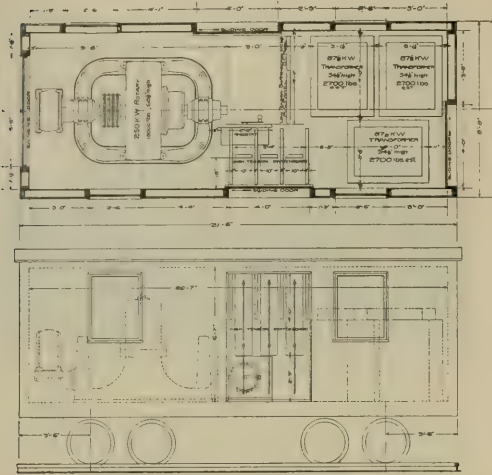


FIG. 16—PORTABLE SUB-STATION.

carries two sets of feeders. The poles are cedar, 40 ft. long and 7 in. in diameter at the top, and roofed at an angle of 45 degrees. Where six feeders are carried one set is placed on each side of the pole, and with three feeders only they are placed on one cross arm, two wires being on one side of the pole, except where the lines are spiraled. Fig. 17 shows the upper portion of a double line pole with dimensions of the two arms. The cross arms are of long leaf yellow pine fastened with two  $\frac{1}{2}$  by 7-in. lag screws, and each has two galvanized iron cross arm braces  $\frac{1}{4}$  x 1 x 24 in., fastened with  $\frac{1}{2}$  by 2 $\frac{1}{2}$  in. lag screws. The pins have oak screw ends with porcelain bushings and  $\frac{1}{2}$ -in. button-head bolts through the arms, and

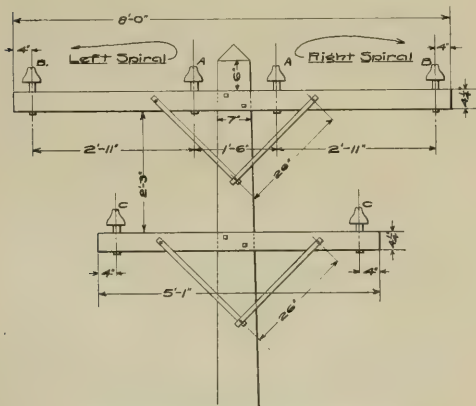


FIG. 17—CROSS SECTION OF FEEDER LINE.

the insulators are porcelain made by the Imperial Porcelain Works. The greater portion of the transmission material including the insulators, pins, cross arms, braces, lags and screws was furnished by the W. R. Garton Co., Chicago.

All the high tension lines are full spiraled every mile, those at the right of the pole, looking from the power house, being spiraled to the right, and those at the left spiraled to the left, thus keeping

the same phase feeders on the two pins next to the pole, one on each side.

Fig. 18 shows the methods of spiraling the lines when only three feeders are used. The letter U indicates that the wire is on an upper 8-ft. cross arm, where two outside and one inside pins are used; the letter L indicates that the wire is on a lower, 5-ft. cross arm where one pin only is used. On four poles each way from feeder spiraling the insulator ties are made extra secure. The lines are all of copper.

In conclusion we wish to express our appreciation of the courtesy of Messrs. Sargent & Lundy, who placed at our disposal drawings and data, and also to Mr. L. S. Boggs and Mr. R. M. Northam, superintendents of construction for Sargent & Lundy, under whose direction the mechanical and electrical apparatus was erected.

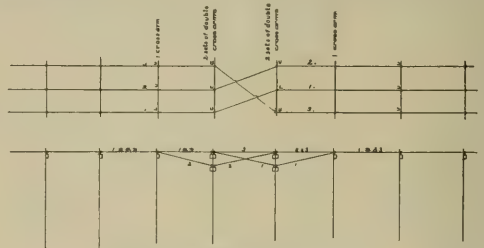


FIG. 18—DIAGRAM OF SPIRALING.

With the completion of the high tension generating station and transmission line the direct current power plants located at Muncie, Anderson, Marion, Elwood and Alexandria were not needed and have been abandoned. The Union Traction Co. therefore desires to dispose of the apparatus thus displaced, a list of which will be found elsewhere in this issue. The complete old station at Anderson which was of 500 kw. capacity has been sold.

### SPECIAL CARS TO HAUL GARBAGE.

The health department of Cincinnati is negotiating with the Cincinnati Traction Co. to effect an arrangement whereby the city's garbage can be hauled to a central point and conveyed by specially constructed electric cars to outlying points.

The North Jersey Street Railway Co. has elected Joseph D. Bedle and Edward L. Young, directors, in place of the late F. O. Matthiessen, who died in Paris, recently, and Abram L. Garretson, who resigned last summer on becoming a member of the Supreme Court. Mr. E. F. C. Young will continue as president of both the North Jersey and the Consolidated companies.

The Brooklyn Rapid Transit Co. has placed with a number of electric car manufacturers throughout the country contracts for 300 new cars of the modern type now generally in use on the Brooklyn system. The cars will be delivered within two months.

The report of the Consolidated Traction Co. of Pittsburg for the month of February, 1901, shows net earnings from operations of \$98,321.50 as against \$89,981.16 for February, 1900.

The Ft. Madison Street Railway Co. will extend its lines across the Santa Fe Bridge at Ft. Madison and thence down the Mississippi River to Nauvoo, a distance of seven miles. Later a new company will probably be organized to build from Nauvoo to Hamilton, Ill., and thence across the river to Keokuk, Ia., 14 miles. Frank C. Wood, Nauvoo, Ill., may be addressed.



## MEETING OF NEW ENGLAND STREET RAILWAY CLUB.

The regular monthly meeting of the New England Street Railway Club was held at the American House, Boston, on the evening of March 28th. Preceding the meeting the customary dinner was served, at which most of the members were present. During the progress of the dinner a very pleasing diversion occurred when President Bradford announced that Lieut.-Gen. Nelson A. Miles, of the United States Army; Rear Admiral Robley D. Evans, of the United States Navy; and Assistant Secretary of the Navy Frank W. Hackett, who were attending a banquet in another part of the hotel, had consented to appear before the New England Street Railway Club and make a few remarks. The distinguished officers were then introduced and were given a rousing reception by the members of the club. After a few extemporaneous speeches and an exchange of congratulations the visitors were escorted to their own dining room.

The business meeting was called to order at 8:30 with Vice-President McLain in the chair.

After the minutes of the previous meeting had been approved the chair announced that 44 new applications for membership had been received during the month, bringing the total membership of the club to 150.

It was then stated the subject of the evening would be "Trucks" and Mr. H. E. Farrington, master mechanic of the Lynn & Boston Railroad Co. was invited to open the discussion.

Mr. Farrington pointed out that the higher speeds and heavier weights of modern electric railroading have made necessary stronger and heavier trucks, and he thought too much care could not be bestowed on this part of the equipment. He did not believe that a standard truck could be developed to meet the requirements of all roads, but thought that many of the parts, as axles, journals, brakes and brake shoes could be standardized, so a road would not have to carry a multiplicity of parts in stock for repairs. He had used a solid steel truck that gave satisfaction. His company had adopted standards for trucks and various parts.

Mr. E. J. Rauch, of the Brockton Street Railway Co., then read the following paper.

### TRUCKS.

The art of constructing trucks for railway service has, for many years, been passing through great development. New conditions of service and improvements in other parts of the equipment, call for corresponding changes in trucks, and, although a state of high efficiency has been reached, the end of the evolution is not yet in sight. Our managers have also been passing through a course of development, and have become so critical that trucks have to be greatly improved to satisfy them. Patrons, as well, expect to see improvements made, while a few years ago they were satisfied to ride in cars of any style, mounted on trucks of an inferior design, but they have now discovered the difference in the ease of riding of cars, and demand the best.

The manager has also discovered that his cars are patronized largely for pleasure travel, when the service is good, and it pays to cater to the pleasure business by providing the best. And he "kicks" at his man in charge of the rolling stock, if he does not have as good, or little better riding truck, or cars, than his neighbor manager.

The truck best adapted for single truck cars is one that will prevent its oscillation, and ride easily, whether light or heavily loaded. To prevent the oscillation of car bodies 18 and 20 ft. long (28 to 30 ft. over all) the usual length, especially when running at a comparatively high rate of speed, (15 to 30 miles an hour) the truck must be constructed with a spring base, sufficiently long to prevent the teetering of the car body.

In order to do this and also support the weight of the car body at the extreme end of the truck frame, there should be a truss, supported from underneath, and the only truss suitable for this purpose is the cantilever style. With the sides of the truck so supported, and the car body suitably mounted, upon a combination of half elliptic and spiral springs, which should reach out from the extended ends of the truck, the additional weight of the passengers is carried by the spirals, the car should ride easily and without teetering. I would add here that the extended half elliptic springs,

together with the cantilever truss, should keep the body of a 20-ft. car from sagging at the ends, or in other words, keep the body of the car straight and in proper shape.

Leaving the single truck, I wish to express my opinion on bearings, on which, it seems to me, few truck makers put enough thought, and then express my idea for a double truck.

The hot box always has been, and no doubt always will be, with us. Its causes are many, usually lack of care, sometimes the lubricant, and sometimes the quality of bearing metal. The size or shape oftentimes has much to do with the heating of the box. The journal should be long and large enough to ensure strength, and should also be as close to the wheel as is possible to have it, as the farther the weight from the wheel the greater the stress on the axle.

The bearing, or brass, as some term it, should not reach too far around on the journal, for at its center line, longitudinally, comes the greatest stress, and on this line the most lubricant is needed, for on the amount of lubricant received at this place the life of the bearing largely depends, and if the bearing is long in its circular form it will wipe the lubricant from the journal before it has reached the point of heaviest pressure.

For the past few years street railway companies have been experimenting with longer car bodies, and have come to the conclusion that they are more economical to operate than the short four wheel single truck cars.

In adopting double truck cars, the length of the car and the style of the truck will depend somewhat on the service required, and grades of the roadbed.

Where the service requires frequent stops, as in crowded cities, and the grades are not excessive, it is customary to use car bodies about 25 ft. long (34 or 35 ft. over all) with only one motor per truck, or two per car, and for this service the maximum traction truck is well, if not best adapted, as this style gives greatest possible traction on driving wheels. Not only is the load eccentrically placed, so as to bring as much weight as possible upon the driving wheels, but the radial point is eccentric. Incidentally the lightly loaded pony wheels, through leverage, have ample power to guide the trucks. The driving wheels, on account of this arrangement of the king pin have a very small movement on curves. In consequence of this the body of the car can be brought low, and the driving wheels allowed to come up between the floor timbers, where they still have ample space in rounding curves; at the same time the low end of the truck, with the small pony wheels, is able to turn freely beneath the body, or under the steps of open cars. The wheel base can be made short, not greater than the gage. The speed of this truck, I will admit, should be somewhat limited, that is, not run at a greater speed than 25 miles per hour.

We have on our division a number of types of double trucks under cars, varying from 34 to 45 ft. over all. Some of these are as fine riding trucks as one would wish for, while others are not so pleasant to ride over, and these latter are not the maximum traction truck against which there is much prejudice. Right here I wish to say for the maximum traction trucks, that we have been using these trucks, with very good success, for nearly four years, and the repair expense, aside from brake shoes and wheels, has been nominal; also that we have four cars equipped with these trucks, which have been put to the most severe test of any truck we are using, and there are some of our officers here who will bear me out in this statement, when I refer to the Whitman line, making a round trip of a little more than 12 miles, in one hour, including numerous stops, over a very light rail and a very rough roadbed.

The cars, trucks and motors, together with the electric equipment and air brakes, weigh approximately 30,000 lb., say nothing of freight, which often amounts to from 15,000 to 20,000 lb., making a total weight of from 45,000 to 50,000 lb., which is nearly as much as the weight of a common steam railroad car and its freight, equipped with trucks which will weigh as much as four of the maximum traction trucks and having a heavier rail and a better roadbed to run over.

These maximum traction trucks are equipped with G. E. 57 motors, gearing 21-64, and the motors weigh about 3,000 lb. each. The cars are 28-ft. body, (40 ft. over all) and for a two-motor equipment, for fighting snow, or a slippery rail, we have yet to find their equal. They are fairly good riding trucks, and will keep the rail well on an even roadbed, though I will admit I do not feel as

safe, at a high rate of speed, with this style of truck as with a well made standard four-wheel double truck, with a motor mounted on each axle.

Of this type we have several different makes, and I prefer trucks of as short wheel base as is practicable to have them, as they will serve better where the radii of curves are short, hanging the motors outside the axles, or driving wheels, and the car body supported upon a center bearing swing bolster, which allows the truck to readily adjust itself to any and all conditions of the track, at the same time securing the best results and the easiest riding car.

The frames should be of solid steel castings or wrought forgings, thereby reducing the number of parts and bolts, and should be supported upon springs at the journal boxes, and the truck bolster supported upon an arrangement of helical and elliptic springs, so as to give an easy riding car. The driving wheels should swing beneath the sills of the car. The height of the body from the rail can then be reduced as low as the motors will allow.

Designers of trucks have a favorite method of describing the theoretically perfect truck, by saying it should be a three legged stool with four legs. In other words, it must have the characteristic property of the three-legged stool, which is to set firmly, even on an irregular surface. To accomplish this in a truck, it must have complete vertical flexibility, so that upon an irregular rail surface it can stand with an equal weight upon each one of its wheels; it must also possess the ability to run rapidly, and still maintain this condition of an equal bearing on each wheel. Such complete independence between the wheels cannot be obtained with springs alone, even though they possess perfect elasticity. Springs fail, both theoretically and practically.

In passing low places over the track, one wheel shirks the load and relieves the wheel on the opposite corner of the truck, while at high points the wheel shoulders the load. This is true when running and the same at rest. The points of support of an unequaled four wheel truck are rapidly changing from one pair of wheels to the other, this is one of the reasons for the ease with which four

ease of riding contributes to diminish the wear and tear of the truck, especially the flanges of the wheels, and also of the track. Ease of riding is also exceedingly valuable, because it increases safety. Where there is an absence of vertical and horizontal shock, there is little danger of the car leaving the rail.

A perfect truck has yet to come into the market, but I trust we shall, ere long, have such a truck as will be adopted by our managers as a standard, so that it will not be necessary to carry several car loads of duplicate parts in stock, to enable us to make the necessary quick repairs in cases of emergency.

The subject of trucks is a very broad one, and I wish we might discuss its component parts, or in detail. Take, for instance, the wheels, the axle, journal bearing, boxes, springs and the frame. The whole evening might be well spent on any one of these parts, after this take the truck as a whole, and I think from the many suggestions, if they are thoroughly sifted, we might get a better truck than we now have, if we could get the good points together in shape.

Mr. Paul Windsor, of the Boston Elevated Ry., said his company kept wheel records by placing a cyclometer on the axle.

Mr. Whitcomb, of the Composite Brake Shoe Co., believed it was very important to decide upon a standard form of brake shoe.

Mr. Farrington added that he believed in bolting the brake shoe direct to the truck beam, doing away with a key and brake head.

Mr. Conway, of Brockton, had used a number of maximum traction trucks and had no trouble with them at speeds up to 15 miles an hour. He was greatly in favor of a center beaming truck for double trucks.

Mr. Bradford, of Worcester, did not agree with Mr. Farrington as to brake shoes, but thought the key and brake head should be retained.

It was then voted to appoint a committee to prepare specifications for a standard wheel, and decide what is the best weight, size, width of tread, and depth of flange. The chair appointed



DIGHTON ROCK PARK.

wheel cars and rigid trucks jump the rail, and is also one of the reasons why unequaled trucks are so very destructive to the road-bed. Heavy weights are constantly being brought to bear upon pairs of wheels, and in many cases these weights amount to a considerable portion of the whole weight of the car.

The truck should not only be equalized, but should have a swing motion, with links (and I prefer spring links) as well as other sets of springs, which take up the first shock of the wheels upon the rails, but also other springs being composed of half elliptic, which will give the car an easy slow acting motion, together with helical springs, which will take care of the little humps.

The equalization, or in other words, the distribution of the load upon the wheels, should be perfect, and no opportunity be given for a wheel to jump at a moment when the load is removed, as there should be no leverage against the springs.

This constant and even distribution of weight should make the truck ride very easy on the track. Whatever contributes to the

Messrs. Windsor, Farrington and Rauch to act as this committee.

The meeting adjourned at 10:30 p. m.

### DIGHTON ROCK PARK.

Among the many street railway parks scattered through Eastern Massachusetts, none has been designed and laid out with greater skill than Dighton Rock Park, midway between Taunton and Fall River, on the Dighton, Somerset & Swansea Electric R. R. The grounds, which are located on the Taunton River, 9 miles from Taunton and 8½ miles from Fall River, include about 25 acres, all of which had to be graded, sodded and planted with foliage and shrubbery, as nature had left the place almost barren of natural beauties. However by the skill of the landscape artist, with the expenditure of about \$60,000 the park has been converted into a

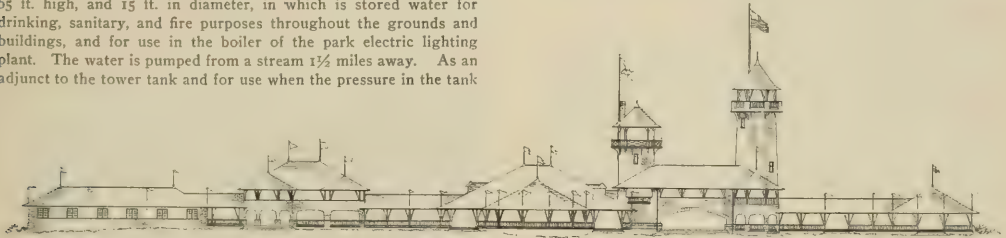
most attractive spot, and is now the popular resort of the country for miles around.

Aside from the work of beautifying the grounds the principal improvement has been the erection of a long pavilion, which combines under one roof, a bowling alley, billiard hall, restaurant, dance hall and children's building, with a wide promenade extending the length of the building and connecting these various rooms. The building is 525 ft. long, and a general idea of its design can be had from the line drawing and photograph reproduced herewith. About in the center of the pavilion are two towers, one 85 ft. high, and one 65 ft. high, with balconies around the top from which an extended view of the river and the surrounding country can be had. The larger of the two towers serves as a cover for a huge water tank, 65 ft. high, and 15 ft. in diameter, in which is stored water for drinking, sanitary, and fire purposes throughout the grounds and buildings, and for use in the boiler of the park electric lighting plant. The water is pumped from a stream  $1\frac{1}{2}$  miles away. As an adjunct to the tower tank and for use when the pressure in the tank

and the company believes that by combining the attractions under one roof in this way, far more satisfactory results are secured than by scattering them around in separate buildings.

During the summer good vaudeville performances are given on pleasant afternoons and evenings, and this feature is also managed in a rather novel way. Properly speaking, there is no theater, but the shows are given on an open stage, set on the lawn in front of the pavilion, and the audience arranges itself as it chooses, on the lawn, along the pavilion railing, in the dining room, or in the towers. The stage is 32 x 42 ft., with dressing rooms beneath the stage floor.

The street railway fare between Taunton and the park is 25 cents



ELEVATION OF PAVILION.

drops below 50 lb. per sq. in., a smaller tank with automatic air compressor is provided nearby for preserving the pressure in the fire hose and stand pipes with which all the buildings are fitted, these precautions having been taken at the request of the insurance company. The pavilion, including the towers and its various wings, is solidly built of hard pine, finished in tan color, with shingle roof painted red. The electric lighting system is elaborate, and includes 50 arc lights on the walks and lawns, and 1,200 incandescent lights in the buildings. The park has its own lighting plant which was installed at a cost of \$12,000. Near the children's end of the pavilion is a merry-go-round, and a bank of fine sand in which the little ones may play to their heart's content. Dancing in the hall is free, and as no liquor is allowed on the grounds, and perfect order is maintained at all times, the most refined people from both Taunton and Fall River do not hesitate to enjoy the dancing privileges. The long promenade is also a popular feature,

for the round trip, which also includes admission to the grounds and buildings. Many of the park patrons also come from points along the river by steamboats which land at a wharf provided by the railway company. The steamboat passengers are afforded the same privileges as patrons of the electric cars.

The restaurant, merry-go-round and other concessions, are leased for the season to outside parties at a stipulated sum. A long siding at the entrance of the park enables the company to store 20 or more cars at a time for service during the homeward rush.

## EXHIBITORS AT THE PAN-AMERICAN EXPOSITION.

Among the exhibitors that will be at the Pan American Exposition are the following firms and companies in the street railway and electrical fields. Many of these concerns will in addition to their exhibits have their apparatus placed about the grounds in the service of the Exposition:

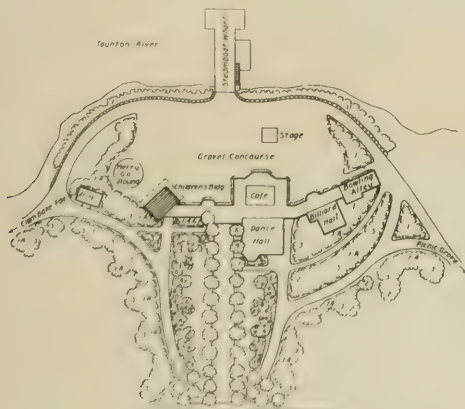
General Electric Co., Schenectady, N. Y.  
 Morris Electric Co., New York.  
 H. B. Camp Co., Akron, O.  
 American Vitrifed Conduit Co., New York.  
 Cutler-Hammer Manufacturing Co., Milwaukee, Wis.  
 Gould Storage Battery Co., Depew.  
 National Carbon Co., Cleveland, Ohio.  
 Northern Electric Manufacturing Co., Madison, Wis.  
 Stanley Electric Manufacturing Co., Pittsfield, Mass.  
 Electric Storage Battery Co., Philadelphia.  
 Crocker-Wheeler Co., Ampere, N. J.  
 Bullock Electric Manufacturing Co., Cincinnati.  
 Westinghouse Electric & Manufacturing Co., Pittsburg.

## PHYSICAL REQUIREMENTS FOR CAR MEN.

The Consolidated Street Railway Co., of Worcester, Mass., has decided that undersized men will not hereafter be engaged as motormen and conductors, and a standard of height and weight has been prescribed for all future applicants for these positions. The requirements are given in the following notice which has been posted:

"Hereafter all applicants for positions as conductors on the Consolidated Street Ry. must be 5 ft. 7 in. tall and weigh 145 lb., before their applications will be considered. Applicants for positions as motormen must be 5 ft. 7 in. tall and weigh 160 lb."

The small men already employed on the road will not be affected by this rule.



PLAN OF BRIGHTON ROCK PARK.

- |   |  |
|---|--|
| 1. Gravel (Horse) (Hesperis matronalis)       | 7. Indian Currant (Elaeagnus angustifolia) |
| 2. Silver Birch (Betula alba pendula)         | 8. Japanese Rose (Rosa rugosa)             |
| 3. White Birch (Betula alba)                  | 9. Sweet Pepper Bush (Clethra alnifolia)   |
| 4. Larch (Larix laricina)                     | 10. Hardy Hydrangea (Hydrangea paniculata) |
| 5. California Privet (Ligustrum californicum) | 11. Hardy Perennials                       |
| 6. Red Cedar Dogwood (Cornus sanguinea)       |  |



## CANADIAN NOTES

The Glen Tay Power Co., Ltd., has made application for incorporation, share capital \$50,000.

The Hamilton Radial Ry. will commence work in a few days on the extension of its line to Oakville.

The Hamilton Street Ry. has ordered 10 large summer cars from the Stephenson company, of New York.

The bill incorporating the Niagara District, Wellandport & Dunnville Electric Ry. was reported without change.

The Toronto Suburban Ry., has equipped its cars with the Providence fenders in accordance with the government suggestion.

The Norwood & Apsley Electric Ry. asks incorporation to construct a railway between Norwood and Apsley, in Peterboro County.

The British Columbia Electric Railway Co. advertising for tenders for the construction of a large addition to its buildings at Goldstream.

It is understood that American capitalists will make an offer for the Brantford street railway system, and if the deal is consummated, as it probably will be, the line will extend to Paris.

The Metropolitan Ry. is seeking entrance into Toronto, and a great deal of interest is being taken in the application by citizens generally and shareholders of the Toronto railway in particular.

A deputation of clergymen and others has waited on the Ontario Government and asked that steps be taken to restrict electric railway traffic in the Niagara Peninsula on Sunday during the time of the Pan-American Exposition.

The Ottawa Electric Railway Co. has purchased a cast welding outfit and have commenced to weld the joints on the various lines throughout the city. The work is being carried on at night and does not interfere with the regular service.

The Ingersoll Street Ry. is negotiating with the Toronto Radial company regarding the taking over of the charter of the local line, but so far no agreement has been reached. The local road is in the market, and offers for its purchase will be received from other sources.

Wire thieves are operating near Montreal, and a few nights ago secured several hundred feet of wire along the line of the Lachine canal. The wire stolen, which is not used during the close of navigation, was cut up into short lengths and disposed of as junk, has been found, and it is expected that the thieves will be apprehended.

At the meeting of the Longueil Council it was announced that the Longueil Electric Ry. had completed arrangements whereby the Grand Trunk Railway Co., will operate the line of the former company across the Victoria Bridge, and connect with the cars of the Montreal Street Railway Co. This will give Longueil a much desired connection with Montreal.

Control of the Montreal Terminal Ry. has passed into other hands, and the company has been reorganized. W. Dale Harris, of Ottawa, who has been identified with the company ever since its commencement, has resigned the presidency, and sold out his interest in the road, which represented one-half the stock. The retirement is also announced of J. B. Butterworth, vice-president, and of J. J. MacGee and R. Carr Harris two of the directors. Under the reorganized board D. Murphy has been appointed presi-

dent, with H. H. Melville as vice-president, and under the management of J. P. Mullarkey, the company proposes carrying out the operations and extensions as previously outlined.

At the recent meeting of the Ontario Surveyors' Association here the question of the threatened damage to Lake Erie ports, consequently to the lowering of the level of the lake consequent to the enormous quantities of water drawn off by the Niagara River to furnish electric energy at the Falls, was thoroughly discussed, and remedial measures proposed.

Sunday cars were given quite a setback by the railway committee of the Legislature in connection with the bill permitting the South Essex Electric Ry. to extend its lines to Leamington. The clause permitting the running of Sunday cars was opposed by several resident ministers, and the opinion of the committee also inclined against it, the clause was therefore struck out.

A new company, known as the Montreal Light, Heat & Power Co., has just been granted a charter. The new concern is capitalized at \$17,000,000 and will take in the Consumers Gas Co., the Royal Electric Co. and the Chambly Power Co. The fact that four of the board are directors of the Montreal Street Railway Co., lends color to the rumor that the latter company will also come into the combine.

The harnessing of the great water power of the Upper Ottawa is now the order of the day. A well-known Montreal gentleman has secured concessions at a point known as Chats Falls, about 20 miles above this city, where there is 100,000 h. p. available. A town site of 2,000 acres has been laid out and the promoters claim that industries equalling in magnitude those of Sault Ste Marie will be established at this point in the near future.

The Montreal Ry. has acquired control of the Montreal Park & Island Railway Co., whose lines run from the north end of the city to Back River, Outremont and other suburban points, and to Lachine. The acquisition of these lines will give the Montreal Ry. complete control of the traffic in these districts, and is an important addition to the system. The company is also negotiating with the town of St. Louis with a view of extending their lines to that place.

The long expected extension of the Toronto Suburban Ry. through the township of Etobicoke is now to be realized. This question has been dealt with on various occasions during the past year, but owing to the opposition of the township, nothing was accomplished. This has finally been overcome, and the company has agreed to commence work not later than September, and to have cars running within one year, the township on its part granting right of way.

The city engineer of Toronto has recommended that the street railway be utilized for the purpose of hauling all kinds of refuse and street sweepings from depots established in different sections of the city, to the dumping ground at Ashbridge Bay. There is a clause in the railway companies charter which provides that the rate for hauling shall be \$1.50 per car of 10 tons, and as the work could be done at night, there is a strong probability that the street railway will be employed for this purpose.

The Montreal Railway Co. have signified to the council its readiness to commence work on several streets previously designated, and ask that immediate permission be granted to proceed with the work, under the terms of its charter. The proposition is being vigorously opposed by a number of the leading cartage companies, who claim that the narrow business streets of the down town district are already almost monopolized by the street railway company, rendering teaming difficult, and ask that no further track laying be allowed. The railway company, however, has notified that if permission is not forthcoming it will proceed with the work without it.

Considerable antagonism is being directed against a proposed electric road through Littleton, N. H. A number of citizens have declared they will never ride in the cars if the road is built.

## Steubenville, Mingo & Ohio Valley Traction Co.

The opening of the Steubenville, Mingo & Ohio Valley road last fall disclosed one of the most picturesque as well as circuitous routes which has ever been followed by an electric railway. The idea of connecting Steubenville and Mingo had previously been considered almost an impossibility on account of the physical aspect of the intervening country. These two towns are in the same township and are only a little over two miles apart on an air line, but they are separated by a hill which rises to a height of 500 ft. and slopes abruptly down to the Ohio River.

In order to connect these towns it was found necessary to lay out a route over the hills somewhat over five miles in length.

Mingo, O.

Wellsburg, W. Va.



FIG. 1 VIEW FROM ALTAMONT HILL.

which probably describes one of the crookedest paths ever traveled by an electric street car. The line ascends the hill to a height of 500 ft. and then descends to the river's edge on the other side, but nowhere in its course do the grades to be climbed exceed 7 per cent. In winding about the hillsides a number of horse-shoe and letter S curves can be plainly seen from the car in descending the hill. At some points cuts were made through solid rock to the depth of 40 ft., which required several months of blasting, and at one place the line passes along the edge of a precipice overhanging the river at a height of several hundred feet. From a seat in the car one can look straight down into the river, and the Panhandle trains which pass along the foot of the hill appear like toy trains.

The scenery along the route of the railway is unsurpassed. Along part of the way the line runs through thickly wooded forests from which it emerges at intervals, giving the passengers many glimpses of rugged mountain scenery. From the top of the hill, along which the road travels for some distance, an unbroken view is had for 15 miles in all directions.

The road includes 5½ miles of single track and the work on the extension of the road to Brilliant, O., has already been commenced. The latter extension will be four miles in length. The rails are of 73-lb. T-section and are laid on white oak ties 2 ft. between centers. Suspended rail joints are used and the whole roadbed has a 12-in. crushed limestone foundation. The rails are bonded with "Crown" bonds of the figure 8 style.

The overhead construction consists of bracket and span wire work, the trolley line being the figure 8 section of the American Steel & Wire Co. and having a No. 6 section. This is fed by four No. 0000 feeders aggregating 4 miles in length. All the overhead fittings were made by the Ohio Brass Co. and the work is carried on wooden poles. Fig. 1 shows a view of the line winding around on the side of the hill and gives a good idea of the diversity of the scenery visible from the cars of this line. To the left in the picture down in the valley lies the town of Mingo, while further up the river on the opposite side the city of Wellsburg, W. Va., may be faintly traced. This road connects at Steubenville with the P., C., & St. L. R. R., and its Chester branch; the P. W. & Ky. R. R.; the C. & P. R. R. the W. & L. E. R. R. and the Ohio River boat. At Mingo the same connection is made with the exception of the P. W. & Ky. and the Chester branch of the P., C., & St. L. roads. On the opening of the line there were four cars put in service, two being open and two closed cars. Four more cars have since been ordered. These cars were made by the Jewett Car Co. and are 30 ft. long with vestibuled platforms.

The open cars have a seating capacity for 60 passengers and the closed or convertible cars seat 30 each. They have spring cane upholstered seats with walkover reversible backs and are painted chrome red and yellow on the outside and have mahogany and bird's-eye maple finish inside. There are four electrolights of two lamps each in the cars. Both the rolling stock and roadbed are well built and thoroughly modern.

The cars are mounted upon Peckham trucks of the "Cincinnati Special" No. 7 type and carry two Westinghouse No. 49 motors of 35-h. p. each. The trucks are used with 33-in. wheels.

The power-house, which is situated outside the town and close to the line of the road, is shown in Fig. 2. It is divided into an engine and a boiler room. The entire building is 148x50 ft. in dimensions, the engine room measuring 80x50 ft. and the boiler room 68x50 ft. The structure is of brick. The engine room contains two 300-h. p. engines, each of which drives a 175-kw. Westinghouse generator. There is also a 100-h. p. generator used for lighting purposes. The switchboard in the engine room contains four panels 7 ft. high by 2 ft. wide, upon which are mounted Weston volt and ammeters and Westinghouse circuit breakers. The boiler room in the rear of the building contains six 100-h. p. boilers with feed water heaters, pumps and injectors. The boilers carry 100 lbs. pressure. Alongside the powerhouse is a coal bank belonging to the company which has been opened on a 30-acre tract, from which the fuel supply is obtained. About six tons of bituminous coal is used per day.

The car barn and repair shop which adjoins the company's office are illustrated in Fig. 3. The former building is of brick, 105 ft. long and wide enough to accommodate four tracks. A brick partition runs longitudinally through this building separating one of the tracks from the other three, and the single-track compartment is utilized as the repair shop.

The average speed of the cars on this road is 8½ miles per hour and the cars average 150 miles per day. In addition to its regular passenger traffic this road also makes a business of carrying express packages in a combination baggage and passenger coach which is the best paying car on the line. Electric signals are used along the route and an electric car telephone system has been added lately.

In connection with the electric railway the company has estab-



FIG. 2 POWER HOUSE.

lished a pleasure resort at the top of the hill known as Altamont Park. In times past this towering hill was so inaccessible that it was about half a day's journey to reach its summit on foot, and for this reason the spot has been but little explored by visitors. On July 16, 1900, when the Steubenville, Mingo & Ohio Valley road was opened, more people visited Altamont Park than had ever reached the summit of the hill in five years previous. The park contains about 75 acres of ground of which 20 acres is situated directly on the summit of the hill, which is comparatively

level. The remainder of the park is located on the hillside terraces immediately adjoining the summit, and the whole area of the park has been laid out by a landscape gardener with groves, lawns, flower-beds and driveways of broken white stone, making it a most attractive summer resort, yet without detracting from its natural rugged beauty. The company has set aside \$25,000 for further improvements of this park, which will be completely



FIG. 3—OFFICE AND CAR HOUSE.

equipped for every form of outdoor sport and amusement for the coming summer season.

The largest building which so far has been erected in the park is the Casino, illustrated in Fig. 4. This is situated on the brow of the hill overlooking the river and is surrounded by broad and spacious covered verandas. The building is 120x70 ft. in size, including the verandas, which are 10 ft. wide. The interior contains an elevated stage for entertainments and the auditorium floor is finely finished in hard wood for dancing. The building is brilliantly illuminated by night with hundreds of incandescent as well as arc lights and is heated by steam during the winter months. A spur track from the electric road has been built to land passengers at the door of the Casino in inclement weather.

The park contains six large groves of native woods, each of which is capable of accommodating a church, Sunday-school or



FIG. 4—CASINO.

lodge picnic and insuring privacy and freedom to a large party. Benches and tables have been provided among the trees and all the underbrush has been cleared away. There are, besides numerous smaller groves, which will accommodate a number of small picnic parties. In addition to a large well near the casino there are 12 springs of pure water to be found throughout the park, at least one being situated near each grove. At different parts of the grounds there are laid out golf links, a baseball diamond, ten-

nis courts and shooting ranges and traps. Before the opening of the summer season there will be added merry-go-rounds, coaster railroads, bowling alleys and all the usual amusement features of outdoor resorts.

The company has recently erected a large passenger waiting room at the Altamont station, and in the rear of this building four bowling alleys have been fitted up. This building is about as large as the Casino.

In addition to the 75 acres in the park the company owns 75 acres which has been laid out in building lots 60 x 140 ft. in dimensions, which are now being sold. A water supply, natural gas and electric lighting are to be introduced into this sub-division.

The traffic on this electric road has been most satisfactory from the first day the road opened. On Labor Day the road handled 10,782 passengers with but six cars, and hundreds of people take the round trip rides solely for the view of the river valley scenery.

The officers of the company are: President, W. H. Hearne; vice-president, W. Lipphardt; secretary, F. H. Eick; treasurer, L. E. Sands; chief engineer, O. C. Pillichody; electrical engineer, W. Gerber; superintendent, Louis Lipphardt; attorney, J. H. McKee. The general contractors for the road were Hallock & Sands, Wheeling, W. Va., who are also directors of the company.

### MAINTENANCE OF WAY ASSOCIATION.

The second annual meeting of the American Railway Engineering and Maintenance of Way Association was held at Chicago, March 12th to 14th, there being about 125 members of the association in attendance. The business meetings were held in the banquet room of the Auditorium Hotel and exhibits were displayed in hotel parlors. Most of the exhibits consisted of models, blue prints, photographs and catalogs, lack of space preventing the supply men from showing bulky articles. Among the companies having exhibits were:

The American Steel & Wire Co., wire fencing; represented by George P. Rider.

Fairbanks, Morse & Co., models of hand cars, jacks, track bolts and joints, catalogs, blue prints, etc.; represented by George Akers, A. H. Davis, S. M. Ball, W. H. Stearns and A. A. Taylor.

Lidgerwood Manufacturing Co., New York, photographs of Lidgerwood rapid unloader and of electric winches; represented by W. H. Baldwin.

Kinnear Manufacturing Co., Columbus, O., sample curtains and catalogs; represented by R. H. Kinnear.

Eureka Nut Lock Co., Pittsburg, "Eureka" nut locks; represented by S. D. Barnett.

Anderson Dupuy Co., Pittsburg, track tools and springs; represented by Garson Myers.

Perfection Rail Joint Co., Cynthiana, Ky., "Perfection" rail joint; represented by H. Redmon.

Cambria Steel Co., Philadelphia, 100 per cent rail joints; represented by A. Morrison and M. W. Thompson.

Link Belt Machinery Co., Chicago, photographs of coal handling machinery; represented by J. Wepner.

Railroad Supply Co., Chicago, tie plates and steel posts; represented by F. W. Edmonds.

National Lock Washer Co., Newark, N. J., lock washers; represented by R. L. Thomas.

Weber Rail Joint Co., New York, Weber rail joints for standard T and girder rails and compromise and insulated joints; represented by C. P. Cogswell, jr., and W. A. Poor.

Many companies were represented at the convention, but did not make exhibits. Among the representatives of these concerns were:

J. G. McMichael and R. V. Kent of the Atlas Railway Supply Co., Chicago.

E. S. Nethercut of the Paige Iron Works.

H. M. Montgomery, L. F. Braine and W. E. Clark of the Continuous Rail Joint Co., Newark, N. J.

W. H. Elliott of the Elliott Frog & Switch Co., St. Louis.

Officers were elected for the ensuing year as follows: President, G. W. Kittredge; vice-president, A. W. Sullivan; secretary, L. C. Fritch; treasurer, W. S. Dawley; directors, J. Kruttschnitt and T. F. Whittelsey.



## ACCIDENTS.

The motormen and conductors of a street railway are the only representatives of the company with whom the great majority of the passengers come in contact, and much depends upon the conduct of these employees. Carelessness or ignorance on the part of the car men will surely result in a large sum being entered under "Damages" in the company's annual statement. Further, the conduct of this class of employees is instrumental in determining the feeling which the public in general has towards the road.

When Mr. Ira A. McCormack was appointed general manager of The Cleveland Electric Railway Co. in April, 1900, the number of accidents was considerably in excess of 300 per month, the average per month for the first half of 1900 being 333. For the latter half of 1900 the accidents by months were July, 296; August, 253; September, 207; October, 169; November, 131; December, 138.

The principles of the method by which Mr. McCormack was enabled to accomplish this result were: Thorough instruction of the men in their duties. Thorough inspection by competent men.

An applicant for the position of motorman is given a copy of "The Motorman and His Duties," which is published by the "Review," to be studied as a text book and is put on a car to receive practical instruction from the motorman. After 10 days on the car as an on-looker only, the new man operates the car himself under the eye of the regular motorman. At the end of 10 days more the new man is examined by the general superintendent. Mr. Charles Currie (this being required by city ordinance), and if found satisfactory is put on the extra list. Failing to pass the examination, the applicant must devote more time to learning his duties.

The men who have runs are further assisted by the inspectors, who, whenever a fault in handling a car comes under their eyes, board the car, point out faults to the motorman and show him what the proper method is and how to avoid the same mistake in the future. The inspectors, of course, make reports, but nothing is said to the motorman by those higher in authority. The inspectors before being put on that duty become thoroughly familiar with the apparatus and its operation by work in the shops, so that they are competent to instruct the car men.

The endeavor has been to show the men how to avoid acci-

Accidents are tabulated on blanks and submitted to the general manager daily, the classification being as follows:

- Adults struck by motor.
- Children struck by motor.
- Collision with vehicles, horses, cows, etc.
- Collision of cars.
- Accidents to employees.
- Passengers ejected, trouble about fares, transfers or disorderly conduct.
- Fell off cars.
- Fell in cars.
- Fell getting off cars.
- Fell getting on cars.
- Electric shock.
- Derailment of cars.
- Gates damaged.
- Running board accidents.
- Miscellaneous.
- Total.
- Cars damaged.
- Personal injuries.
- Fatalities.
- Life guard.

One of the blanks for reporting accidents is shown reduced; the original size was 8x11 in. On the reverse side is space for the motorman and conductor to write their accounts of the accidents. Instructions are as follows: "Employees are required to fill out accident reports promptly and leave them with the starter, or at the superintendent's office, immediately after the accident happens. Report every accident, no matter how slight it may appear to you, even though no damage or injury exists, or is claimed. Report full particulars of any trouble with any passenger, arising from refusal to pay fare, disorderly conduct, ejection from cars, or from any other cause. Every employee, who may witness an accident in which this company may be interested, is required to fill out one of these blanks and send it to the superintendent's office. In your statement state fully how the accident occurred."

## STREET CAR FUNERAL CORTEGE.

The practicability of using street cars in funeral processions was shown last month in Cleveland, O., at the funeral of Mr. Frank A. Heinline, an old employee of Cleveland Electric Railway Co., and for the last three years the paymaster of the road. The home of the deceased was but a few doors from the company's Cedar Ave. car line, and the house was more than filled with the company's employees while simple funeral services were conducted.

The undertaker arranged a schedule for the minister so that the latter should conclude his service at a certain time. This was necessary so that the street should not be blocked by the procession. The service was concluded and the casket borne to the car line just as the first car of the funeral procession arrived. This was the funeral car owned by the company, and which has been used for small funerals for some time, although this is the first occasion on which it has been a part of a regular procession.

After the funeral car came the private car of Henry A. Everett, president of the company. This was occupied by a number of officials of the company, in whose regard Mr. Heinline had won a warm place during his eight years' employment by the railroad.

Behind these two cars were five trolley cars such as are used in the ordinary traffic of the company. These were filled by the employees of the company and the other friends of Mr. Heinline who attended the funeral, making it in point of numbers one of the largest funeral corteges that ever passed through the streets of the city. Unique as it was, the funeral procession was a solemn and impressive sight.

The cemetery was reached in about 20 minutes, and the members of the funeral party left the trolley cars. It took but five minutes to embark in the trolley cars at the house, and no longer to leave them at the cemetery, and the traffic of the railway was not impeded at all. Everything moved with the utmost precision.

Many of the men who attended the funeral were off duty but a short time, and it would have been impossible for them to have made the long journey to the cemetery in carriages in the limited time at their disposal.

File 30

## The Cleveland Electric Railway Company.

## ACCIDENT REPORT.

**NOTICE:** DO NOT FILL OUT THIS ACCIDENT ONLY TO OFFICERS OF THIS COMPANY. KEEP AWAY FROM INJURED PARTIES AND HAVE NO COMMUNICATION WITH THEM AFTER THEY HAVE BEEN LASHED TO.

Date of Accident \_\_\_\_\_ Time of day \_\_\_\_\_ Line \_\_\_\_\_

Exact place of Accident \_\_\_\_\_

Name and Residence of Person Injured, or owner of Property Damaged \_\_\_\_\_

Nature and extent of Injury \_\_\_\_\_

No. of Motor-car \_\_\_\_\_ Kind of car \_\_\_\_\_

Direction in which Car was going \_\_\_\_\_

Direction in which other Vehicle was going \_\_\_\_\_

Motorman \_\_\_\_\_ Conductor \_\_\_\_\_

Position of Conductor at time of Accident \_\_\_\_\_

Position of Person or Vehicle injured at time of Accident \_\_\_\_\_

WITNESSES:

Signature \_\_\_\_\_

Signature \_\_\_\_\_

## ACCIDENT REPORT BLANK.

jents, and to be lenient with first offenses, so that the men will not become discouraged, but try to do better.

In regard to the number of accidents as previously given, it should be stated that the term "accident" includes what might be called "incidents." Thus if the person is seen to leave the car in safety and to stumble and fall in the street or on reaching the sidewalk, it is reported as an "accident." The reason for doing this is that a suit was once brought by a person who tripped on the curb stone after leaving the car.

## GRADUATION.

Extracts from a report to the American Railway Engineering and Maintenance of Way Association, submitted by W. McNab, C. Dougherty, R. C. Barnard and H. Baldwin.

The term "Graduation" as here used is intended to embrace the preparation of the ground, the excavation and placing of the material, and other general work incident to the formation and maintenance of the railway roadbed and yards.

It is therefore the fundamental element in construction, and upon the design adopted for the cross-section of the roadway and its accessories, and the manner of placing in the embankment the several kinds of material from excavation, will depend largely the future cost of maintenance.

Innumerable instances are noticeable in which much expenditure after construction might have been avoided or minimized, if false economy had not been originally practiced, by making insufficient width at sub-grade, and giving too steep a pitch to the slopes of the cuts and fills; as well as by the neglect of drainage features, requiring ultimately substantial rectification.

In the extent of territory embraced by the lines having representation in this association, every physical, climatic and commercial condition and influence exists, and therefore no plan or dimensioned section can be taken as standard that will absolutely apply to all. In regard, however, to the shape, dimensions, and other features connected with the roadbed, and matters generally incident to the slopes, drainage, and maintenance of embankments and cuttings, it has been the aim of the committee to keep in view the broad lines of good theory, and the best practice, recognizing that if these be rightly understood, ordinary details which may vary in individual instances, according to locality and special surroundings, can be accommodated to them.

The committee has made an analysis of the drawings and specifications of representative railways in all parts of the country, and the fact intimated in last year's report that great dissimilarity exists in standards, even under similar general conditions, is much emphasized by this analysis.

Some roads use no general standards in regard to cross-sections, or have standards which exist only on paper; others have plans which have been in use thirty or forty years without revision to meet modern requirements of loads and speed, and are time-honored. Some have standard sections, the general principles of which are the same as those used by a larger system, but which have been slightly altered without apparent reason—and frequently to the disadvantage of the road making the change; others have admirable plans, with ideas carefully thought out, but which leave room even yet for modification or amplification, whilst still others have plans in which the cost of the work represented is beyond the financial resources of ordinary roads.

After this analysis, the committee is of the opinion that in many instances a needless refinement is exhibited in regard to the shape of the roadbed at sub-grade, viz., a curve, series of curves, or a series of planes at various angles, shapes which are not easy to make and maintain, and are rarely adhered to in actual practice. Simple drainage planes of a uniform slope of .04 per foot falling from each side of the center line of roadway are easy to make, and are found to be effective.

The width of roadbed is also, generally speaking, too narrow—20 ft. on embankments, and a corresponding width between ditches in cuts should be taken as minimum for single track, on what may be termed a first-class road, with an addition of 13 to 14 ft. in case of double track.

The surface ditches in cuts should be kept well below the intersections of the sub-grade planes with the planes of the slopes of the cut, and the shape such, as can most economically be maintained. Surface ditches on curved portions of the road should be on the same level, the inclination of the track being made up in the ballast.

In order to benefit railways generally, and more especially the smaller lines, or those with limited means, it is the intention of the committee in a future report, to submit sketches of roadbed with its several accessories, that might be taken as a standard for a first-class road, and at the same time show how such can best be modified to suit these smaller lines.

On preliminary and location profiles, the several descriptions, or the nomenclature indicating the classes of material or the kinds

of ground, are frequently imperfect or misleading for the proper determining of the most suitable slopes, and the best methods of dealing with unstable ground upon which embankments are to be constructed. The engineer of location should therefore not only possess a thorough practical knowledge of the condition and physical composition of every class of soil and rock met with, but be precise in recording it.

To ensure substantial embankments, much depends upon four important features—first, proper clearing and grubbing of the ground to receive the earthwork; secondly, that the nature of the ground is either suitable for supporting the fill which is to overlie it, or can be made so by drainage or otherwise; thirdly, placing of excavated material in the most suitable locations with regard to greatest frictional resistance in masses; fourthly, trimming to the slope adopted.

In embankments of 2 ft. or less in height, the whole of the space occupied should be thoroughly grubbed out, and where they are more than 2 ft. and less than 4 ft., all trees and stumps should be cut at least 2 ft. below sub-grade.

In preparing unstable ground for the embankment, it should be subjected to the closest examination as to its nature, with a view to remedy before placing material upon it. Preliminary drainage is frequently all that is necessary. If the land is swampy, with a thin crust of insufficient strength for the weight to be supported (commonly called a "sink hole") it may be necessary to continue filling in material until a solid foundation is obtained, in order to secure a roadbed that can be used with undiminished speed, but there are numerous other methods, each depending on local conditions.

If the swampy material be on a side hill, it should first be drained by means of a side ditch on the upper side, parallel to the roadway, and the water led off to the lower side by means of cross drains.

A case has been noted in which a swamp or bog of about half a mile in length is being crossed by a line at present under construction. This swamp or bog consists of a black soil somewhat like peat in its nature, which holds the water tenaciously. A ditch on either side of the embankment at a distance of 75 ft. from the center line was excavated down to the sand and gravel, a depth of 3 to 6 ft., but the water still stood between these ditches, and the bog material was about as impassable as before the ditches were cut. Cross trenches were then cut at intervals of about 50 ft., and boxes of 3-in. plank, open at the bottom, were put in, with a result that the ground has now dried up sufficiently to enable the material from the adjacent cuts to be hauled on to it, and from present appearance, it is anticipated that the weight will squeeze the water out of the blocks of ground into which this is divided, and eventually give a dry and good roadbed.

The material excavated from cuttings should be built up in the embankment evenly, and in horizontal layers not exceeding 3 ft. in height, each layer being carried out to full width at the particular height, any stone or heavy materials should as far as practicable be placed at the base of slopes. The best soil should be reserved for outer dressing, in the event of subsequent sodding or seeding.

Cases have come before the notice of the committee where great trouble and expense has been caused by defective banks due to sliding of the material in large masses. Investigation by cutting the bank revealed the fact that when originally constructed, borrowed material of heavy blue clay had been deposited at the base of the embankment with an inclined top plane, and overlaid with surface material from cuts, and that there was a well-defined line of cleavage between the two materials. The sliding of the embankment occurred on this plane, and it may reasonably be inferred that if it had been built up level, such sliding could not have taken place.

Much depends upon homogeneity in the mass of the fill, and to this end it is advisable (especially in woodland districts where there is frequently a leaf mould overlying a substantial sub-soil) at the end of cuttings, to strip the surface soil, if it is light and porous, to a depth of 18 or 20 in. below the grade line, and dump the portions of soil thus stripped into fills which would be a greater depth than 2 ft. below grade. By this means, the sub-soil material in the portions of the roadbed immediately below grade would be continuous from excavation to embankment. Homogeneity in the mass is naturally a check against large moves, and

at the top it is especially felt by giving a uniform firmness during summer, and a greater freedom from heaving in winter.

Experience shows that the slopes of cuttings, and more especially of embankments, when they attain their permanent set, are not the surfaces of planes, but more or less curved—a rounding off at the top, and a curving out at the foot. Cross-sections taken for double track, and other extension purposes on roads originally single-tracked, show how such earthwork has behaved in the past. This being the ultimate natural result, and as the solidity and permanency of the roadbed is largely dependent upon nature, and how natural effects are either assisted or retarded, it is best at the outset, when such can conveniently be done, to further its attainment by rounding off these angles.

Allowance for shrinkage of embankments of 3 to 7 per cent according to material should originally be made. It would be better to provide for this shrinkage by making the roadbed wider than standard, instead of adding to the vertical height, so that when settlement takes place, there will be width enough to fill out, and not unduly run down the slope.

Where embankments are made on a side hill, deep furrows should where necessary be plowed in the slope, in order to bind the new material thoroughly to it; and in the case of widening out for double track, and sidings contiguous to the main line or in other similar circumstances, it is best if the banks are over four feet high, to give them similar treatment.

The practice of reducing initial cost by taking out cuts with a wide base and steep slope, is one in which the temptation to follow it in original construction is often great. It should be avoided when possible, as the material is often of such a nature, that the sides soon begin to cave and slip, the result of which is the prohibition of first-class track until the defects are remedied, and the application of the remedy after the road is in operation almost invariably costs much greater than if it had originally been taken out to normal section.

The fundamental principle in maintenance is to keep the roadbed dry, and to insure this, every reasonable means should be employed to intercept the natural course of water from outside sources that would otherwise reach the roadbed, and then if by this means a sufficient degree of dryness is not obtained, sub-drainage should be employed.

The surface ditches at the foot of slopes in cuttings being for the purpose of draining the roadbed, and also for the purpose of protecting it by intercepting and carrying off the accumulation of surface water on the slopes from rain, and that due to seepage, they should be of sufficient capacity to take off readily the water from the heaviest rainstorm, and of such shape as can most easily be cleaned from time to time. It is believed that in ordinary cuttings, a ditch 9 in. deep, 12 in. wide at bottom, and slopes of  $1\frac{1}{2}$  to 1, generally meets these requirements. A true grade should be preserved for the bottom of these ditches and the greatest possible pitch given at their outlet.

In wet cuttings, where the soil is retentive of water, a supplementary sub-drain of tile, of 6 in. to 10 in. in diameter, laid in the following manner, is of great advantage to the maintenance of track, and gives excellent results: A trench is excavated to just below frost line, in which the tiles are laid with ends abutting, engine cinders are placed over the tiles to a depth of 2 or 3 in., and the remainder of the trench filled with coarse gravel or broken stone.

Occasionally in long and wet cuts, the size of the tiling should be increased as it approaches the outlet, increases from 6 in. to 8 in., and occasionally 8 in. to 10 in., the enlargement taking place at intervals of one-quarter to one-third of a mile, and depending upon the amount of water tributary to the cut, but necessity for enlarging seldom occurs, and generally the same size will answer all purposes.

In cuts through ground sloping transversely, a ditch should be made on the upper side, to intercept the surface water which would otherwise flow over the slope; but the distance to make this ditch from the edge of the slope, as well as its general characteristics, must receive due consideration, for the soil may be of such a permeable nature, and become so saturated with water from this ditch, that injury will result to the slope.

It is often better to have a broken stone or tile drain on the top of the cut to collect and carry off the water, or else pave or box the ditch to prevent damage from the water cutting through

the slope. In every case, however, where the general ground is sloping toward the cut, the nature of the soil should first be thoroughly examined, local conditions noted, and the main source of supply stopped or diverted where possible.

#### PROTECTION OF SLOPES.

Protecting the face of slopes on the older and more important lines is receiving much attention, and where done has been generally beneficial, and added much to the appearance. Sodding is the best and simplest method, if it can be well started and has sufficient proper soil to subsist upon. In most cases the extra expense of sodding, especially at time of original construction, will be made up in a few seasons by the security it gives against heavy maintenance charges. Sods from high, well-drained ground are the best, as those from swampy localities are apt, if exposed to the sunny side of a cut or fill, to dry out rapidly and disintegrate; still the latter can be used to advantage on the shady side of slopes, but the former are more resisting from their previous condition of growth. Sods for transplanting are best when about five years old, but in laying, extreme care is needed, and they should be secured by slender hardwood stakes driven well down into the ground, where the material on which they are laid is inferior.

Supplemental to the sodding, improved results can be obtained if for the first year a good mixture of timothy and oats seed be sown; it quickly forms strong roots and helps to hold the sod in place, afterwards as may be needed, a mixture of Kentucky blue grass, white clover, perennial rye, red fescue, and red top in the proportions of 8, 4, 9, 3, 8, respectively, making thirty-two pounds per acre.

Before sodding is begun, the slopes should be dressed to a reasonably fair shape. It is practically useless, however, to attempt sodding on unstable clay slopes which slide so deep as to carry away both sods and pegs, or on poor soil on barren slopes on which it soon burns out. When such conditions exist, other methods have to be adopted.

In warm climates, slopes of embankments composed of sandy material may be successfully protected by setting out on the embankment small tufts of Bermuda grass, planted about eighteen inches apart in each direction, the sod being collected and cut into pieces about six inches square. It is found that such frequently makes a substantial sod of Bermuda in twelve months.

Grass seed alone, even if the soil be fertile, is difficult to start on account of liability to washing away during rainstorms, but where it can conveniently and economically be used, it is well to do so.

Excellent protection on some soils, such as silt or slippery clay, and especially as a guard against washing, where the embankment is alongside the course of a stream which rises and falls considerably, is attained by planting willows. Such trees or shrubs are well adapted for the purpose, as they grow quickly, and are easily propagated from cuttings, and their masses of fibrous roots spread through the soil to a great depth, and hold the bank tenaciously.

Slag or ordinary rip-rap deposited in a layer of 3 ft. or more in thickness below water, and 2 ft. above water, has been found generally an efficient protection against abrasion of embankments, subject to ordinary currents or the wash of lakes, etc. In heavy rip-rap—i. e., where large stones are used with fair regularity, the bed of each stone in the face of the wall should be laid at right angles to that face, and a V-shaped trench dug, and foundation of the rip-rap laid in it, where there is danger of undermining and settlement of the rip-rap wall. Where the bottom is mud or quicksand, or liable to scour, brush may sometimes be satisfactorily used underneath the rip-rap.

There are many banks in which protection has been furthered by placing blind drains in the slopes at right angles to the line of track, consisting of loose rock put in ditches about three feet wide and four feet deep. Most of these banks had sloughed out more or less, and this sort of protection is an added feature, frequently after long use of the embankments; these broken stone drains serve the double purpose of carrying off sub-water, and acting as buttresses for the support of the embankment.

There are some instances where heavy cuttings exist through light sandy soil, in which the face of the slopes have been protected from the action of the wind, by covering them with a layer of clay from four to six inches thick. In this layer of clayey soil, grass and small shrubs take root, and serve still further to protect



the slope. In sandy soils, good results are also obtained by spreading engine cinders over the slopes of embankments and cuts, and very little washing away of the soil then takes place. The use of cinders on the slopes of cuts also prevents the drawing in of large quantities of dust during the passage of trains.

#### RETAINING WALLS.

The general subject of retaining walls is an important one, and the committee has in view an investigation of the general practice in a manner worthy of this importance. In subsequent reports it is the intention to present data and sketches illustrative of typical methods adopted throughout the country. Meanwhile only a few notes are submitted in order that they may form a basis for present discussion.

Retaining walls are used to protect the sides of cuts and fills against continual slidings, by building up and then lessening the slope—to curtail the spread of the slope of embankments on steep side hills, and that of cuts and fills where streets in towns are contiguous, or where land value is a vital matter of expense; they are also used in certain cases to prevent abrasion of the embankment by water, either by current or waves.

In fills, the walls are generally built in such location as to require the least masonry, and in cuts, the distance of face of wall should not be less than seven feet from the outside of the outside rail.

Permanent retaining walls are principally of masonry or concrete, or of both, the selection of the material being dependent on local conditions. They should generally have a batter of not less than one-quarter to one (although in some cases, as in cities or towns, they may have to be plumb), and be from 2 to 3 ft. wide on top, with base four-tenths to one-half the height, dependent on the condition of the ground back of the wall, and the quality of the masonry.

Drainage of broken stone or coarse gravel should be properly provided at the back of the wall, if the soil to be supported is retentive of water; but if the ground is of clean sand or gravel, this special drain need not be made. Ample weep holes should in all cases be placed in the wall, otherwise there may be disastrous failures, and there should be a drain in front of the wall, and parallel with it, to receive the output of these holes.

Pile retaining walls at some points where the embankments are low have been made, and the walls tied transversely with iron rods, but this does not give permanent satisfactory results, neither do cribbing of old ties, sand bagging, etc., although these latter methods often tide over difficulties for a considerable time, and are valuable as temporary expedients.

#### OPPOSITION TO ELECTRIC RAILWAY AT RICHMOND, KY.

An electric railway is to be built in Kentucky which will connect Lexington with a number of the adjacent towns, and the project has so far advanced that work on the line is to be commenced at once. While it has invariably been the rule that a street railway connection between a small town and a business metropolis has proved as much, if not more, to the advantage of the smaller place as to the larger one, there exists in Richmond, Ky., a strong opposition to what a local paper calls the invasion of its business territory by the prospective lines from Lexington. It seems somewhat paradoxical that the electric railway, which for the past ten years has been the most important factor in the development of suburban places, should be held up as a menace to the prosperity of any community.

#### TRIBUTE TO THE LATE C. L. MAGEE.

At a meeting of the Consolidated Traction Company's Employees' Relief Association, of Pittsburgh, Pa., held on March 11th, the following minutes on the death of Senator Magee were adopted: "The president of this association, Christopher L. Magee, died Friday, March 8, 1901. Upon the formation of this association he became its president and remained so until his death. He was deeply interested in the welfare of the association and in the welfare of its members. He cheerfully gave to the association the benefit of his counsel and judgment and generously contributed to its treasury. Altogether he was the association's most helpful and useful member.

"As between the traction company and its employees, he was a fair arbiter and always favored that which was just, this association has suffered a great loss in his death and this insufficient minute is made that we may to some extent record our appreciation of our departed friend."

#### STREET RAILWAY PARK SUGGESTIONS.

BY G. J. A. P.

At this season of the year the manager of a street railway begins to figure on his summer traffic and how to stimulate it, and naturally the question of what will draw the best crowds is the main point to be solved.

As all communities are not made up of the same class of people, what may attract a large number in one place may prove a failure in another. It becomes necessary for the manager to study the taste of his particular locality and supply those attractions which will be in keeping with the wants of the larger number of the populace.

A park suitably located is, however, always a drawing card, provided it is properly laid out and cared for. Then comes the question of providing the additional attractions. In some localities all semblance of entertainments on Sunday are generally tabooed and it would be a loss of money to attempt to draw people to the park on that day. In such cases one must figure on week day evenings for giving entertainments, and to make this pay it becomes necessary, either to fix the cost of the entertainment lower than for one on Sunday, or to have a sufficient amount of rolling stock to handle a large crowd quickly. If you have a large crowd during the evenings on week days you will have perhaps an hour or an hour and a half at most in which to take the people out, and, as a general thing, crowds going out in the evening all want to return at once as soon as the program is completed.

It is therefore advisable to have entertainments of various kinds two, three or four evenings each week. This will divide the crowds into various groups, and if the tastes of the people who attend these attractions are carefully noted, a manager can soon arrange his attractions so as to draw different crowds each evening, thereby dividing the population into groups and providing entertainment for all the people.

Then during school vacation months special "childrens' days" should be arranged. On such days attractions suitable for children should be provided, and if properly handled, this can be made a source of considerable revenue. Of course the liability of accidents from handling a large crowd of children is to be fully taken into consideration, and ample provision should be made for sufficient help to properly care for all children carried.

In this connection it may not be out of place to call attention to the liability of accidents at times when large crowds are being taken to and from places of amusement. The cars running to these places should be operated by the most careful, cool-headed men on the line, and should not run too close together or too fast when approaching a crowd of people. One accident may cost a road more than the entire season's profit. People on pleasure bent are notably more careless than at ordinary times and require more of a train crew's attention at such times than in the ordinary running.

All appliances of a mechanical nature in a park should be securely housed and out of the reach of inquisitive persons so as to avoid accidents from that source.

One of the most important requirements for making a park successful is to keep it free from the low or rowdy element. Rigid enforcement of the rule to eject all disorderly persons will assure the public they can go to the park at any time without being thrown in contact with objectionable persons. Once allow anything objectionable to occur at a park and it is but a short time until the better element will not go near it, and it soon becomes a dead load for the company. It pays better to refuse the use of a park to people who would cause adverse criticism than to allow them to use it, even though they would pay several days' expenses.

In very few localities can a park be run successfully where liquor is allowed on the grounds. Successful parks of this kind are rare, and liquors should not be either sold or allowed to be brought into the park by any one.

# MECHANICAL DEPARTMENT

## TEMPORARY REPAIRS FOR BROKEN AXLES.

A car with a broken axle is about as hard a thing to move as can be imagined, and the problem of getting a car thus disabled back to the car barn with the least interruption to traffic is a particularly aggravating one. In Denver, Syracuse and other cities, emergencies of this kind are met by keeping ready for use a small dummy or "bogie" truck, which can be run under one end of the disabled car as a substitute for the damaged pair of wheels, enabling the car to be pushed or pulled to the barn.

Mr. C. D. Brown, master mechanic of the Binghamton (N. Y.) Railroad Co., suggests the following ways of accomplishing the same results: From careful observation he has found that of the total number of broken axles, the break, in 80 per cent of the cases, occurs just inside and close to the hub of the car wheel, so that there is no way of temporarily splicing the two pieces. Mr. Brown explains that in these instances, the car may be brought home in the following way: Raise the end of the broken axle from the ground and support it by a chain passed around the axle and over a timber laid on the car floor across the open trap-door; then chain both wheels on the broken axle to the truck so they cannot turn. After this, by raising the wheel pit or cover over the wheel at the broken end, and driving two wedges between the outside of the wheel rim and the car sill, throwing the wheels to wide gage at the track line, the car may be taken to the barn on its own wheels. Of course the disabled pair of wheels will skid all the way, and if the distance is great, will probably be flattened, but a pair of wheels may sometimes be damaged with good grace in order to clear a blockade. If the car is not off the track, it can be prepared for moving in this way, in from 15 to 20 minutes.

Mr. Brown states that the other 20 per cent of broken axles break either close to the gear wheel, or else close to the collar that bears against the other end of the motor case. In the former instance, a good temporary repair can be made by loosening the split gear and moving it along the axle until the center of the gear is over the break, when the gear may be tightened and will serve as a clamp to hold the broken ends together. For use when the rupture is at the collar, Mr. Brown has a clamp, which is merely the hub of a broken split gear wheel, with the spokes and rim of the wheel removed. There are always one or two damaged gears around a shop from which the rim and spokes may be broken, leaving the hub for use in emergencies of this nature. Sometimes when the break is just at the collar seat, it will be necessary to run a narrow shim of sheet iron, 1-16 in. thick, around the axle in order to make the diameter at the seat equal to that of the gear hub clamp. If the clamp is properly put on and the bolts tightened the car can be brought to the barn by one motor, with all wheels turning and without further attention.

Mr. Brown states these expedients have helped him out of several mishaps during the past two years.

Consul Warner, of Leipzig, has written the State Department that there is great need for electric heaters in the street cars of that city, the three electric street railways in and about Leipzig not having a single car which is heated either by electricity or coal on the coldest days in winter. Formerly, when horse cars were in use, they were heated by placing coals of fire in iron boxes; but, after several months' trial, the system was abandoned. Mr. Warner urges the introduction of American electric street car heaters, but adds that, in order to meet with success, it will be necessary, first of all, to convince the authorities of the fact that the health of the general public is greatly endangered by riding in unheated cars during the winter months.

## TESTING INCANDESCENT LAMPS FOR RAILWAY SERVICE.

A number of street railway companies have found it necessary to make more or less elaborate tests of incandescent lamps to determine which make is best suited to their requirements the principal one of which is that the lamps shall have a satisfactory life when used five in series on the railway circuit. By reason of the special feature which the Calumet Electric Street Ry., of Chicago makes of elaborately illuminated cars for trolley parties during the summer months, this company finds the choice of suitable incandescent lamps more important than would some other roads. This company uses about 10,000 lamps per year.

By the courtesy of Mr. H. M. Sloan, general manager of the Calumet company, we are enabled to show here some of the results of lamp tests recently conducted by Mr. W. H. Harding, master mechanic of the road.

It is quite apparent that the most important requirement for lamps to be used in series on a railway circuit is that they shall

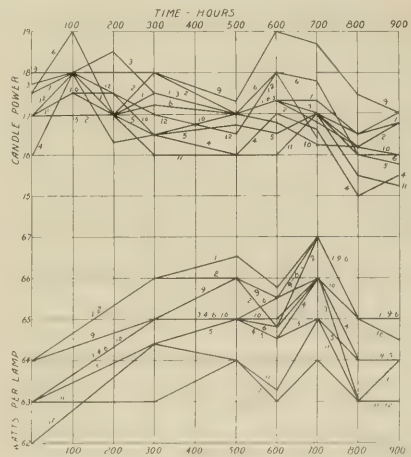


FIG. 1.

consume nearly the same number of watts per lamp; the efficiency, that is, the watt consumption per candle power, or the total candle power per lamp are of comparatively much less consequence. When the lamps are used in parallel on say a 110-volt circuit each lamp takes its proper current and stands by itself uninfluenced by the other lamps of the system. But with say five lamps in series the current flow is determined by the total resistance, and if one or two lamps have a low resistance and high candle power they will be quickly burned out. Thus even if the five lamps show exactly the same efficiency, a difference in their candle power will make a difference in the watt consumption per lamp such as to render them unsuitable for use in series.

The tests made by Mr. Harding included 14 different makes of lamps, and two makes were tested at 110 and 100 volts per lamp. For the purposes of the test 20 lamps were selected at random from stock and numbered from 1 to 20 inclusive. After being tested for candle power and watts per lamp, each set was then placed on the testing board in four series of five lamps each, no

heed being paid to the order in which the individual lamps were numbered. After burning 100 hours the lamps were again tested for candle power and total watts, and replaced on the test board, no effort being made to keep the same lamps in series, as it was considered that replacing them at random more nearly represented the usage they would receive on the cars. The tests for candle power and total watts were repeated after each 100 or 200 hours until the lamps were burned out.

The result for 10 out of each 20 lamps were plotted, making diagrams. Two of these diagrams are reproduced here, one show-

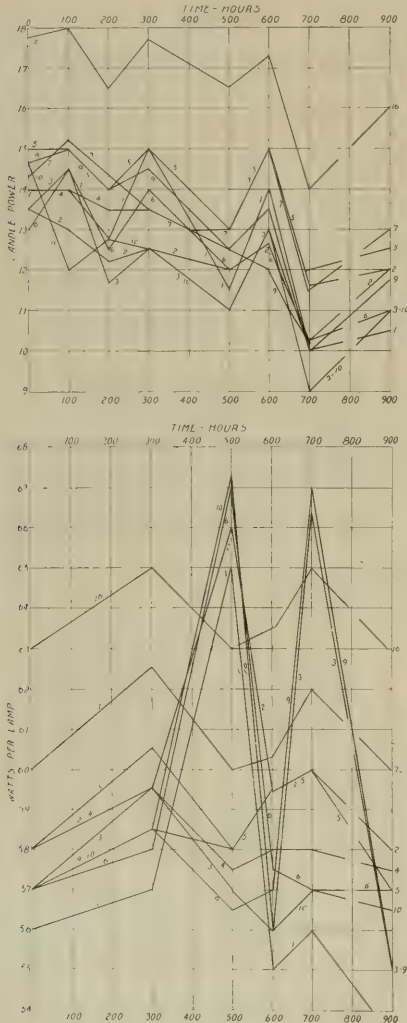


FIG. 2.

ing one of the best sets and the other one of the worst. For the diagrams the lamps numbered 1 to 8 inclusive were chosen and in addition the ones having the highest and lowest values for either candle power or watt consumption.

From an inspection of these diagrams the wide variation in watts per lamp is readily apparent. There is a great difference in the true rating of lamps and the rating marked. A lamp marked 110 v.—16 c. p.—3.5 watts, will show on test an average for 600

hours' test about 20 c. p. at 110 volts. Other lamps marked the same will vary from 20 to 13 c. p., and consume from 3 to 9 watts per candle. One lamp rated at 64 watts may vary only 3 or 4 watts per lamp; another lamp will vary 12 to 16 watts per lamp.

Hereafter all lamps purchased for the Calumet will be tested, and those which by reason of low or extra high watt consumption or great difference in candle power per lamp are unsuitable for the railway circuit will be marked by a bar of red paint. These rejected lamps will be used for lighting on low potential circuits, and if they are inadvertently placed on the cars they can be quickly detected and removed.

### HYDRAULIC JACK FOR CAR PIT.

An inexpensive, but very serviceable and convenient hydraulic pit jack, for raising car bodies in the car house, is in use at the barns of the Syracuse Rapid Transit Railway Co. The accompanying illustrations, for which we are indebted to Mr. Harry J. Clark, chief engineer of the company, gives a general idea of the construction and method of using the device.

The essential part of the jack is an old, but water-tight, engine cylinder 24 in. in diameter, fitted with a piston having a 42-in. stroke. The cylinder has been set on end in the car pit, and rests on a wooden frame, 48 in. long by 30 in. wide, made of 9 x 12 in. timbers, which in turn rest on a bed of concrete, 18 in. deep, let

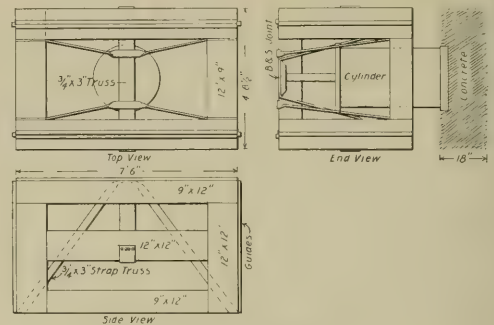


DIAGRAM OF FRAME.

into the pit floor. Around the cylinder and resting upon the end of the piston, is a heavily built and rigidly braced wooden framing, which moves up and down as the piston moves, and serves as a support for the car which is to be lifted. The operation of the jack is extremely simple, the motive power being city water, which is admitted into the cylinder through an ordinary water controlling valve near its base, and acts upon the piston at the city pressure, namely 90 lb. per sq. in. When it is desired to lower the piston the water is permitted to slowly escape through a similar valve. The piston bears upon the under side of the top center piece of the framing, and is joined thereto through the medium of a ball and socket joint, which prevents injury to the piston due to possible twisting stresses.

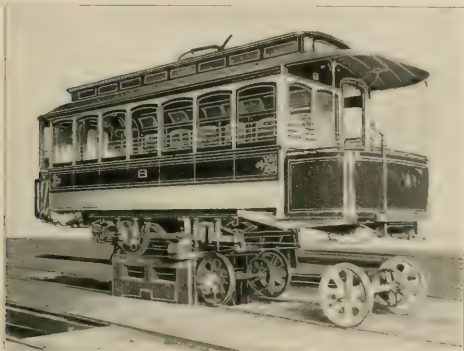
The details of the framing and dimensions are clearly indicated in the accompanying drawings. Upon the top longitudinal side members of the frame are girder rails which, when the frame is lowered, form alignment with the rails on the barn floor, enabling a car to be pushed upon the jack without difficulty. Guideways at the ends of the framing aid in preserving this alignment and also keep the frame from wobbling when in its raised position.

The half-tone engraving shows the method of changing wheels under single truck cars. With the aid of the jack, two men frequently change a pair of wheels in 28 minutes, including time necessary to raise and lower the car. When it is desired to change trucks from one body to another, the old truck and body are raised together, and wooden horses are placed under each end of the body. The old truck is then detached, lowered, and pushed



out of the way, leaving the body elevated upon the horses, after which the new truck is rolled from the other direction, on to the jack. The truck is then raised to position under the car, and after being fastened in place, both truck and body are lowered to the barn floor.

The device was designed and erected by Mr. F. Du Bois, fore-



CAR MOUNTED ON JACK.

man of car shops of the Syracuse Rapid Transit Co. The company also has two smaller hydraulic pit jacks, without the framing, which are used for removing armatures from the motors, the upper end of the piston bearing a cradle in which the armature rests.

### COSTS OF BUILDING CONSTRUCTION.

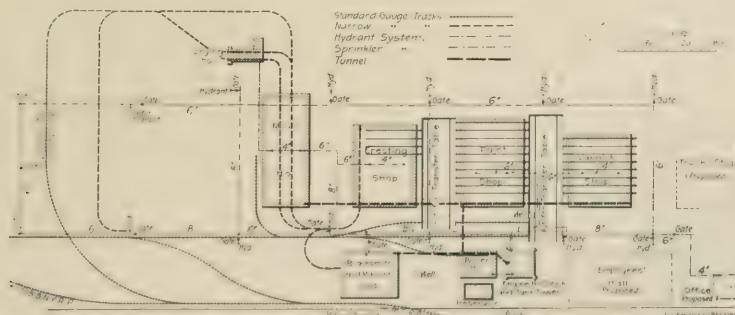
The following costs per unit of the various items involved in the construction of the shops of the John Stevenson Co., Ltd., were furnished us by Mr. Charles Henry Davis, C. E. of New York, and are of interest on account of the method under which the work was prosecuted. In the erection of these shops all of the material was purchased f. o. b. on the property of the company. This material was then taken by the contractors for each distinctive portion of the work and used according to the plans and specifications. This saved to the company the profit of a general contractor.

Grading cost 20 cents per cu. yd., for earth and 60 cents per cu. yd. for rock.

Track costs were 15 cents per cu. yd. to unload, haul and distribute cinders to a distance of 2,000 ft.; 18 cents per cu. yd. to unload, haul and distribute cinders to 2,500 ft.; 17 cents per cu. yd. to unload, haul and distribute broken stone to a distance of 2,000 ft.; 20 cents per cu. yd. to unload, haul and distribute broken stone to a distance of 2,500 ft.; 11 cents per ft. of track to unload and haul 50-lb. track material and ties, and to lay, line and surface, the ballast being delivered to contractor along the line; 8 cents per ft. of track to unload and haul 30-lb. track material and ties, and to lay, line and surface, the ballast being delivered to contractor along the line; 7 cents per ft. of 50-lb. track on trestle; 7 cents per ft. of 30-lb. track in buildings laid on and in concrete furnished by another contractor; \$20 per 50-lb. switch complete; \$10 per 30-lb. switch complete; \$1.54 per ft. cost of all track, standard and narrow gage, on property and in buildings.

Buildings costs were \$1.70 per cu. ft. for Potsdam red sandstone, rock face; \$5.20 per M for selected brick  $7\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{1}{4}$  in.; \$4.45 per M for good hard common brick; \$3.95 per M for thoroughly burned but rain washed brick; \$1.30 per 2,000 lb. for crushed trap rock,  $\frac{3}{4}$ -in. mesh and under; \$1.20 per 2,000 lb. for crushed trap rock,  $\frac{3}{4}$  to  $1\frac{1}{2}$ -in. mesh; \$1.15 per 2,000 lbs. for crushed trap rock,  $1\frac{1}{2}$  to  $2\frac{1}{2}$  in. mesh; \$1.74 per bbl. of 380 lb. of Atlas portland cement; 75 cents per bbl. of 300 lb. of old Newark Rosendale cement; 75 cents per 2,000 lb. of sand; 3 4-5 cents per sq. ft. for material and labor on Warren-Ehret 4-ply gravel roof; 10 cents per sq. ft. to unload, haul, spread, tamp and furnish all material except stone and cinders, 4 to 6 in. of cinders, 4 inches of concrete and 1 in. of cement, (the cinders were spread by another contractor); \$6 per cu. yd. for all material and labor on buildings; 27 cents per cu. yd. to unload, haul and distribute cinders in buildings to a distance of 2,500 ft.; 30 cents per cu. yd. to unload, haul and distribute broken stone in buildings to a distance of 2,500 ft.; \$1.60 per sq. ft. of ground occupied cost of all buildings, oil vault, tunnel, reservoir, lumber shed and 344 ft. clock tower complete; \$1.65 per sq. ft. of floor area cost of dry house, mill, body shop, paint shop, varnish shop, blacksmith shop, boiler house and tunnel; \$1.75 per sq. ft. of enclosed area cost of all buildings, oil vault, tunnel, reservoir, lumber shed and 344 ft. clock tower complete; \$1.49 per sq. ft. of ground occupied cost of dry house, mill, body shop, paint shop, varnish shop, blacksmith shop, boiler house and tunnel; 21 3-5 cents per sq. ft. of floors cost of heating system; 6 cents per cu. ft. of space occupied cost of all buildings, oil vault, tunnel, reservoir, lumber shed and 344 ft. clock tower complete; 6 2-5 cents per cu. ft. of space occupied cost of dry house, mill, body shop, paint shop, varnish shop, blacksmith shop, boiler house and tunnel;  $\frac{3}{4}$  cents per lb. cost of steel structural work in buildings.

Water costs were 15 cents per lineal ft. for trenches in earth;



PLANT OF THE JOHN STEVENSON CO.

The accompanying illustration shows the general arrangement and extent of the plant.

Wells cost \$2.75 per ft., from 0 to 250 ft., with 8 in. wrought iron pipe lining, and \$3.25 per ft., from 250 to 500 ft., with 8 in. wrought iron pipe lining.

\$1.25 per ft. for trenches in rock; 70 cents per 2,000 lb. to unload and haul pipe, valves and all material; 8½ cents per ft. for laying, lead joints and filling trench for 10-in. cast pipe; 7½ cents per ft. for laying, lead joints and filling trench for 8-in. cast pipe; 7¼ cents per ft. for laying, lead joints and filling trench for 6-in. cast pipes;

7 cents per ft. for laying, lead joints and filling trench for 4-in. cast pipe; \$2 per 4 and 6-in. hydrant, setting and lead joint; \$18.70 per 2,240 lb. for cast iron water pipes; 2 cents per lb. for cast iron crosses, branches, quarter bends, plugs and sleeves; \$13.96 per 8-in. bell joint gate valve complete; \$8.22 per 6-in. bell joint gate valve complete; \$2.75 per extension pattern gate boxes; \$29.95 per 3-in. nozzle hydrant, 6-in. bottom and 6-in. valve; \$28.32 per R. D. Wood & Co. post indicator and 6-in. bell joint gate valve; \$24.63 per R. D. Wood & Co. post indicator and 3-in. bell joint gate valve; \$2.25 per head, all material and labor from outside main to Grinnell head.

Sanitary costs were 28 cents per cu. yd. for trenches in earth; \$1.25 per cu. yd. for trenches in rock; 25½ cents per ft. to provide, lay and refill for 8-in. Akron pipe; 13 cents per ft. to provide, lay and refill for 6-in. Akron pipe; 10 cents per ft. to provide, lay and refill for 4-in. Akron pipe; 20 cents per ft. to provide, lay and refill 2 ft. wide paved 6-in. tile drain; \$1.10 per ft. to provide, lay and refill for 12-in. cast iron culverts, 12 ft. lengths; 75 cents per ft. to provide, lay and refill for 6-in. cast iron culverts, 12 ft. long; \$1.66 per ft. to provide, lay and refill 12-in. cast iron pipe in concrete; \$3 per vertical ft. to provide all material and lay brick manholes for sewers, 4 ft. diameter at sewer and 8 in. thick cemented.

Power plant cost was \$55 per h. p. at the generators.

Transmission cost was \$31.10 per h. p. at the machines driven.

Real estate cost was \$518.60 per acre of property owned.

Works cost was \$3.44 per sq. ft. of ground occupied including entire plant and equipment.

Water system cost was \$566.66 per acre, 30 acres being protected and supplied with water.

Insurance cost was 27 1-3 cents per \$100 of insurance.

The total cost of the works and the approximate percentage of the different parts is as follows:

Legal .....	3,000	0.75
Real estate .....	46,000	11.5
Engineering .....	29,000	7.25
Transportation system .....	20,000	5.
Buildings .....	170,000	42.5
Sanitary system .....	10,000	2.5
Water system .....	17,000	4.25
Wood working tools .....	20,000	5.
Machine tools .....	18,000	4.5
Transmission system .....	27,000	6.75
Central power plant .....	22,000	5.5
Heating system .....	17,000	4.25
Lighting system .....	4,000	1.
Total cost .....	403,000	100.75

### PAINTING CARS.

Editor "Review": The excellent articles on painting railway cars read at the Kansas City convention and published in your November issue were doubtless appreciated as they deserved to be, and your readers will probably be interested in a system of painting which I have used for many years. The system saves both time and labor, gives a surface quite as durable as that obtained with rough stuff, and is far superior in wearing to the work done by ordinary methods.

The particular objects sought were to do away with "rough stuffing" because of the expense and still retain a good finish and a more durable surface, and also to avoid so far as possible the use of sandpaper. Sandpapering is the most unhealthful part of a painter's work, and also the most unprofitable for his employer; no other process in the trade is more abused or causes the waste of so much money by thoughtlessness. The reason is simple; being an undesirable task, the job of sandpapering is given to a boy or laborer, and the result is about what could be expected were a boy given a board and some tools and told to make some holes and that a wood-carver would do some fine carving on it later. The boy is not to blame and the employer foots the bills.

As a rule one does not need to inquire further concerning a painter's ability after seeing him do a piece of sandpapering or putting; if he can do these two things well he is generally competent to do any other work at his trade. While on this side issue I will say that when an inexperienced person is hired, the employer gets the full benefit of what that man does not know.

To return to painting cars, suppose an average 18-ft. closed car is to be varnished inside and painted outside; the belt, letter board and dashes to be dark, and the other parts a light shade. The car is supposed to have been shopped previously and to be in its place, with the brass work, handles, etc., removed for painting. We would proceed as follows:

Monday morning, wash all parts not to be burned off, which will take two men 2 hours, to total of 4 hours. Burn off belt and letter board; two men 1½ hours, a total of 3 hours. Clean up burned off parts and prime; later wipe off any surplus oil not absorbed; 2 hours.

Tuesday morning, putty large holes smoothly (½ hour); touch up bare spots inside (2 hours); paint roof and deck (5 hours); coat light parts with color (4 hours); lead burned off parts (1 hour).

Wednesday, sandpaper lightly the leaded parts (½ hour); fill (5 hours), putty and second coat light parts (3 hours); varnish inside, sash in (6 hours.)

Thursday, color, color varnish and varnish dark parts (3 hours); third coat light parts (2 hours.)

Friday, fourth coat light parts (2 hours); rub belt (2 hours); ornament belt, dash, etc. (6½ hours.)

Saturday, stripe light parts (2 hours); paint floor (1 hour); apply finishing varnish (5 hours); black off bumpers, drawbars, etc. (1 hour.)

This gives a total of 60¼ hours. By allowing it to harden the following day (Sunday) the car can be put in service on Monday, and may run a year before it requires varnishing, and three or four years before repainting. The expense for stock would be the average Chicago price plus freight.

The filling mentioned will be more than equivalent, so far as durability is concerned, to two coats of lead as usually applied. The filling does not consist of a plastering over with hard putty by boys, or a so-called scraping in, which usually requires from eight to ten or more hours of sandpapering, but is done by an expert painter who leaves a surface that does not need sandpapering. The application of filler is as much an art as is putting on varnish or ornamenting.

It must be understood that the time given here for the various operations is the minimum. With the same amount of work and more time allowed for the several coats to dry the appearance of the work would be much better. The chances are always in favor of greater durability when a job of painting has had plenty of time. While it is undoubtedly true that rushed work will in some cases wear equally as well as that which has been given more time, and a long experience may enable a foreman to succeed even beyond his own expectations, yet it is like skating on thin ice—a person can never be sure he won't get wet. J. L. JOHNSON.

### SNOW PROBLEMS IN THE 90's.

An editorial in a recent issue of the Evening Journal of Ottawa, Can., recalls the fact that only about 10 years ago it was generally considered impossible to operate wheeled vehicles on the street railways of Canadian cities because of the snow problem. The Journal says, in part: "Looking back to 1890, when Messrs. Ahearn & Soper courageously tackled the problem, it is now somewhat amusing to recall the sympathetic predictions made by all classes of citizens of the probable result of the undertaking, the conclusion being that it was impracticable and would surely result in financial ruin and disaster. Our neighbors in Montreal were particularly interested, and eagerly watched and awaited the result of the first winter's operations here. The managers of the Montreal Street Railway Co. visited Ottawa during the progress of snowstorms and became au fait with the modus operandi of clearing and removing snow. The good example set Montreal by Ottawa was immediately acted upon and the horse car entirely disappeared from the streets of that city during the following year. This debt of gratitude was gracefully acknowledged a few years ago in the Railway Committee of the House of Commons by the Hon. Mr. Brodeur, the present Speaker of the House of Commons, who stated that to the example and success achieved by Ahearn & Soper at Ottawa was due the fact that electric cars were adopted in Montreal."



## CROSSINGS OF STEAM AND ELECTRIC RAILWAYS.

One of the reports at the recent convention of the American Railway Engineering and Maintenance of Way Association dealt chiefly with matters related to the safety of highway surface crossings of railways. The report is signed by D. Bontecou, C. A. Wilson, G. F. Bidwell, J. R. W. Davis, H. J. S. Slifer, W. Shepard and R. Southgate. In an appendix are given extracts from the laws of nearly all the states and territories dealing with the subjects of signs, fences and crossings for railroads.

The report proper is as follows:

It is believed that little consideration need be given by the association to the numerous crossings of country roads on which travel is infrequent, and where no special sources of danger exist. Although in certain sections, where trains are numerous and highway traffic heavy, there is a tendency to the gradual elimination of all surface crossings, the operation of a very large part of our railroad mileage causes few accidents at the less dangerous crossings, and the prospect of any general and radical change of methods is quite remote.

The theory of protection on which the state laws and of course railroad practice proceeds, is to warn persons near the crossing of the approach of a train, by sign, whistle and bell, and then depend on them to avoid it.

The whistling post on single track lines is always located on the engineer's side, about a quarter of a mile from the crossing and the sign so as to be conspicuously seen from the highway. The form of the sign is necessarily modified by the requirement of the prescribed lettering, and it is not deemed desirable to recommend a standard form.

The physical condition and arrangement of the crossing should be such as to facilitate the passage of a vehicle in the shortest possible time, and with the best possible view of the track. The planking should be smooth, the drainage good, and the grades easy. In the case of those crossings where, for any reason, the whistle and bell cannot be heard, or the approaching train seen, the electric alarm bell has been resorted to with satisfactory results, giving adequate protection in some locations, when without its aid the expense of a watchman would be necessary.

The consensus of opinion from the 50 railroads answering the committee's circular might indicate some diversity of opinion as to the efficiency of bells, since only thirty roads use them. Of these, however, the three that disapprove and eight that express no opinion have had a limited experience, while the 19 roads that find them satisfactory include those that have used them most extensively. The important objection to automatic bells is the possibility of failure and the increased liability of the railroad when a failure leads to an accident. There is, of course, a certain percentage of failures, and their number depends largely on the thoroughness of the methods of inspection and maintenance. Information as to the number of failures is limited to a few sources, but these show that bells operated by track circuit may be depended on not to fail oftener than from once to twice a year. One road, for example, reports the use of 37 track circuit bells, which failed fifty times during the year, and 13 bells of other types which failed 55 times during the year; 85 per cent of the failures being due to causes other than malicious interference.

The statements made by the 27 roads that are using bells do not justify a settled opinion as to type, and hardly admit of tabulation. It may be considered, however, that the bells should give at least thirty seconds' warning of the approach of any train, and be equipped with a 12-in. gong that should ring continuously when the apparatus is out of order. The number of failures is reduced by doubling the bond wires when operating by track circuit. The inspection should be both frequent and intelligent: Station agents or section foremen should examine daily and repairmen frequently; reports in both cases being sent to division headquarters.

The cost of installing bells varies from \$125 to \$500, and of maintaining them from \$10 to \$40 per year.

When the railway and highway traffic become considerable, watchmen, and, on important streets, gates are necessary. At this point crossing maintenance becomes expensive, but there is no criterion by which to decide when it has been reached, other than the judgment of railroad officials or the demand of the municipal authorities, and in most cases the latter act first.

The duty of the crossing watchman is simple and obvious, but

his responsibility is large. He is expected to prevent accidents at his crossing by giving warning of the approach of trains and handling gates where they are provided. He is usually required, in addition, to keep the crossing clean and the flangeway clear. His instructions are confined to those duties by most railways, and some require him to flag trains over the crossing. It is evident that no further duties should be imposed which might detract from his efficiency in preventing accident. The watchman must himself be sure at all times of the conditions under which he is working, and should be warned by automatic signal of approaching trains wherever the location makes it necessary.

Answers to the committee's inquiry about merits and construction of gates were received from 43 roads, and show a preference for some form of gate operated by compressed air, with either mechanical or pneumatic underground connections. These answers do not justify discrimination against mechanically operated gates in locations for which they are suitable, but it may be concluded that wherever quick handling is desirable, or where it is practicable to work gates at two or more points from one tower, the pneumatic power will prove the most efficient.

The essentials of good service are thorough drainage and air-tight connections. The best galvanized iron pipe should be used, laid in wooden trunking and tested for leaks. With these conditions filled, climate does not materially affect the operation of the gates. The cost of gates per set is approximately as follows:

Crank gate .....	\$275
Air gate, mechanical construction.....	300
Air gate, pneumatic construction.....	325
To which must be added cost of erection, about.....	60
Cost of gate house (or in case of elevated tower \$50 additional).....	90

And crossing is doubtless made safer by being lighted, and most railroads assent to the proposition that where the traffic is heavy they should be lighted. The necessity is practically determined by municipal authorities. Where the crossing is near a yard an electric arc light is objectionable, independently of its relation to the crossing, and safety is in some cases impaired by the presence of such a light as interferes with a clear view by locomotive engineers. The cost of lights varies from \$40 to \$120 per annum.

When an electric railway line is crossed the consequences of an accident become very grave, but no well-settled usage or theory of protection appears to have been established. State laws do not as yet take account of this case, except in a desultory way, through the control exercised by the state railroad commissioners; and widely varying opinions have been received from those answering the committee's circular as to the proper regulation of the use of the crossing; many recognizing no obligation on the steam railway to use more care than in the case of an ordinary crossing, and some going so far as to advocate the same precautions as when crossing the tracks of another steam railway.

The most common practice is to depend on the street car conductor to safely flag his car over the crossing, presupposing a higher degree of discipline than either his training or ordinary duties tend to promote.

The conditions surrounding the use of crossings of electric lines change materially from the case of the interurban line operated along a country highway and often at a rather high speed, to that of the city street car line protected by gates and watchmen and requiring only to take account of steam trains which are being moved under control. The means adopted to avert accident can therefore be modified to suit the requirements of the case, but it is desirable that the steam railroad companies should, while asserting their superior claim to the use of the crossing, accept some responsibility and demand such protection as will insure safety.

In all cases where the steam railway train may approach the crossing at high speed, or where the grade of the street railway tracks does not admit of controlling cars under all conditions, there should be more safeguards than the vigilance and judgment of the street car conductor.

The tendency of advanced practice is to require details in the street car tracks, located at a proper distance and worked by a lever on the opposite side of the crossing. The lever should be interlocked with signals on the steam railway track, or, preferably, with a track circuit block, so as to close the crossing to electric cars when the steam railway track is occupied, the levers being worked by the conductor of the electric car. The latter plan is



safer, and the occasional short delays to electric car movements are fully offset by the avoidance of delays to important trains and by not requiring additional signals. This plan affords the degree of safety which, in the opinion of the committee, is necessary in most cases when gates and watchmen are not provided.

The question of how much a railroad company can afford to pay to avoid a grade crossing can only be settled by the consideration of special cases. It involves the financial ability of the railroad, the expense of maintenance, the unknown element of risk, and various other conditions which are sometimes equally important.

The actual cost of constructing and maintaining a single track grade crossing with cattle guards, etc., may be capitalized at about \$300, or, if alarm bells are added, about \$700. At most crossings in sparsely settled districts the average risk is indefinite, but certainly small. The Northern Pacific Railroad Co. reports 102 accidents for two years, all at stations, and 26 of them on branch lines. The sum charged for claims arising from these road crossing accidents outside of cities, when capitalized at 5 per cent., amounts to \$119.20 per crossing. The claims for crossing accidents on the Kansas City, Fort Scott & Memphis, and Kansas City, Memphis & Birmingham main line and branches may be fairly capitalized at \$50 per crossing.

The crossing accidents in New York in 1899, reported by the State Railroad Commission, amount to 101 deaths and 79 injuries, resulting from operation of about 8,000 miles of line. A large proportion of these probably occurred at city crossings and probably very few at country crossings remote from stations. The committee's information on the subject is meager, but seems to justify the conclusion that a very small sum will, in average cases, cover the item of risk at country crossings, so that most roads would doubtless be willing to exceed their real financial interest in aiding to eliminate them.

When the maintenance of the expensive accessories of important city crossings is capitalized the amount becomes large, and more than railroad companies would be willing to pay to avoid the operating expenses alone. In these cases, however, the risk becomes great, and city regulations affect the cost and convenience of handling business, so that special and important problems are presented which cannot be briefly generalized, but which, in connection with the subject of the separation of grades, the committee hopes to consider in a future report.

## MONTHLY MEETING OF THE MASSACHUSETTS STREET RAILWAY ASSOCIATION.

Report and Discussion on "Signals as Applied to Street Railways"—Discussion on the "Necessity of Signal Lights on Rear End of Cars."

The regular monthly meeting of the Massachusetts Street Railway Association was called to order at Young's Hotel, Boston, on Wednesday, March 13th, at 8 p. m., Pres. John R. Graham, of Boston, in the chair. As is the custom of this association, the members enjoyed an excellent dinner before the regular business of the evening was taken up.

After the roll call, which showed 42 delegates present, the president announced that the first order of the evening was the report of the committee on signals, appointed at the previous meeting. The following report was then read:

### REPORT OF COMMITTEE ON SIGNALS.

The committee appointed by the Massachusetts Street Railway Association on "Recommendations for electric signals for street railway service" would make the following recommendations:

That a telephone system in conjunction with a proper block signal system is necessary for a safely and satisfactorily operated suburban single track road.

That it is impossible to make any recommendations to cover the needs of general city traffic, the necessities of the case being largely determined by conditions entirely local.

That the telephone system should be owned and operated by the railway company.

That a system of selective signals should be used in connection with the telephone system, to call outside telephone stations.

That the signal system should be entirely automatic; should contain a minimum number of parts; should contain some other

means of visual signal besides incandescent lamps, and should not depend upon incandescent lamps for continuity of circuits; should set at far or danger end first, and be locked at danger before it is possible to operate cautionary signal at near end; should not burn out under ordinary conditions of contact with live parts of trolley system; should be normally at danger and it should be impossible to set it at safety unless all parts are in normal working condition; that signal after being set at danger cannot return to safety until all cars that have gone onto block have gone off again; should be capable of working satisfactorily with from 200 to 600 volts; and should be of the best possible construction, mechanically and electrically.

The report was signed by G. W. Palmer, jr., William Pestell, D. Valentine, H. S. Nowell, H. E. Reynolds, members of the committee. It was adopted and placed on file.

In reply to a question a member of the committee explained that by a "selective" system was meant one by which the conductor at any turnout could be signaled and notified that he was wanted at the telephone at that turnout, without calling all the other conductors on the road by setting signals at all the turnouts. Another member stated that the committee did not feel itself called upon to recommend any particular make of signal. There are several good systems on the market, but none of which, in its opinion, fills all the conditions mentioned in the committee's report. It was thought that by bringing to the attention of the makers of safety signal systems, all the features that the street railway operating men believed to be essential, the makers would be better able to develop a more nearly perfect system. The committee extends to the inventors and makers of signal systems in all parts of the country a cordial invitation to send drawings and descriptions to Mr. G. W. Palmer, jr., Fall River, Mass., chairman.

One or two members of the association did not believe that a telephone system was essential in connection with a signal system. A member cited an instance in which a heavy storm rendered the telephones useless just at the time they were most needed. The weight of opinion, however, of those present was greatly in favor of the use of private telephones along the line, and several members stated that if both a safety signal system, and a telephone system could not be used, it were better to have the telephone system alone, than the signal system alone.

President Graham then announced that he would like to hear from all present on the "Necessity of Signal Light on Rear End of Cars."

The opinion was unanimous that rear oil lamps were absolutely necessary, the chief advantage of course being that a car was protected against rear-end collisions if the trolley wheel should leave the wire or the current fall from any cause. It was thought best to have the signal an ordinary steam railroad bull's-eye lantern, which could be taken by the conductor and used for signaling other cars and at crossings. The lantern should be placed on the rear end of the car body and should not project beyond the side of the car, as it will frequently be knocked off by wagons. A number of cases were cited where serious accidents had been averted by the use of rear oil lamps.

It was pointed out that to avoid fire care must be exercised in keeping oil lamps at the barn. It is better to fill and keep the lamps in a separate building or in a separate fireproof room if possible.

The following is a list of those present:

John R. Graham, president, Boston; E. C. Foster, Boston; H. B. Parker, Newtonville; E. P. Shaw, Boston; C. C. Benson, Newburyport; Charles F. Grosvenor, Palmer; A. J. Purinton, J. S. Binckett; A. H. Walcott, Rockland; E. J. Ranch, Brockton; W. S. Walcott, Salem; Wm. Pestell; W. H. Tucker, Fall River; F. C. Wilkinson, Lynn; J. M. Lane, Wakefield; H. M. Pedrick, Gloucester; M. M. Nash, Lowell; Geo. C. Morse, Taunton; F. J. Ladd, Lowell; Thomas Lees, Nashua; H. S. Nowell, Lawrence; Alex. McRae, Haverhill; J. T. Conway, Brockton; J. T. Day, Lowell; H. C. Page, Lynn; Jas. H. Sherman, Brockton; D. Valentine, Brockton; F. H. Smith, Boston; Gardner F. Wells, Plymouth; John Kelley; Wm. S. Loomis, Holyoke; G. F. Seibel, Taunton; G. W. Palmer, jr., Fall River; B. W. Warren, Boston; Robert S. Goff, Fall River; H. E. Reynolds, Quincy; Edward C. Spring, Newton; R. M. Babson, Wellesley; W. W. Sargent, Fitchburg; Chas. S. Clark, Boston; E. E. Potter, New Bedford; C. B. Fairchild, jr., Street Railway Review, New York City.

## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### ACTS AND ADMISSIONS OF INTERVIEWER OF WITNESSES NOT EVIDENCE AGAINST COMPANY.

*Nowack v. Metropolitan Street Railway Co. (N. Y.), 66 N. Y. Supp. 533. Nov. 9, 1900.*

An investigator, or employee in a subordinate position, whose duty it is to interview witnesses of accidents, and take their statements to be used on the trial, being on a car when an accident occurs, neither his acts nor declarations at the time are admissible in evidence, the appellate division, first department of the supreme court of New York holds, to affect the main fact to be proved, namely, the negligence of the company's agent in the management of that car. Moreover, there being no evidence of his having any authority to suborn testimony, or that his employment contemplates any act of this character, the court holds inadmissible as against the company evidence to show that he offered a witness money in reference to testimony he was to give.

### DUTY TOWARDS VEHICLE STANDING BETWEEN SIDEWALK AND TRACKS.

*O'Leary v. Brocton Street Railway Co. (Mass.), 58 N. E. Rep. 585. Nov. 28, 1900.*

A team was stopped on the side of the street, between the sidewalk and street railway tracks. A car came along, hit the rear wheel of the carriage, breaking it, and causing a runaway. The supreme judicial court of Massachusetts overrules exceptions to a verdict in favor of the company. It holds that instructions were all properly refused, each one of which made it imperative, under the conditions therein stated, that the motorman should have taken such measures as would avoid a collision. The real duty upon him was simply to use reasonable care to avoid a collision. He testified that he saw the team, and had complete control of his car, but he did not stop, because he thought there was room to go by. It was a question for the jury whether, in coming to that conclusion, and acting upon it, he was negligent.

### MOTORMAN'S DUTY WHERE A COVERED VEHICLE IS PROCEEDING BY SIDE OF TRACK.

*Tashjian v. Worcester Consolidated Street Railway Co. (Mass.), 58 N. E. Rep. 281. Oct. 19, 1900.*

It cannot be said as a matter of law, the supreme judicial court of Massachusetts holds, that a motorman has a right to assume that a person driving along by the side of the car tracks, without any reason to suppose that a car is following close behind him, will continue in the same line, and will not attempt to cross the track. Before running forward at such speed that he would be likely to strike a wagon that might turn across the track, a motorman should give warning of the approach of the car, unless he has good reason to believe that the occupants of the wagon are aware of it. And the court holds that in this case the conduct of the motorman should have been influenced somewhat by the fact that the vehicle before him was a carriage with a top, whose occupants could not see the road behind them.

### STARTING CAR BEFORE INFANT PASSENGER IS SEATED.

*State v. North Jersey Street Railway Co. (N. J.), 47 Atl. Rep. 427. Nov. 12, 1900.*

The starting of a trolley car before an infant passenger, who is in her mother's care, has been seated, is not, in itself, the supreme court of New Jersey holds, a negligent act. It says that it is a matter of common experience that thousands of people daily ride in these cars without being seated, and that their doing so is unaccompanied by any danger; that while they are doing so the cars are stopped and started again at every street corner with perfect safety to such travelers. It may, perhaps, be that a greater degree of care in the starting of a car is required when some of the passengers are standing than when they are seated, but it is no part

of the duty of these companies to refuse to carry on their cars more passengers than can be seated therein, or to delay starting them while any of such passengers remain standing. And this is equally true in the case of a child non sui juris, or not having legal capacity to act in its own right, accompanied by and in the care of its parents, as in that of an adult.

### INJURY TO PASSENGER SEATED ON STEPS.

*Holloway v. Pasadena & Pacific Railway Co. (Cal.), 62 Pac. Rep. 478. Oct. 2, 1900.*

A passenger on a crowded electric car was seated on the front platform, with his feet resting on the step. As the car ran over a cattle guard, he fell or was thrown from it, having one foot crushed and the other badly injured. The evidence, although not the most satisfactory, tended to show that the track was not in proper repair, and that he was thrown off the car by reason of it giving a lurch as it passed over a defective joint. Believing, however, that this evidence would be insufficient to sustain a verdict in his favor if such a verdict had been rendered, the supreme court of California holds that it was error to direct a judgment for the company, and not leave the jury to pass upon the question of negligence. So, also, whether or not the company, by crowding its car, caused the passenger to take a seat on the steps, and whether or not the seat was such as to endanger his life or safety provided the company exercised due and proper care, the court holds, were questions for the jury.

### WHERE WAGON ON TRACK CANNOT WELL BE TURNED OUT.

*Mertz v. Detroit Electric Railway Co. (Mich.), 83 N. W. Rep. 1036. Oct. 31, 1900.*

Much less than may a motorman, who sees a wagon stalled on the track ahead of him, or traveling the track in the same direction, proceed in anticipation that the traveler ahead of him will get out of the way, the supreme court of Michigan holds, can a motorman do so when aware of the fact that the driver of a wagon would have a peculiar difficulty in turning out, owing to the unwrought condition of the road. The duty of the motorman at the very least, it holds, is to keep a lookout ahead; and when it becomes apparent that the track is occupied by a vehicle which cannot be gotten off in time to avert a collision it is his duty to bring the car to a stop. Whether or not the driver of the wagon in question in this case was guilty of contributory negligence in not going back to warn the motorman, the court holds was a question for the jury, there being evidence to justify a finding that the motorman might have seen the wagon, if he had looked ahead, three blocks away, while he presumptively knew something of the difficulty the driver would have in turning off the track. The one in charge of a street car is bound to know that the drivers of ordinary vehicles are in no sense trespassers upon the track. The duties of each are, in some sense, reciprocal.

### WHERE STATE CONSTITUTION RESERVES TO LEGISLATURE POWER TO REVOKE CHARTERS.

*Wilmington City Railway Co. v. People's Railway Co. (Del.), 47 Atl. Rep. 245. Sept. 27, 1900.*

The court of chancery of Delaware holds that the reserved power of revocation by the legislature of charters granted under the constitution of that state of 1831 exists under the present constitution. For example, it holds that the charter of the complainant company, being a contract between the state and the company, and the reserved power of revocation by its legislature being a part of the contract, the right to revoke by the legislature became a vested right of the state, of which no legislature could divest it, and of which it could be deprived only by some subsequent constitutional provision relinquishing or taking it away either explicitly or by necessary implication. Furthermore, the court holds that the general incorporation law passed in accordance with the provisions of



the new constitution, by authorizing the organization of corporations possessed of powers necessarily inconsistent with the exclusive rights conferred by the complainant's charter, so far revokes its exclusive right to construct and operate a city railroad in the city of Wilmington, leaving it possessed of all its other franchises, only shorn of their exclusiveness.

#### NO ACTIVE DUTY OWED BOYS WHO CLIMB OVER GIRDERS OF BRIDGE.

*Freeman v. Brooklyn Heights Railroad Co. (N. Y.), 66 N. Y. Supp. 1052. Nov. 23, 1900.*

A company is not bound, the appellate division, second department, supreme court of New York holds, to anticipate the danger its wires on a bridge may be, although 14 or 15 feet from the passageway and entirely out of the reach of persons using the street and sidewalk in the ordinary and usual manner, to boys leaving the sidewalk constructed for passengers on foot, and crawling over the girders of the bridge, a position of danger independently of the wires, and especially is this true with regard to a guard wire not designed for the purpose of carrying a current of electricity, and with the usual precautions, by way of inspection, having been taken, to see that there is no leakage of the current from the trolley wire to the guard wire. The mere fact that boys had been known to pass over the girders, or even that a boy who has been burned by such a guard wire has been able to find one or two other boys who have been burned, it holds, does not constitute such a public use of the girders as a means of crossing the bridge as to impose upon the company the high degree of care necessary to create a liability to one so injured. In other words, it does not consider imposed in such case the active duty of actually preventing the guard wires becoming charged with electricity, holding that if it has become charged with electricity through some accident, there will be no liability to a boy injured thereby while crawling over the bridge girders.

#### TURNING TO LEFT ONTO ANOTHER TRACK TO LET CAR PASS.

*Hughes v. Camden & Suburban Railway Co. (N. J.), 47 Atl. Rep. 441. Nov. 19, 1900.*

For reasons of safety, a traveler, the court of errors and appeals of New Jersey holds, may use any part of a highway, having due regard to the rights of others, and taking such care as prudence would require him to take in the position he assumes. If he thus uses a highway, he may assume that others using it, including trolley-car companies, will use it with due regard to his rights. For example, when required to remove from the right-hand track to permit the passage of a car from behind, he is bound to exercise a reasonable judgment as to how he can do so in safety. If it is perilous to go to the right, and reasonable prudence requires, he can go to the left, notwithstanding a track is there maintained for cars coming from the opposite direction. Wherefore, there being evidence in this case from which a jury might find that the driver of the horse and wagon collided with would have been put in peril if he had turned out to the right, to permit a car from behind to pass, the court holds that he was not necessarily negligent in turning to the left, although he was thus brought upon the in-bound track, but that there was a question for the jury, whether or not his act was wanting in proper prudence. In other words, it holds that, upon the evidence, such as a traveler in the exercise of reasonable prudence would avoid; whether, after he reached the left-hand track, he took reasonable care to observe and give place to a car approaching upon that track. All these were questions to be decided against him before he could be pronounced negligent.

#### MUST EXPECT AND TRY TO PROTECT YOUNG CHILDREN.

*Elwood Electric Street Railway Co. v. Ross (Ind.), 58 N. E. Rep. 535. Nov. 1, 1900.*

It would be a harsh and unreasonable rule, the appellate court of Indiana says, to hold that, because there is danger arising from operating a street railway line, children of such tender years as to be incapable of discerning the danger incident thereto should be de-

barred from the use of streets under any and all circumstances. And here it holds that it was the duty of the company to take notice of the fact that children were likely to be on the street, and it was required to use greater care to avoid injury to them than with other persons who had reached the age of discretion. In other words, while there was no specific charge in this case that the company's servant in charge of the car saw the child, but the complaint did show a straight track, with the child in plain view of such servant, the court holds that it was his duty to see it, and use all reasonable means to avoid injuring it. Furthermore, under this showing, and it being his duty to see any person or object on the track in front of the approaching car or approaching the track, the court says that it must assume that he saw the child in time to have stopped the car before coming into contact with it. Then, considering the age of the child, which was in this case about 4 years and 10 months, the court holds that the company's servant had no right to assume, as in the case of an adult, that it would get off the track to avoid the approaching car, or that it would turn aside, and avert the impending peril. Indeed, when the motorman saw the child approaching the track, and the distance he was from her, and the distance she was from the track, these being such that the child would reach the track at about the time the car reached the point at which she would cross, he had no right, the court holds, to assume she would either stop or turn aside, and it was his duty to take all necessary and reasonable steps to avoid injuring her. This he failed to do, and such failure was actionable negligence.

#### PASSING BEFORE APPROACHING CAR TO BE ON RIGHT SIDE TO TAKE IT.

*Walker v. St. Paul City Railway Co. (Minn.), 84 N. W. Rep. 222. Nov. 22, 1900.*

Amidst the complicated affairs of city life in the use of street cars by their patrons, the same confidence, the supreme court of Minnesota holds, should be indulged in in behalf of passengers that is due on the other hand to the company. Neither is obliged to assume that legal duties by the other will be neglected, where the instincts of self-preservation by the traveler or the demands of duty by the company require the exercise of proper care. It is not the duty of a person seeking passage on an electric street car to assume that proper signals to stop the car will be disregarded, but such passenger may have regard to the probable conduct of the person in charge of the car, and act accordingly, when such reliance is not apparently attended with danger. It is not, as a matter of law, negligence for a person intending to take passage on a street car to assume that such car is running at the customary rate of speed, and to act with reference to such custom, in the absence of evidence to the contrary. In this case, a woman accompanied by two friends approached, at about 11 o'clock at night, a platform station where interurban cars were required to stop on signals. They were yet on the wrong side of the track for her to take the car wanted, when one was seen by the headlight to be approaching. One of the friends ran rapidly across the tracks to the platform and signaled the car with his hands in the usual manner several times. The woman, having seen the signals given, and believing that the car was coming to a stop, and that she would therefore have time to cross the tracks in safety, tried to cross before the car got there, so as to run no chances of being left, and was struck by the car, which was running at the rate of perhaps 45 miles an hour. The evidence, the supreme court holds, in affirming a judgment for damages, supported the finding of the jury that the company negligently disregarded signals to stop its car, which was run at a reckless rate of speed past the proper stopping place, and that the woman was not negligent, under the facts found by the jury, in passing before such car, when intending to enter the same as a passenger.

#### SPEED NOT PROVABLE BY EVIDENCE OF SPEED AT OTHER TIMES.

*West Chicago Street Railroad Co. v. Torpe (Ill.), 58 N. E. Rep. 607. Oct. 19, 1900.*

Rehearing denied Dec. 7, 1900.

The vital point in issue in this case was the rate of speed at which the car or cable train in question was going when the party run



over attempted to board the same. On the trial, evidence was introduced, over the company's objection, tending to show that it had a custom of stopping its cars near the point where the accident occurred, for the purpose of taking on passengers. The supreme court of Illinois holds that this was reversible error. All of the witnesses agreed that the train was moving when the party attempted to mount it. The rapidity with which it was moving was important. To permit the testimony of the witnesses who testified that it was moving very slowly to be corroborated by proving that at other times the trains ran slowly or stopped at this particular point for the purpose of receiving passengers the court deems prejudicial. So, too, it holds that, if, as the witnesses for the company testified, the cars were going at a full rate of speed when the party attempted to mount the same, this testimony could not be legitimately overcome by testimony that cars passing this place the day previous, or at some other time, stopped or ran slowly. Then, it was contended that such evidence was proper and material to be considered by the jury in determining whether or not, in view of the conflict in the evidence on that point, the particular train moved slowly or rapidly at the time in question. But the court declares that it is unable to see how testimony of the manner in which trains were handled at this particular place at other times tended legitimately to show the manner in which the particular train was handled at the time in question. Again, it was suggested that the testimony was proper as tending to show that the company was accustomed to slow up or stop its trains at that point, and that there was evidence in the record from which it might be inferred that the party knew of such custom. The court's answer to that is that, if it were admitted that such custom did exist, and the party knew the same, such facts would not justify him in attempting to mount a cable train running at full speed past said point, even though the same was run in disregard of such custom.

#### ADMISSIBILITY OF EVIDENCE OF PREVIOUS ACCIDENTS.

Morrow v. Westchester Electric Railway Co. (N. Y. Sup.), 67 N. Y. Supp. 21. Nov. 23, 1900.

If it had been shown that there was some peculiarity in the construction of the track at a given point, and that the car on which the plaintiff was riding left the track at that point, the second appellate division of the supreme court of New York says, it would have been proper to introduce evidence tending to show that other cars had left the track at the same point under similar conditions, as this would have a tendency to show that there was a defect in the track, and that the defendant had had notice of this defect by reason of the fact that other accidents had happened there, and a failure to remedy the defect would constitute negligence, or at least the jury would be justified in finding that the defendant had failed in the discharge of its duty to the plaintiff. But beyond this, it says, it is doubtful if the authorities in New York state sanction the introduction of evidence of independent accidents. And in this case evidence that other accidents of a like nature of the one in question had happened in the locality was properly excluded, the court holds, the fact that the conditions were the same not having been established.

#### RIGHT TO REMOVE SHADE TREES.

Miller v. Detroit, Ypsilanti & Ann Arbor Railway Co. (Mich.), 84 N. W. Rep. 49. Nov. 13, 1900.

A street railway company, has the right, the supreme court of Michigan holds, to remove shade trees within the limit of the public highway, for the construction of its road as established by the township authorities, without compensation for damages. The principle is the same as that which governs when the necessity for the removal of branches exists. It is established beyond controversy that municipal authorities have the entire control over their highways, streets, and sidewalks, and may remove shade trees whenever they are an obstruction to the use of the highway for public travel, without compensation to the owner. Trees planted in the public highway are planted with the understanding that they can remain there only so long as the space occupied by them is not required for public use. A street railway is not an additional servitude. When, therefore, the construction of one is duly authorized, it log-

ically follows, the court maintains, that the company has the right to remove from the highway any obstruction which interferes with the proper construction and operation of the road. Such power is necessarily implied. The township authorities, it adds, might possibly fix, as a condition to the grant of a street railway franchise, the payment of damages for the destruction of shade trees. The legislature undoubtedly has the power to provide that abutting owners should be compensated for the damage that must result to them in the destruction of their trees. That, however, is a matter for the determination of the legislature, and not for the courts. The Michigan legislature has granted the power to do it without compensation. The township authorities have not provided for it. Courts are therefore powerless. But, the supreme court says, there was one fatal defect in this case in the company's proceedings. It secured no greater rights by its franchise than the municipality had. The law gives neither the right to remove shade trees without notice to the owner, and an opportunity to him to remove them as he may see fit. Wherefore, it holds that the party here suing was entitled to recover for damages, and that a judgment in her favor for \$275 for the destruction of 11 shade trees in front of her property, dug up and removed by the company in the construction of its railway, the location of which was fixed at 20 feet from the center of the highway, must be affirmed.

#### STEAM RAILWAY TRACK A DANGER SIGNAL TO MOTORMAN.

Goodrich v. Chippewa Valley Electric Railroad Co. (Wis.), 84 N. W. Rep. 419. Dec. 7, 1900.

It appeared by the complaint that the plaintiff was a motorman on one of the defendant company's street cars (presumably, says the supreme court of Wisconsin, an adult in full possession of his faculties); that he was directed by the company to run his car across the track of a steam railway company without stopping, and assured that no accident was liable to occur thereby; that he did as directed, and was run into by cars being operated on that railway track. There was no allegation that the steam railway track was apparently unused, but it was alleged that the motorman did not know that it was frequently used. Upon these facts it is quite plain, the court holds, that the motorman could not recover damages for the personal injuries which he sustained in the collision mentioned. The steam railway track, it goes on to say, must have been in plain sight. It was itself a danger signal. It was just as much a signal of danger to the motorman of a street as to the ordinary traveler. In crossing it without looking or listening—as it must necessarily be inferred that he did from the statements of the complaint—he was plainly guilty of contributory negligence. The fact that he was ordered to cross without stopping, and assured that there was no liability of accident, was no excuse to an employe of full age and capacity, who could appreciate the danger as fully as his employer.

#### POWER TO IMPOSE OCCUPATION TAX.

Savannah, Thunderbolt & Isle of Hope Railway v. Mayor, Etc., of Savannah (Ga.), 37 S. E. Rep. 393. Nov. 26, 1900.

The charter of the city of Savannah confers upon the municipal authorities "full power and authority to make such assessments and lay such taxes on the inhabitants of said city, \* \* \* and those who transact or offer to transact business therein, as said corporate authorities may deem expedient for the safety, benefit, convenience and advantage of said city." Section 2180 of the civil code of Georgia contains a proviso that all street railroad companies incorporated thereunder "shall be subject to all just and reasonable rules and regulations by the corporate authorities, and liable for all assessments and other lawful burdens that may be imposed upon them from time to time." Under these circumstances, the municipal authorities of the city have power, the supreme court of Georgia holds, to levy and collect an occupation or business tax from street railroad companies for the use and occupation of the city streets by their tracks and cars, when such companies' principal business is the transportation of passengers from points within the city limits, to other like points. And it suggests that if a street railroad company combine the two businesses so as to transport freight or passengers from the city to

points beyond, or from such points to a point within the city, and also to transport freight or passengers from one part of the city to another, then such company, though it might not be subject to a city tax on its extramunicipal business, may be taxed by the city on the business carried on exclusively within the city limits. The charter of the city gives it ample power, the court says, to levy and collect a tax upon the business of street railroad companies, and the tax is therefore within the terms "assessments and other lawful burdens" imposed upon them.

#### RIGHT OF APPEAL WHERE CHANGE OF RAILS IS ORDERED.

Pawcatuck Valley Street Railway Co. v. Town Council of Westerly (R. I.), 47 Atl. Rep. 691. Dec. 12, 1900.

The language of a charter was: "Upon such streets \* \* \* as shall be from time to time fixed and determined by the town council, \* \* \* with the assent of said corporation in writing expressed and filed with the town clerk of said towns, and upon compliance with such terms and conditions and under such rules and regulations as said town councils may impose." No appeal was provided for in the charter, and, in view of its terms, it is evident, the supreme court of Rhode Island holds, that none was intended to be given, from orders of the town council. Nor does it consider that this was rendered otherwise by statutory provision that any person aggrieved by any order or decree of any town council might appeal within 40 days. It would be absurd, it says, to suppose that an appeal, with a consequent trial by jury, was to be given to every order specifying a street to be used, the location of poles, provision for gutters and culverts, and the like. Such regulations are simply administrative, and so are placed solely in the discretion of the town council. An order of the town council with reference to paving, and the kind of rail to be adapted to it, is of the same character. If the town council has the authority to pass upon the matter, its action is not subject to an appeal. Moreover, an inspection of the language of the charter above quoted, the court points out, shows that the assent of the company related only to the streets through which it should go. The terms and regulations required no such assent. They were not limited to the time when the road was built, for the obvious reason that experience might show the necessity of reasonable modifications. And, under these circumstances, it does not think that it could be said that when the town passed an ordinance permitting the company to use certain streets for electric cars, and, among other things, prescribed the use of a T rail, that the assent of the company constituted a contract which could not be changed without the further assent of the company, with regard to the kind of rails to be used, so that the town council could not order a change to grooved rails to fit block pavement about to be put down. But the test of the legality of an ordinance making some new requirements deemed necessary for the safety, health or welfare of the community being its reasonableness or necessity, the court says that upon this ground courts have the right and duty of review in order to protect rights and to avert oppression.

#### STARTING WITHOUT SEEING PASSENGER COMING OR ON STEPS.

Gaffney v. St. Paul City Railway Co. (Minn.), 84 N. W. Rep. 304. Dec. 3, 1900.

One of the instructions given in this case was: "If the jury believe from the evidence that the plaintiff came up to the \* \* \* car from the rear, and was not upon the car, but was in a position where the conductor, in the exercise of ordinary care in looking for intending passengers at the rear step of his car, would not ordinarily see plaintiff, and the conductor, in the exercise of ordinary care in looking for intending passengers at the rear step, did look there, and in so looking saw no intending passenger, and at once gave the signal to go ahead, and the car thereupon started, then there could be no recovery in this case, and your verdict will be for the defendant." This instruction, the supreme court of Minnesota holds, was as favorable to the defendant as it was entitled to have it. Another charge to the jury was, in effect, that if they found from the evidence that the plaintiff was not on the step of the car when it started, but that she attempted to board

it after it was in motion, she could not recover; but if they found that, while the car was still waiting for and receiving passengers, she then presented herself as an intending passenger, and gained a position on the lower step before the car was set in motion, and the conductor, in the exercise of ordinary care in the discharge of his duty, ought to have seen her in that position, they would find that she was a passenger on the car at the time of the accident. This instruction the court holds was correct; for, it says, if a street car stops at a usual place for receiving passengers, and a person in the exercise of due care gets upon the steps or platform of the car for the purpose of taking passage while it is so waiting, he is to be regarded as a passenger.

#### LIABILITY FOR SHOCK OF PASSENGER ON METAL DOORSILL.

Wilson v. Nassau Electric Railroad Co. (N. Y. Sup.), 67 N. Y. Supp. 486. Dec. 14, 1900.

This was an action to recover for personal injuries sustained by a passenger who, while stepping from the platform to the doorsill of an electric street car, received a shock that paralyzed him. It was not claimed that the car was out of order. It was wet, and its platform was wet and slushy, for the day was rainy, and snow was on the ground; and the accident was due to the fact that the passenger, who had been wet by the rain, completed a circuit for the electric flow. This was the explanation of his experts. Besides which one testified that, if proper insulating material were employed, wet wood would not carry the current; that he believed such material was in use, and that he had used insulating material in cars. He also stated that he had worked upon these cars three years before, and that then he had employed the latest and most improved methods of wiring. The trial resulted in judgment for the plaintiff. This, however, the second appellate division of the supreme court of New York says must be reversed for an erroneous charge. After the main charge, the jury was told that if it found another passenger was shocked by electricity on the car on the way to the ferry, and before it reached the ferry, and that the conductor reported the car as defective to the man in charge, it might take that evidence into consideration in determining the condition of the car when it left the ferry. The court says that if there had been testimony in the case permitting an inference of the fact that another passenger on this car on the day in question, and before the plaintiff boarded it, had received a shock of electricity, then it would have borne upon the negligence of the company. But, inasmuch as all of the evidence on that point, which was the testimony of the conductor, must be considered mere hearsay, the court holds that there was no evidence upon which to found the charge, and that practically informing the jury that there was evidence in the case on which they might find another passenger had received a shock of electricity could not be considered harmless error.

#### WOMAN ENTITLED TO TIME TO CLEAR HER SKIRTS FROM CAR.

Smith v. Kingston City Railroad Co. (N. Y. Sup.), 67 N. Y. Supp. 185. Nov. 16, 1900.

Culpable negligence cannot be predicated in using the plunger furnished on a car when there is no dispute of the testimony in the case that there were no better or safer cars made than those made by the company that made the one in question, and it is not shown that any better plunger exists, or that there has been any change in the plunger, except that a hood has been placed over it, an apparent improvement. At the same time, a woman, the third appellate division of the supreme court of New York holds, is entitled to not only time enough to step off, but also to clear her skirts, in the event that they catch upon any obstruction on the platform, and it is the duty of the conductor to see that she is clear from any such attachment before he starts the car. If he starts before he knows that she is thus free, it is a negligent method of starting, and he takes the chances. Nor does the court consider that it can be held negligence as a matter of law for a woman to travel upon a car with a dress so long that it will be more likely to catch upon such appliances as necessarily extend above the platform.

## The Laconia (N. H.) Street Ry.

A charter for the construction and operation of a street railway in the towns of Guilford and Laconia, N. H., was granted by the New Hampshire Legislature in 1881, to the Laconia & Lake Village Horse Railway Co., and in 1895 the name of this corporation was changed by the Legislature to the Laconia Street Ry. The road was built from Laconia to Lakeport in 1882 and ran as a horse



FIG. 1—SUMMER EXCURSION TRAIN.

railway until August, 1898, in the summer of which year a controlling interest was secured by H. L. Pierce, G. H. Cook and Chas. T. Foster, of Leominster, Mass., who immediately equipped the four miles of track for electric power. As a horse line the property earned an average dividend of 6 per cent per annum on the capital invested.

Before the close of 1898 preparations were made for extending

summer months, and the company enjoys an exceptionally heavy excursion and gala day traffic from picnics, conventions and outing parties.

Laconia is a beautiful and enterprising city of 12,000 people situated within walking distance of Lake Winnesquam, Lake Pangus and Round Lake, so that it has become known as the Lake City. Weirs is a summer place with many cottages, large and beautiful



FIG. 3—EXTERIOR OF BUILDINGS.

hotels, and having a summer resident population of about 3,000, but upon many occasions during the reunions, festivals and celebrations that are held here every year by organizations from all over the state, 10,000 people make Weirs their temporary home.

Active construction work on the Weirs extension was begun early in the spring of 1899, and the road was equipped and in operation by June of that year. The entire length of line is now a little less

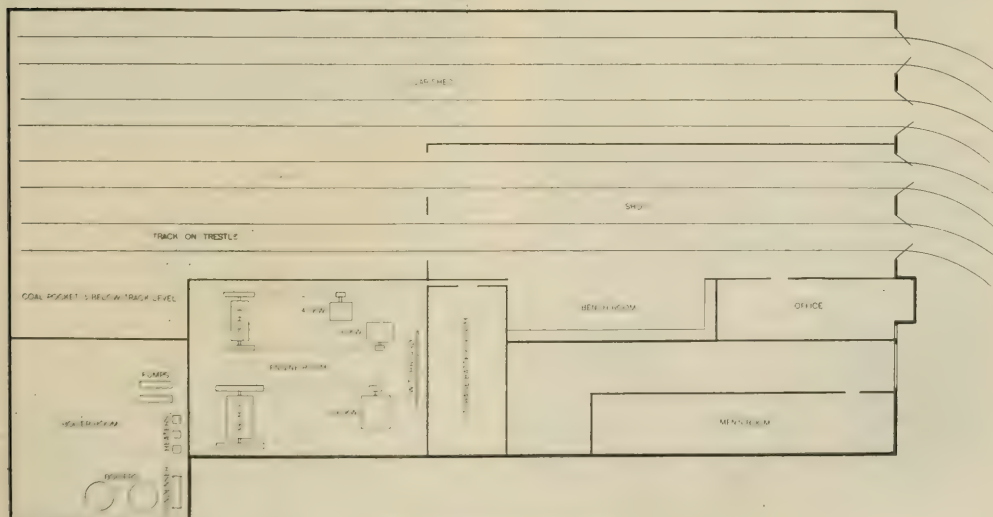


FIG. 2—DIAGRAM OF BUILDINGS.

the road to Weirs on Lake Winnepesaukee, and arrangements were perfected with the city for building a broad boulevard along the shore from Lake Pangus to Weirs. The Laconia Street Ry. follows the driveway for most of the distance along the water's edge, a feature that has caused the railway to become very popular with the thousands of people coming to the lake region during the

than 10 miles. The extension to Weirs, about 6 miles, is laid with 60-lb. T-rails, on chestnut and oak ties, 2 ft. c. to c. The old track is of 45-lb. T-rails. Pine poles are erected on the four-mile city line, and chestnut on the country extension. The maximum grade is 6 per cent.

Eight motor cars and eight trailers, built by the Laconia Car Co.,



make up the present equipment. Four of the motor cars have Laconia double trucks and four are mounted on Bemis single trucks. They are all fitted with Westinghouse motors. Fig 1 shows a number of Laconia cars carrying one of the frequent excursion parties to Weirs.

The car barn and power station are located at Laconia, six miles from the Weirs terminal and four miles from the Lakeport

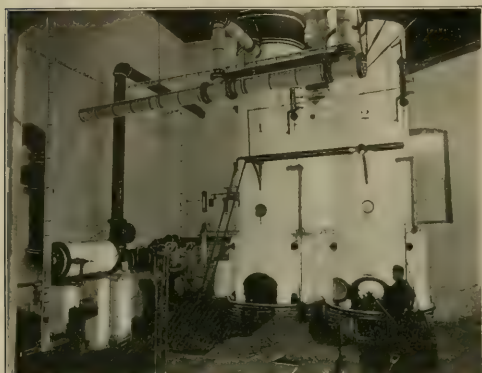


FIG. 4 -BOILER ROOM.

terminal. A diagram showing the general layout of the buildings is reproduced in Fig. 2, and an outside view is given in Fig. 3. The main building is of wood with gravel roof, and sides covered with clapboards, painted a light color. Four tracks extend the length of the car shed, which is 150 ft. deep, with one corner partitioned off as a repair shop. The remainder of the building is divided into stock room, office and mens' room, and engine room, all heated by steam.

In the engine room, which is 30 x 40 ft., are installed one 380-h. p. compound condensing engine driving a 200-kw. Westinghouse generator, and one 180-h. p. compound condensing engine driving a 60-kw. and a 40-kw. Eddy generator. They have independent jet condensers. The engine room floor is cemented and foundations are of brick and portland cement, built up from a coarse

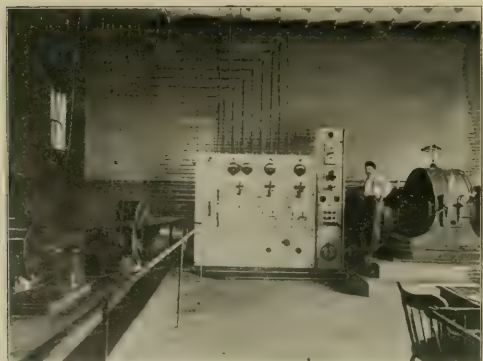


FIG. 5 VIEW IN ENGINE ROOM.

gravel bed. Views of the engines and generators are given in Figs. 5 and 6.

The boilers are in a separate but closely adjoining building, which is 30 x 30 ft., with brick walls and iron roof, and floor of brick laid in cement. The building contains two 150-h. p. Manning boilers, 61 in. in diameter, built by the Portland Co., of Portland, Me. The boilers, which are shown in Fig. 4, are fed by two Worth-

ington duplex plunger pumps, with outside packing. The feed may be taken from the city water mains or from the hot well. Two special feed water heaters are in operation. The boilers are fitted with automatic draft regulators. All piping was installed by Carpenter & Jefferson, of Lowell, Mass., and is protected with Nightingale & Childs "Magnesia" covering.

Owing to the heavy fluctuations in the load on the station, caused by the peculiar excursion traffic, that frequently makes it necessary to move a number of crowded cars at once, a 250-cell storage battery has been installed, which is charged during the periods of light travel and helps out on the overloads. This battery is placed in a room 14 x 29 ft. opening out from the engine room.

Cars are run on 20 minute headway between Lakeport and Laconia throughout the year, and from Laconia to Weirs, on 40 minutes headway from May 1st to June 1st, when a 20 minute schedule is put in effect on Sundays, holidays and afternoons. The company's charter permits it to shut down about five miles of track at the Weirs end during the winter months.

At Weirs a fine park has been laid out, containing a rustic stage and the usual amusement attractions found at pleasure resorts of this nature. Fig. 7 is reproduced from a photograph taken at Weirs Park during a band concert.

The employees of the company have an organization known as the Laconia Street Railway Employees' Social Club. The club has a well-appointed clubroom in the building, which is connected by telephone and speaking tube with the office of the company. The

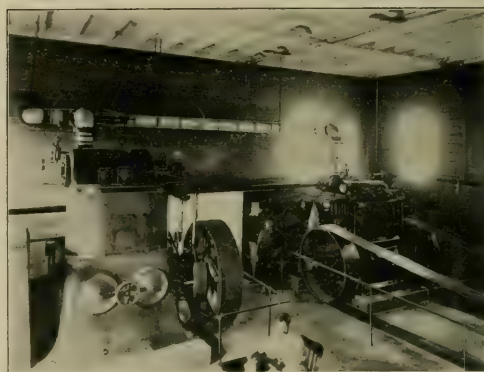


FIG. 6 -VIEW IN ENGINE ROOM.

clubroom is equipped with a pool table, card tables, etc., with which the men amuse themselves during their leisure hours. The dues of the club are 40 cents per month, and the men pay 1 cent per cue for pool. The proceeds of the clubroom go to a sick benefit fund, and the club is considered of great advantage to the men, as it provides wholesome recreation for the employees, and what money they spend there is spent in a good cause. It also keeps many of the men nearby who can be called upon for extra duty by the company if required.

The officers of the company are: President and general manager, H. L. Pierce; treasurer, Edmund Little; superintendent, L. S. Pierce; electrician, H. Mathers; chief engineer, C. Arnold.

Mr. L. H. Pierce entered the electrical business in 1889, when he started the manufacture of electrical supplies at Leominster, Mass. In 1890 he organized the Pierce Construction Co. and has since then built about 200 miles of electric roads throughout the East and South. Mr. Pierce gave up the construction business to devote his entire time to his several railway interests, among which are the Fitchburg & Suburban, of Leominster, Mass., and the Laconia Street Railway, of both of which companies Mr. Pierce is president.

Mr. L. S. Pierce entered the electric railway business in 1887, when there were but very few roads in operation. He was at first electrician on the Belt line in Lynn, Mass., and the following year was appointed superintendent of overhead construction and electrician of the Pierce Construction Co., which position he held for

about ten years. He became connected with the Laconia Street Railway, Aug. 1, 1898.

Mr. Charles T. Foster, who was the former treasurer and general manager of the road, was one of the active promoters of this railway as well as a number of others, with several of which he has



FIG. 7 BAND CONCERT AT WEIR'S PARK.

been officially connected. Mr. Foster has also large real estate interests in the neighborhood of Leominster, and recently severed his connection with street railway work to give his entire time to other business interests.

#### TRAFFIC ON THE BROOKLYN BRIDGE.

The overcrowding of the New York end of the Brooklyn bridge has recently been so admittedly dangerous that it is probable some radical change in the structure will be made as soon as the required remedies can be decided upon. The New York Chamber of Commerce has taken the matter up and appointed an investigating committee of three to consider a remedy for the overcrowding. Mr. Clinton L. Rossiter, president of the Brooklyn Rapid Transit Co., believes that the only permanent relief from the present conditions will be obtained by completely remodeling the New York entrance of the bridge. In regard to the travel over the bridge Mr. Rossiter says: "We now carry 3,000 local and 22,000 through passengers an hour each evening during the rush hours; but through the use of the double platform there is comparatively little crowding on these platforms. The crush of people occurs for the most part on the stairways leading to the platforms. On the double platform there is always a train waiting. During the rush hours recently when the ferries were stopped because of the ice floes, I personally stood on this platform for an hour, and never, for even a quarter of a minute, was there not a train waiting. Many of the passengers try to catch an outgoing train and so crowd at one point. Others who only want a seat in the waiting train find no difficulty in the crowd."

#### FATAL STREET CAR ACCIDENT.

A fatal accident occurred on the Mahoning Valley Electric Ry., March 30, during a storm which covered the tracks with sleet. A car on the Elm St. line was approaching the terminus when the motorman lost control of it. At the foot of the grade there is a sharp curve, and as the car struck it it left the track and turned over. The conductor, who was on the rear platform, was caught and crushed, but the motorman escaped injury. There were no passengers on the car.

The survey for an electric road between Rockford, Ill., and Belvidere is nearly completed and several farmers on the route have refused to allow the road to pass through their land. One man has laid out his farm in city lots, which he holds at a high price. Condemnation proceedings will be begun.

#### EUROPEAN HIGH-TENSION THREE-PHASE RAILWAY SYSTEMS.

Abstract of a paper read before the American Institute of Electrical Engineers by W. J. Hammer.

Several high-tension three-phase systems of electric railways were described by Mr. Hammer. One of these systems is that now being installed upon the Lecco, Sondrio & Chiavenna line in northern Italy, and which system was run experimentally last year upon a circular track a mile in length at Alte-Ofen Island, in the Danube, near Budapest, Hungary. The length of the Italian electric road, which up to the present has been operated by steam, is 66 miles, and the maximum grade 2.2 per cent. It is safe to say that this road, by reason of its length, problems in freight and passenger haulage, high potential employed, and its special electrical and mechanical features, represents the most interesting electric railway installation now under construction, and it will be followed with the greatest interest.

The motive power now being arranged for represents about 7,400 h. p., with facilities for increasing when necessary. The power will be derived from a waterfall near Morbagnio,  $9\frac{1}{2}$  miles from Calico and  $15\frac{1}{2}$  miles from Sondrio. Four 2,000-h. p. Schuckert three-phase dynamos, generating 20,000 volts at 15 cycles, are direct connected to four turbines, which are supplied from a raceway between two and three miles long, delivering 35 cubic meters of water per second and having a fall of 30 meters. The three-phase current of 20,000 volts will be supplied direct to the line, and the 12 substations will transform it to 3,000 volts and supply 12 independent sections of the railway line, each of which is equipped with fuses. Two overhead trolley wires 8 mm. in diameter represent two of the phases, and the track the third. The line insulators are of porcelain, having five petticoats decreasing in size from top to bottom. The line wire, which is of copper, is 7 mm. in diameter. The sections of road are operated upon an ingenious block system; when the stop signal is set, the line circuit is opened and simultaneously the brakes on the train are set. Passengers and freight traffic are operated independently. The freight locomotives will be of 700 h. p., employing four motors, and capable of hauling 250 tons at a speed of 19 miles an hour up a 10 per cent grade. The passenger locomotives are also equipped with four motors, each weighing about  $3\frac{1}{2}$  tons and representing 300 h. p. The schedule speed is about  $37\frac{1}{2}$  miles an hour on the level and about half that on grades. The 3,000-volt current is taken from the trolley lines by two copper rollers 16 in. long and having a diameter of  $3\frac{1}{4}$  in. These rollers, which are mounted in the same axial line, revolve upon steel ball bearings (through which no current, however, passes) and are separated by 5 in. of hard wood saturated in paraffine under pressure. On the left and right sides of this pair of rollers are copper cones about 8 in. long, rigidly connected to the trolley support. The base of the trolley is mounted on a long horizontal hinge on the top of the car and connected to a piston of an air cylinder, so that the trolley can be raised and lowered by air pressure. Each of the primary or high-tension motors has its trolley with double rollers. Collecting-brushes running on graphite collars take the current from the two rollers, being held against them by spiral springs. The current is then led by highly insulated wires, protected by grounded metallic tubing, to the motors. Each car is mounted on two trucks, and is equipped with two primary and two secondary induction motors, or four in all, each of 150 h. p. Each motor weighs  $1\frac{1}{2}$  tons, and the air gap is between 4 and 5 mm. The 3,000-volt current passes directly to the stationary windings of the primary motors. In starting up the train or in climbing a grade the motors are connected in "cascade"; that is, the windings of the primary rotors which are designed for 300 volts, are connected to the stationary winding of the secondary motors, while their rotors are connected to the fluid resistances. This gives the car a speed of about  $18\frac{1}{2}$  miles an hour. The controller handle has only two positions, half-speed and full speed, and when speed is attained on the first position of the controller the handle is thrown to its second point, which throws the stationary fields of the primary motors on the line and their rotors on the fluid resistances which are slowly cut out of circuit, the secondary motors meantime also being thrown out of circuit. This arrangement gives a car speed of  $37\frac{1}{2}$  miles an hour.



The wires in both field and rotor windings are invisible, as they pass longitudinally through insulated tubes in the iron and at the ends of the windings are insulated by mica and protected by plates or caps bolted on. The controllers at each end of the car are connected mechanically, and the high-tension switches are connected electrically. A small transformer on the locomotive connected to the line delivers current at 100 volts to a three-phase motor for compressing air for use on the air brakes, operating the high-tension switch, raising and lowering the fluid in the resistance boxes (which is simpler than raising the plates), and for raising and lowering the trolley. The same transformer supplies current for lighting the train; Cruto three-phase incandescent lamps are employed, the periodicity being but 15 per second, the fluctuations were too noticeable in the ordinary lamps, so the Cruto three-filament lamp was employed and showed no fluctuation.

The three-phase liquid rheostat is a feature of considerable interest. It consists of an iron box having three wings to it. From the top of the box depend three separate cylinders. Supported inside of each cylinder are two sets of iron plates. They are of varying length, and are rounded at the lower extremity. The alternate plates are connected in pairs, the current entering by one pair and leaving by the other, the sets being attached to the three phases of the low-tension rotor circuits, which have a potential of 300 volts. The lower portion of the outer case contains a solution of sodium carbonate. The upper portion of this outer case is supplied with compressed air, which, according to the rate with which it is allowed to pass into the outer chamber, causes the liquid to rise in the three cylinders. The liquid as it rises comes in contact with the various iron plates, one after the other, and more or less resistance is thus cut out of circuit, depending upon the height of the solution. By releasing the air pressure in the outer compartment, the solution immediately drops into the lower part of the case, and the plates are then entirely separated from each other. The entire height through which the solution passes is less than 12 in. This resistance box, which is the result of a large amount of experimentation, enables the motor-driving torque to be kept constant during acceleration. The air exhaust valve is a lift type of valve, normally kept open by a spiral spring. The valve for operating the rheostat is compound, having several ways through it. On being operated, the latter first opens a clear way for the compressed air to a cylinder, and to the top of a piston which compresses the spiral spring above referred to, and closes the exhaust valve. The air is next admitted slowly through a small throttling aperture, which admits the air at low pressure, to the outside of the resistance box casing. When half-speed has been attained, the motion of the controlled lever when thrown to full speed, causes the air cock to close the throttling aperture and open another, thus relieving the air above the upper surface of the exhaust valve piston, permitting the compression spring on this valve to instantly open it, thus throwing in again instantly the whole resistance. These operations are repeated in passing from half to full speed, and vice versa, when the motors are in "cascade" as described.

The motors are direct-connected to the axle; that is, there is no gearing; the rotor axle is hollow, with an internal diameter of 8 in. and is lined with brass, permitting the car axle, which has a diameter of 4 in., to pass through it. The circuits to the three collector rings pass through grooves in the rotor shaft. The rotor shaft and the car wheels are flexibly connected, and thus jarring and vibration are prevented. The rotor has at one end the three collector rings, upon which rest the three carbon brushes. At the other end of the rotor is a driving-flange which is connected to the driving-wheel on that side through two links, one of which acts by thrust and the other by tension, the two stresses being of equal magnitude.

The firm of Siemens & Halske, of Berlin, has been studying the problems connected with the operation of electric railways under steam conditions, and as long ago as 1892 made some interesting experiments with three-phase current on a track 360 meters long at Charlottenburg.

In 1898 a longer line was built by this company between Grosse Lichterfelde and Zehlendorf, having a standard gage track 1.8 km. in length. The power station was situated at about the center of the line. The trolley line as originally arranged is shown in the illustration Fig. 1. The current was taken off by sliding contacts

on top of the wires, but in a subsequent arrangement the wires were disposed to permit the sliding contacts on the sides. All three of the wires, which are of hard-drawn copper 8 mm. in diameter, were placed alongside the road in order to get rid of the effect produced upon the telephone system by using the track for one phase. Tension is maintained on the wires by heavy weights placed inside the lattice poles at definite intervals, which act through a loose pulley and a block with six pulleys and give a stress of 1,500 kg. on the wires. As a precaution all the poles are separately grounded to the rails.

The trolley consisted of strong aluminum pieces, pivoted about a horizontal axis, and fastened to an iron pipe, being held against the wires by a spring. In the system employed later all three conductors lie in a vertical plane one meter apart. With the latter arrangement three bow trolleys are used on top of the locomotive, each of which is pivoted upon a vertical axle, the three axes being of the same height. The loops or bows are of different lengths and inclinations. They also pivot horizontally to pass below crossings, etc., and are controlled simultaneously by a worm gear, operated from inside the cab. The working conductors and trolleys were tested with a current as high as 30,000 volts. Power is

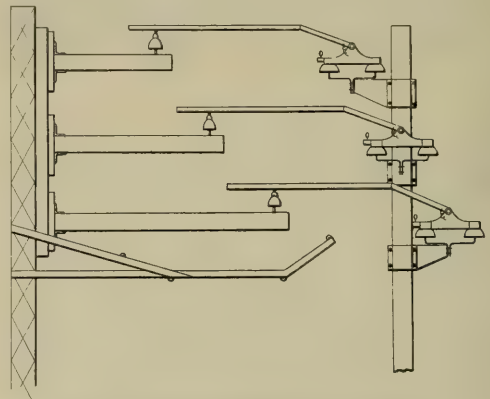


FIG. 1—ORIGINAL ARRANGEMENT OF TROLLEYS.

supplied from the sub-station of the Grosse-Lichterfelde Railway, which has a storage battery and direct-current motors for driving a rotary current dynamo. The latter is 12-pole, giving normally 700 volts and 50 periods, and 120 to 250 amperes at 500 revolutions per minute. This machine can be completely altered so that potentials from 385 to 4,000 volts can be developed. There is also a rotary current transformer, with a transforming relation of 750 to 10,000 volts. With this plan it was possible to secure 750 volts directly, 2,000 volts directly and 10,000 volts by transformation. The transformer, dynamo frame and instrument cases were all grounded as a precaution. As first operated, the transformer stepping down from 10,000 to 750 volts was carried on a separate car with trolleys in order to better observe the sliding contacts and to be free from the high tension at the motor, which was not encased. There was only room in the locomotive for the large resistances and other apparatus. Later an iron top casing was put on the locomotive, in which the transformer was placed. The weight of the locomotive complete was 16,000 kg. It is equipped with two rotary current motors, one on each of the two axles, and operating at 650 to 850 volts and 30 h. p. normal. The current is taken direct to the stationary windings. The motor is provided with slip rings and ventilation. The air gap is 1.5 mm.

These motors show an efficiency of 88.5 per cent, and the largest is of 120 h. p. capacity with 650 volts, which is increased to 200 h. p. with 850 volts. The motors are flexibly suspended upon the car axles, and two sets of gear wheels serve to change the speed. For the operations of 750, 2,000 and 10,000 volts the same motors, frames and rotary parts were used, only the stationary parts being exchanged for the direct operation with 2,000 volts.

Fig. 2 gives a diagram of the circuits. A controller constructed for 750 volts is employed for switching in and out and for starting



the motors. This has in its interior a reverser drum for changing the running direction and a controller drum for switching the stationary windings of the motor in and out. The controller drum is mechanically connected by a chain gear with the starting devices for the rotating parts of the motors. When running with 750 volts the controller is directly connected with the trolleys. When running with 10,000 volts, it is, however, connected through the transformer, from 10,000 volts to 750 volts, and a switch for 10,000 volts. Running with 2,000 volts the supply conductors to the primary parts of the motor can be cut off from the controller, and the car operated by two auxiliary switches, and without the use of the transformer. The reverser drum of the controller is so arranged that when employing an additional transformer (for instance with 10,000 volts) different currents can be taken off, thus obtaining the higher torque when starting through a higher e. m. f. (850 volts) than during the normal running (650 volts). The reverser drum also has steps at which only two phases are connected up, thus making it possible to reduce the running speed by half. The starting devices are entirely separated from each other to facilitate the cutting out of each motor, and to avoid any irregularities in the synchronism of the motors with wheels whose

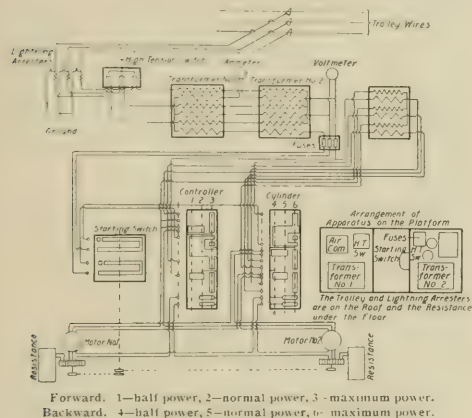


FIG. 2—DIAGRAM OF LOCOMOTIVE WIRING.

diameters did not correspond. All the electrical circuits and connections are heavily insulated and protected. Siemens lightning arresters are used on the locomotive for each phase. Hand and air brakes are employed, and the usual volt and ammeters. A locomotive with a load of 30 tons was run up to a speed of 60 km. in 60 seconds' time, with 700 volts and 190 amperes. The locomotive alone, attained the same speed in 30 seconds. When run with a load of 30 tons at 60 km. per hour, the motor consumed 70 amperes at 700 volts. As is known, the starting torque varies with the square of the voltage; therefore, by increasing from 670 to 950 volts, the starting torque can be increased to double that at the normal tension. This can easily be obtained when employing transformers, in the operation with 10,000 volts, by the addition of coil sections. The speed may be regulated by wheel resistances in the secondary, by opening a secondary circuit or by "cascade" coupling.

The Jungfrau three-phase railway has been under construction since 1897 and, it is estimated, cannot be completed before 1908 to 1910. It employs three-phase currents of 7,000 volts supplied by generators operated by water power. Part of the current is transformed to 120 volts for lighting purposes and the current for the operation of the locomotives is transformed to 500 volts. Two overhead trolley wires are used, the rails being employed as the third conductor. The trolley wires are 16 in. apart and have double insulation between each other and between them and the ground. Double trolleys with both slide and wheel contacts are employed. The overhead conductors are bare and are supported on triple petticoat porcelain insulators mounted on wood poles.

Lightning arresters are used on each end of the circuits, and each pole carries a pointed wire connected to the earth. The station electrical machinery and apparatus is made by the Oerlikon company. The two generators of 500 h. p. each and one of 800 h. p. are direct coupled to Gerard turbines which have horizontal shafts with two wheels running at 380 revolutions. These generators are of the inductor type with stationary windings, and generate a three-phase current of 38 cycles and 7,000 volts, running at a speed of 380 revolutions per minute. They are connected to the turbines by flexible insulating couplings and are mounted upon porcelain insulators. Two exciters of 25 h. p. each at 600 revolutions, supply a direct current of 120 volts for exciting the fields. These exciters are shunt wound, and direct coupled to separate turbines. Each exciter is capable of exciting all four generators which will constitute the plant. All of the turbines are automatically regulated. The present station at Lauterbrunnen will supply 2,000 h. p. from the "Weisse" Lutschine, and that at Grindelwald will supply, when completed, 3,000 h. p. This supply comes from the "Schwartz" Lutschine, which gives 9,000 available h. p. The total length of the transmission line from the Lauterbrunnen Station to the top of the mountain is about twenty miles. At ten per cent drop, the allowance would be about 700 volts. The conductors are about 5-16 in. in diameter, and when the road is completed there will be twelve sub-stations along the entire line, about one and one-half miles apart. The highest will be 13,000 ft. above sea level. There will be about seven miles of tunnel on this road, costing alone \$1,000,000. Owing to the nature of the rock it has not been necessary to face the tunnel with stonework.

There are five locomotives used on this road. Two of them were made by Brown, Boveri & Co., of Baden, with an individual weight of 13 tons, and each locomotive has two motors with a maximum output of 200 h. p. and a speed of 760 r. p. m.; the other three locomotives were made by the Oerlikon company of Zurich, and are each of 19 tons weight, each being equipped with two 220 h. p. induction motors with a normal speed of 500 r. p. m. The locomotives are designed to make an ascending speed of five miles an hour and draw two cars seating eighty persons. These motors are connected by a double reduction gearing. A sprocket wheel having teeth 4 in. pitch and  $2\frac{3}{4}$  in. broad, of aluminium bronze, engages a continuous "Strub" rack laid between the rails of the road. This rack is put down in 10-ft. sections, its height above the ties is about 7 in., the pitch 4 in., the breadth of the teeth is  $2\frac{1}{2}$  in. and the tooth depth  $2\frac{1}{2}$  in. The rails are of steel, 42 lb. to the yard and 32 ft. in length, and the gage 3.28 ft. In the open they are laid upon wood ties and in the tunnel upon cast iron ties. A controller cuts resistance in and out of the rotor circuits, which resistances are kept cool by air forced through them by a ventilating fan. Each motor on the locomotives has a separate resistance which is used not only for starting but for absorbing current when the locomotive is descending, at which time the motors are left in circuit to secure automatic braking action and to give the generators a nearly constant load. These descending locomotives may at times supply current to the line, thus assisting the ascending cars. The locomotives will start themselves on a grade of 25 per cent. By mounting one end of a car on an extension of the locomotive frame the traction has been favorably increased, and to secure the greatest benefit of this weight the cars are put in front of the locomotive in going up hill, and behind it in descending.

It was customary at one time before descending to signal the Lauterbrunnen power house, and resistance was put in circuit, but later the locomotives were equipped with a resistance qualified to absorb the whole current generated by the motors in descending. This saves wear and tear on brakes and turbines, generators, etc., and wastes no extra power, as the water must pass the power house at any rate.

The cars are equipped with hand, automatic and electric brakes, as required by Swiss Mountain regulations.

It was found after very careful estimates had been prepared that from manufacturers' actual prices the first cost of a rotary converter method would be over 50 per cent greater than the present system in which three-phase currents only are used.

A difficult problem has been to satisfactorily reduce the speed of locomotives going down hill, which always exceeded the ascending speed by reason of the fact that three-phase generators run faster as generators than as motors. The Oerlikon company has

neatly solved the difficulty by attaching a small direct-current dynamo to the motor-shaft and supplying a direct current to the stator windings of each motor; a resistance placed in circuit permits the regulating of the direct current and secures a speed about half that of ascending. When the locomotive starts to descend, the overhead trolleys are lowered, and the three-phase current generated by the rotor is absorbed by the motor-starting resistance, which is much less than formerly. This brake arrangement has displaced the magnetic brake, which is only in circuit when going uphill.

The Jungfrau is 13,667 ft. above the sea level and 11,808 ft. above Interlaken.

The electric road is now open from Kleine Scheidegg—which is 4,270 ft. above Interlaken—to Rothstock, and although financial difficulties have recently delayed the work, it is expected that Eismere will be reached in 1903 and, as before stated, the road entirely completed between 1908 and 1910.

When completed the round-trip fare will be 35 francs or about \$7. The entire cost of the road when completed is estimated at \$2,000,000.

### MAINE STREET RAILWAYS IN 1900.

The 42d annual report of the Railroad Commissioners of Maine has just been issued for the fiscal year ending June, 1900. The volume contains considerable statistical and other information in regard to the street railways of Maine. The increase of mileage for 1900 was insignificant, being but 28½ miles, due to additional construction on existing roads. The total mileage of all street railways operating in the state is 268.99 miles. The following table shows the earnings, charges, income and dividends of the different roads.

The street railway companies in a number of cases failed to make returns of the number of men employed and of wages paid to employees, but an estimate based upon those returned and upon in-

### CONDUCTORS ANNOUNCING STREET CROSSINGS.

One of the noticeable features of street railway operation in Boston and vicinity is the fact that all conductors, as every street is approached, invariably open the door and call the name of the street. While this matter of announcing streets is one of the little things, there is hardly a better way in which a company can manifest to the public its interest in the comfort and convenience of its patrons. The companies in Boston have given special attention to the matter and conductors are required to call in a clear and distinct voice, that shall be audible in all parts of the car, the name of each approaching street or avenue in the suburbs, as well as in the city. In order to make the announcement perfectly distinct they are instructed to speak in a deep, full voice and directly into the car.

The general order covering this subject, as issued by the Boston Elevated Railway Co., reads as follows:

"The attention of conductors and motormen is especially directed to the requirement of the rules, not only that all stopping places shall be announced, but that they shall be announced in a clear and distinct manner.

"Employees will be required to make these announcements distinctly and with proper pronunciation. Slovenly habits of pronunciation, such, for example, as 'Beeking' for Beacon, and 'Bothineer' for Bothnia, must be corrected.

"In order that announcements may be more clear and distinct the use of the words 'street' or 'avenue' will be abandoned, except in such cases as are necessary to prevent confusion; that is to say, where streets and avenues exist having the same name, and at all streets bearing the same name as that of some suburb upon the system; examples, Dorchester St. and Dorchester Ave., Brookline St., Arlington St., etc.

"Where 'street' is not used, repetition of the street name will often aid in clearness; for example, 'Quincy,' 'Quincy.'

### STATISTICS OF MAINE STREET RAILWAYS, YEAR ENDING JUNE 30, 1900.

Railways.	Miles operated.	Transportation earnings.	Other earnings.	Total earnings.	Operating expenses.	Interest, taxes and other charges.	Total charges.	Net divisible income.	Dividends paid.	Rate-%.	Surplus for the year.	Deficit for the year.
Augusta, Hallowell and Gardiner R. R.	7.00	\$38,402 67	\$845 24	\$38,747 91	\$27,397 10	\$8,645 95	\$36,043 05	\$2,704 83	\$4,800 00	4	\$2,095 17	
Bangor, Hallowell and Winterport Ry.	6.13	25,623 55	1,163 13	26,816 68	22,396 10	2,623 90	25,010 00	1,206 39			\$1,206 39	
Bangor, Orono and Old Town Railway	14.95	49,250 02	1,807 11	50,957 13	36,671 27	8,723 21	45,444 48	5,189 63			3,782 61	
Bangor Street Railway	8.40	63,418 05	1,753 09	65,171 14	50,547 50	10,841 03	61,388 53	3,782 61				155 33
Benton and Fairfield Railway	3.41	6,532 98	26 00	6,558 98	5,965 08	749 83	6,714 91				3,594 85	
Biblehead and Saco Railroad	5.72	31,373 55	198 58	31,572 13	20,802 60	7,174 56	27,977 16	3,594 85			1,722 81	
Cabot Street Railway	7.00	23,336 03	424 61	23,760 64	20,405 37	5,680 08	26,085 45	1,722 81				92
Fryeburg Horse Railroad	3.00	668 20		668 20	519 12	150 00	669 12					
Lewiston, Brunswick & Bath St. Ry.	54.75	214,774 24	7,589 90	222,364 14	167,550 40	53,871 33	221,461 73	902 41	31,011 00		30,108 59	
Mousam River Railroad	2.58	8,894 67	15 75	8,910 42	4,498 86	2,803 56	7,302 42	1,608 00			89 47	
Norway and Paris Street Railway	2.12	6,366 17	89 14	6,455 31	5,390 86	974 98	6,365 84					
Penobscot Central Railway												
Portland Railroad	39.58	411,000 64	2,510 96	413,511 60	285,157 37	56,063 40	341,220 77	71,690 83	49,780 00	5	21,910 83	
Portsmouth, Kittery & York St. Ry.	15.50	68,185 38	2,995 20	71,180 58	46,462 11	12,451 87	58,913 98	12,266 60	15,906 00	*	3,729 40	
Portland & Yarmouth Electric Ry.	7.78	33,685 20	1,410 43	55,095 63	39,275 83	14,690 31	53,966 14	1,150 49			1,485 00	
Rockland, Thompson & Camden St. Ry.	16.64	67,307 58	12,47 55	79,785 51	52,106 08	12,888 33	64,994 01	14,850 50			1,017 32	
Sanford and Cape Porpoise Railway	23.63	42,892 83	4,620 00	47,012 83	33,338 47	14,469 61	48,031 13				2,686 61	
Skowhegan & Norridgewock Railway	12.00	2,996 21	17 20	3,013 51	2,523 08	3,177 04	5,700 12				3,392 29	
Somerset Traction Company	5.75	13,697 81		13,697 81	10,788 37	6,239 73	17,028 10				1,034 99	
Waterville and Fairfield Railway	4.75	22,781 30	20,777 65	43,558 95	29,063 56	14,350 38	43,593 94				1,178 90	
Westbrook, Windham & Naples Ry.	5.83	8,060 32	1,260 90	9,300 22	6,387 43	1,703 89	5,181 32	1,178 90				

\* 12% to October 20; 8% for remainder of year.

† Not operated.

formation otherwise secured places the number employed, including general officers, at 941, against 864 in 1899. The average daily wages paid is about \$1.52. Conductors and motormen receive from \$1.43 to \$1.60 per day.

The report shows a very small number of accidents occurred during the year. The total number of car miles run was 5,969,590, and there was not a fatal accident to any passenger or employee. There were 22 passengers injured upon the street railways, 18 from causes beyond their own control and 4 from their own carelessness. There was but one employee injured. These street railways are, with but one exception, operated by electricity.

A franchise was granted last month by the town of Clyde, N. Y., to Charles A. Lux to build an electric road in that place.

"Employees will receive special instructions as to the manner of making street announcements, and will be required to interest themselves in this matter and co-operate with the management in improving this feature of the service."

The term "stopping places" in the order refers to all street crossings where cars will stop, and includes practically every street crossing on the system.

A project is on foot to connect Ottumwa, Iowa, and Agency with an electric line. The C., B. & Q. track between these places is to be abandoned and a new route taken to avoid a heavy grade at Agency, and it is proposed to utilize the old steam tracks for a trolley road, if they can be procured from the C., B. & Q. company.



## CORRESPONDENCE

### POLE LINES.

Editor "Review": In connection with the very complete and able article of Mr. G. W. Knox on "Pole Lines" in your issue for March, page 160, I would like to add a few items from my own experience, some of which will not agree with Mr. Knox's statements and others that will be supplementary.

First, in regard to the "shaving" of a wooden pole instead of letting it remain with the natural surface obtained by simply "peeling" it. If Mr. Knox had noticed the hard, glossy skin or natural surface of the wood directly under the bark, as contrasted with the open porous surface made by the removal of this skin, he would not have made the unqualified remark in regard to "shaving", and if, in addition he had seen the different results obtained as to "life", both below and above ground, between a peeled and a shaved pole, he would not have made the remark at all in that connection. Where poles are symmetrical or where symmetry and looks are not an object, I should certainly insist that they be carefully peeled only, the knots cut off smoothly with a draw-knife and not too close to the body and the poles set in that condition; and I would get 10 per cent more life out of them than if they had been shaved. The smoother the surface of the wood the less it will catch and retain moisture, and in this respect no artificial treatment of the surface seems to make it equal the natural surface left by simply taking off the bark. With some woods, however, the bark clings so tightly that its complete removal has to be done by shaving in some places, and, for a reason given later on, if a pole that is to be painted is shaved at all it should be shaved all over the portion above ground. There are, however, several kinds of wood used for poles, such as white cedar, cypress and the pines, from which the bark may be entirely removed without marring the under surface, and if I were using these poles under the conditions noted above I would certainly not shave them.

In regard to painting, tarring or in any way "surface-protecting" the poles under the ground my experience coincides with that of Mr. Knox, but in regard to not painting them above the ground I do not fully agree with him. As a preliminary, however, it must be stated that to paint any part of any wooden pole before it is well seasoned is not good practice, and the better the painting the worse the practice. One reason is that the paints prevent the drying out or "ripening" of the juices in the unseasoned pole, and by confining them in the wood allows them to ferment and produce an action on the fiber and cells that is detrimental to their life and strength. If, however, the poles are allowed to remain without painting for a time reaching from three months for a 10-in. butt, 6-in. top, to nine months for an 18 to 24-in. butt, 10 to 14-in. top, such poles will, in most climates, be perfectly fit for painting by the end of that time. The only objection to thus leaving them without painting is that, if set in very warm seasons, they are apt to check and split more than if painted as soon as set.

The other reason for not painting unseasoned poles is that the paint will not "take hold" of the wood and be retained by it as well as if it were seasoned. This is what is technically known as "painting water", the same as on the surface of a wet wall, and every painter knows the effect of such a proceeding. Also, if green poles are painted during warm weather the vapor of the sap juices in the wood will be forced out through the pores by the heat and will drive the soft paint out ahead of it. The same objections which apply to painting green or unseasoned poles apply also to poles which are wet or frozen. The surface of even a seasoned pole should be thoroughly dry before applying the first coat of paint.

Given, however, a well-seasoned, dry, hardwood pole such as chestnut, oak or maple, and Mr. Knox is correct—the painting is a disadvantage so far as the life of the sap or outside part is concerned, as that part will last longer if not painted. Any line-man will tell you that he would rather climb a chestnut pole that has been shaved, so far as ease in climbing is concerned, and if it has also been painted it is still easier to use his climbers, while with an unshaved pole the outside has become so hard and tough that it is with difficulty he can obtain "spur-hold".

With softer woods, however, such as white cedar, cypress or the pines, I have found a distinct advantage in painting, the outside or sap part lasting from one to three years longer. In this class of woods it is absolutely necessary that they be thoroughly and perfectly seasoned before painting, and also that the painting be thorough and complete, otherwise there will be a hard and seemingly perfect outside, while in reality it is only a thin skin, and between it and the heart-wood will be found a decayed shell, disastrous alike to the pole and the man who climbs it.

In painting poles they should never be painted clear down to the surface of the ground; some four to six inches above the ground should always be left unpainted. Poles with good solid butts will always decay quickest from one or two inches above ground to four or more inches below ground, depending on the character of the soil or filling. The cause of quicker decay at this point is the fact of its being the place where the pole is alternately wet and dry for continued periods, according to the weather or season, and it is also, in freezing countries, the point where the rending action of freezing water in the fibers of the wood is most often repeated and most destructive. Anything which tends to retain the moisture in wood at this point is conducive to rapid decay. Wood may be wet and dried quickly a great many times without injury to it, but if it is allowed to dry slowly it will be apt to decay very much sooner. This latter is the action that takes place at the surface of the ground and at a little distance above and below it, and when this action is intensified by the rending action of freezing water within the same section it is little wonder that this is the weak spot in all wood poles. For this reason, painting right down to the ground tends to retain in the wood the moisture drawn up into it for a few inches above the surface, of the ground, whereas if not painted for those few inches this moisture will be more quickly evaporated at that point.

For this reason also in setting poles, every endeavor should be used to keep this portion of the pole free from such conditions. In setting in earth, the soil or filling should be tamped very hard at the top and should be raised around the pole some five or six inches higher than the surrounding surface, sloped away from the pole and well tamped into that shape. In setting in paving, the brick, cobble, flagging, etc., should be set close as possible to the pole and then cement-mortar—i. e., cement and sand, in the proportion of 1 to 4, should be poured around it so as to fill up all cracks and interstices. The mortar should be sloped up towards the pole and around and against it so as to make a complete water-tight joint around the pole and allow all the water running down it to drain away from it on the surface of the cement.

Outside of providing for the pole a larger and heavier base and consequently a better strain-resisting section below ground, the setting of wooden poles in cement with no concrete under them and with the top of the concrete level with or some inches below the surface of the ground, there is little preservative protection afforded. To be of the greatest service the wooden pole should be set on a bed of concrete at least 6 in. thick; the concrete around it should be tamped thoroughly so as to be perfectly solid around the pole, and the body of the concrete should be carried from 3 to 6 in. above the surface of the soil and capped with a sloping top of cement-mortar as described above. The whole butt of the pole is thus encased in a water-tight and impervious solid-ended tube of concrete, and if the wood of such a pole is thoroughly well seasoned before it is set, that butt will last nearly as long as the top, and there will be little danger of its rotting off at the surface if the cement-mortar cap is kept intact.

Iron poles should always be allowed to project several inches below the concrete and into the soil, so as to always be perfectly grounded; otherwise, if they become charged or live, they would be apt to seriously or dangerously shock any person who touched them at such a time, as the person might be grounded while so doing and receive the whole difference of potential.

There are three places where paint should always be liberally used on all wooden poles, and those are, on the top or "roof", over and in all dead-limb knots and in the cross-arm gains. The object of painting at these points is to prevent the entrance of moisture, and therefore a liberal use of paint is essential. If looks are not a consideration, any paint will do so long as it has good linseed oil in it; the entire scraps from the paint-shop, priming, varnish, japan, fat-oil and any and all scrap pigments mixed together, will



answer admirably for these places, as the object is to fill all pores, cracks and holes.

In putting on cross-arms the gain should be as shallow as is consistent with the size of the pole, the weight that the cross-arm is to sustain and the horizontal stress that is to be put on it. With very light wires and an even stress on both ends of the cross-arm no gain need be cut at all on straight-line work, and in no case need a gain be cut over  $\frac{3}{4}$  in. at its deepest part. All cross-arms should be absolutely uniform in thickness at the point where they go into the gains. The top and bottom of the gain should be perfectly parallel and should be cut just wide enough to be a snug fit for the cross-arm, and the back of the gain should be straight, smooth and square with the top and bottom. If such a gain be well painted and, while the paint is wet, a well-painted and seasoned cross-arm be firmly and evenly drawn into it with bolts, those deadly menaces to lines and linemen, pole-rotted cross-arms, will be few and far between.

The cross-arms themselves should be through-bolted, just outside of the end pins, with  $\frac{3}{4}$  or 5-16-in. carriage bolts, well washered under the nut and put through hole bored 1-16-in. larger than their diameter. Steel pins of  $\frac{3}{4}$ -in. diameter of shank, and with separate wooden screw top, should be used, and these should be put through a hole bored 1-16-in. larger than their diameter, and a good-sized thin washer put under both shoulder and nut. The cross-arm braces should be through-bolted to the arms, not lag-bolted, and should be set up tight after the cross-arm is firmly bolted, so as to actually brace the arm and allow no motion in it at all. Where lag-bolts have to be used they should be screwed home and not driven. With all these details attended to, the construction will be the best I have been able to attain on straight-line work—corners and angles and junction points are another story.

H. S. COOPER.

Editor "Review":

I have read with interest the article by Mr. G. W. Knox on "Pole Lines" in your issue for March, page 160, and must take issue with him on the following statement: "Chestnut and Norway pine are perhaps the best lasting of all."

This statement following his remarks about cedar poles conveys the undoubted impression that Norway poles will last longer than cedar. This is without question incorrect. Personally I do not consider a Norway pole 45 ft. to 55 ft. long good for more than six years' service. This has been demonstrated many times and notably at Detroit by the Public Lighting Commission, which is to-day replacing Norway poles set five years ago with cedar poles. Many of these Norway poles in Detroit are to-day considered unsafe and are being replaced as fast as practicable.

In regard to chestnut poles I am not prepared to challenge his statement, but I do not believe it is correct. It certainly does not coincide with the opinion of men prominent in the construction departments of the large telephone and telegraph companies in this country.

Personal observation of cypress poles erected in Mississippi and afterwards replaced with white cedar from the North has demonstrated to me that the sap ring, on young cypress of proper size for pole lines, is so large and so liable to decay that they cannot be depended upon to stand strain for more than four years.

Mr. Knox's statement as to the average life of cedar poles being 15 years coincides with the experience of the Western Union Telegraph Co., but it must be borne in mind that this term is considered the average life of the 6,500,000 poles in its system which embraces all climates of the United States. A large proportion of the Western Union lines carry a very heavy equipment of wires and the strain is greater on the average than in any other service that I am aware of. The use of chestnut poles is confined largely to the sections in which they grow, but the white cedar of the North is distributed throughout the length and breadth of the great country including the deserts and wind-swept prairies, and is expected to stand every climate. Under these circumstances, if the average life of a cedar pole is 15 years, it would certainly be much greater if its use, as with chestnut, were confined to favored localities.

Yours truly,

CHAS. H. WORCESTER.

President Northwestern Cedarmen's Assn.

A proof of Mr. Worcester's letter having been submitted to Mr. Knox, the following reply was received:

Editor "Review": With reference to the criticisms of Mr. C. H. Worcester on the article of "Pole Lines" in the "Review" for March, page 160, I will say in substantiating the statements made relating to "Chestnut and Norway poles are the best lasting of all"—while I have personally had but little experience in the use of chestnut and Norway poles, by taking the statements of those who have had a great deal of experience with them I am justified in making the assertion that I did as to their lasting qualities.

In the "Review" for July, 1895, page 437, I find this comment on Norway pine poles by G. S. W. in the *Technic* (The annual of the Engineering Society of University of Michigan):

"The life of cedar poles in the clay soil of Detroit is said to be about 13 years. Norway poles have lasted in the same soil about 30 years, but were badly rotted at the surface line."

A chestnut pole line which was built in 1879 on Wabash Ave., Chicago, has just been replaced in the past month with other poles; this is 22 years service. These poles were also badly decayed at the surface line where all poles first give out, but aside from this were almost as good as when erected.

In talking recently with a superintendent of the Western Union Telegraph Co., a gentleman who has put in over thirty years in constructing pole lines, he had this to say regarding the use of chestnut and Norway poles:

"Chestnut poles are largely used in the southeastern part of the United States, Maryland, Virginia, etc., where that timber is most extensively found. Chestnut poles, as used in these parts, set in high and dry and often rocky land are almost indestructible and will last I should say, any way 25 or 30 years. I have used them but little here in the West and their life would be, where wet or sandy soil conditions are to be met, not much better than that of cedar. I had a line of Norway poles which were in use over 25 years and when taken out the butts were solid and in almost perfect condition. These butts had, however, been treated with a preparation."

With respect to the cypress poles, they being mostly a product of the South and little used in the North, I am not prepared to defend very strongly the statement made that "they will last eight to ten years." I am again taking the experience of a southern constructing engineer who claims they have a life of as great as 15 years. And again quoting from the "Review" for July, 1894, page 461, the statement is made—"life of cypress timber is much longer than that of cedar."

Speaking from my own experience, I am strongly in favor of the use of cedar poles and believe, taking them all in all, they are the best lasting pole where all conditions have to be considered, like variations in kind of soil and climate, but this is not saying that it cannot be demonstrated that there are other varieties of timber which have a longer life than cedar for pole line purposes.

GEO. W. KNOX.

## LOW RATES FOR SCHOOL CHILDREN.

Editor "Review": There is in many cities a desire on the part of the public to secure lower street car fares (usually half rates) for school children, and this demand has in nearly every case been opposed by the street railway companies concerned.

Laying aside all philanthropic and sentimental considerations, is this attitude of the railways not a mistaken one as a cold-blooded business proposition?

In most cities a large majority of the children live in fairly close proximity to the schools they attend, and comparatively few would ever avail themselves of the low-fare privilege. The reduced fare, in all probability, would increase the travel sufficiently to offset any actual loss. Under a properly drawn ordinance, restricting the hours to between 8 a. m. and 4 p. m. and the age to 15 years (and such an ordinance can generally be obtained) I do not believe any material loss would have occurred. If my judgment is good, the street railways would then be in the enviable position of giving the public something it wanted that cost the railways nothing. This happens so seldom that I think in such cases it would be a good stroke of policy to yield and to yield in a large-hearted way.

The objection urged to granting half-rates for school children is that such a concession would prove to be only an opening for the

thin end of the wedge, and lead to exorbitant demands for low fares. The answer to this, from my point of view, is that if low fares can be forced on railways, nothing the companies can do will prevent it.

If the public believes it can get low fares sooner or later they will get them; and the more we oppose the public in any reasonable request it may prefer the shorter the route to reduced fares. Few people think the best way to make a tiger friendly is to hit with a club, but we sometimes do these things in business and wish we were dead when we see the results.

Many years ago a Vanderbilt once said, "The public be d—d." (The fact is that Mr. Vanderbilt intended no insult to the public, which was clearly understood by the reporter to whom the remark was made, but the editor to whom the interview was reported saw the great possibilities and that sentence has lived.) Assuming that the statement was meant offensively, Mr. Vanderbilt was one of the few men who could afford to say it, and it was said a long time ago. It unfortunately appears to have been considered an axiom to be strictly lived up to by many railroad men of this generation and friction between transportation interests and the public is the rule rather than the exception. In the last twenty years the public has been gradually educating itself on matters of interest to railways, especially street railways.

A public utility should try and serve the public well. The railway that satisfies its stockholders and is on good terms with the public is ideal in its management. While many of us may fail in one or both points, we should never relax our efforts but always try for the ideal and never lose an opportunity, however slight that tends to lessen the distance between us and that highly desirable end, a paying road and a satisfied public.

All companies, with very few exceptions, which have term franchises of 50 years or less, can stand off reduced fares with depreciation. There is no room for reduced fares where a proper and sufficient depreciation account is kept. Where street railways have accepted an extension of their franchise on reduced fares, they have for the most part only put off the evil day, but sooner or later the devil of depreciation will have his due. "Depreciation" and "Reduced Fares" makes a poor team, and the man who thinks he can drive them should carry a good accident policy.

GENERAL MANAGER.

### THE MASSACHUSETTS BOARD OF RAILROAD COMMISSIONERS.

Mr. H. B. Goodwin, who for the past four years has been a member of the Massachusetts State Railroad Commission, has resigned his position on account of ill-health. The governor, after accepting Mr. Goodwin's resignation, at once appointed Mr. Clinton D. White, late member of the Harbor and Land Commission to fill the vacancy. Mr. White has always taken great interest in public affairs, and is well posted on matters pertaining to steam and street railway transportation.

The Railroad Commission now consists of the following members: J. F. Jackson, chairman; Geo. W. Bishop, and C. D. White, Prof. G. F. Swain, of the Massachusetts Institute of Technology, acts as the Commission's bridge engineer, and Mr. Lewlyn H. McLain is street railway inspector. Mr. W. A. Crafts is secretary of the board.

Among the bills which the Commission is endeavoring to have passed by the legislature, is one making it necessary for the board to inspect and approve the construction work of all new electric railways before they are permitted to commence operation; also one whose object is to compel street railways to pay a certain percentage of the cost of abolishing grade crossings in the state.

A franchise has been offered by the Albany (N. Y.) common council to the Schenectady Electric Railroad Co. to lay tracks in Albany. The franchise is to be sold for not less than \$2,500 and 1 per cent per annum of the gross receipts.

The York (Pa.) Street Railway Co. recently took possession of new offices and waiting rooms for passengers. The apartments were formerly used by a banking house and were remodeled to provide a waiting room, offices and storeroom for the railway company.

### FREE LIBRARIES AND TECHNICAL PAPERS.

In its report upon "American Industrial Education," the committee of the Society for the Promotion of Engineering Education, of which Prof. J. B. Johnson, of the University of Wisconsin, is chairman, says the following concerning public libraries and technical journals for industrial workers:

"If free public libraries are not conveniently available, a free proprietary library and reading-room at the works can readily be established. Here all the current technical and trade journals can be kept on file, and those employees who are capable of a large development will find here their mental nourishment. It is, we think, not too much to say that in almost every industry there are now books, technical and trade journals, and catalogues of a very high educational value, which can be continually added to at a small cost. If these reading-room facilities are wanting, therefore, any ambitious boy or man can take one or more of these journals, and by studying them and a few well-selected books, he can acquire a very fair scientific knowledge of his calling."

### STRIKE RIOTS AT MARSEILLES.

A strike was inaugurated on the street car lines in the city of Marseilles, March 22d, and for some time no cars could be run on account of the general rioting of the strikers. Several cars were wrecked by the strikers, and several fights occurred with the police, who had much difficulty in clearing the streets. A sympathetic strike was soon declared which resulted in 18,000 men going out in all lines of trades.

The outlook became very serious on account of the rioting and reinforcements of dragoons and infantry were called in from neighboring places to preserve order in the city. The dock and outdoor laborers who remained at work had to be strongly protected by the troops. During the time that no cars ran the leading thoroughfares were patrolled by cavalry and the majority of the storekeepers closed their shops. The strikers gradually lost ground and after four days the operation of the street cars became somewhat regular. Arbitration has been refused by a number of the employers owing to the intimations of the strikers that they would not abide by the decision unless it were favorable to them.

### NOT LIABLE FOR STREET CLEANING.

The Union Traction Co., of Chicago, has successfully defended a suit brought against it by the city, and it was decided that the company is not liable for the cleaning of the streets over which its line extends, under the street cleaning ordinance of 1897. The decision was on an appeal from the verdict of a justice court in which the company was fined \$100 for failing to clean a certain distance on Kinzie St.

The court held with the defendant, though the decision was specific as to the particular line of track at issue. The court held that as the street was the scene of heavy traffic, the company was not responsible for the dirt on the street and could not be compelled to clean it, any more than any other user of the street, unless the ordinances under which the company existed increased the responsibility of the company.

### ELECTRIC ROADS UNDER R. R. COMMISSIONER'S CONTROL.

A bill is now pending in the Michigan legislature to place all the electric railways of the state under the control of the railroad commissioner in the same way that the steam roads are now controlled. In an interview on the subject Pres. W. A. Boland, of the Detroit & Chicago Traction Co., strongly denounces the bill and says that should it pass it will prove a big handicap to the electric roads in favor of the steam roads if the railroad commissioner is at all biased in favor of the steam roads. In fact, Mr. Boland's objections seem to be based entirely on the probability of undue favoritism of the commissioner to steam roads in the matter of grade crossings, etc., and he adds: "I don't think the commissioners anywhere will ever be biased in favor of the electric roads; at least I have never heard of such a thing."

### CINCINNATI STREET RAILWAY FIRE.

The old car barns of the Cincinnati Traction Co. were totally destroyed by fire on the evening of March 19th. The entire loss is estimated at \$31,000, fully covered by insurance.

The building was 100 by 150 ft. in size. It was partly brick and partly frame in construction. The brick portion was erected many years ago when horse cars were used. It was on the brink of a very steep declivity. The structure was saturated with oil and grease and the flames consequently spread with great rapidity.

Within 25 minutes the old building was a mass of ruins. A part of the north wall fell and several people who were climbing up the hill had narrow escapes from being struck by flying bricks.

The firemen concentrated their efforts on the power house and succeeded in saving it.

There were 16 summer cars in the building. But one of these was supplied with a motor. The building cost about \$10,000. It and its contents were covered by the blanket insurance of \$2,000,000 recently placed by the Traction company.

No definite information as to the origin of the fire was obtainable. Some of the attaches of the company were inclined to the belief

the People's Tramway Co., of Danielson, Conn. This road is to be constructed principally on private rights of way.

### SALE OF THE UTICA, N. Y., BELT LINE.

A controlling interest in the Utica Belt Line Street Railroad Co. and the Utica Suburban Ry. was sold on March 25th to Mr. Horace E. Andrews, of Cleveland, who represented a syndicate of capitalists. Mr. John W. Boyle, president of the road, and two or three associates who controlled the property sold 1,650 out of the total 3,000 shares of the Belt Line road and 300 of the 500 shares of the Suburban line. In addition to the stock Mr. Boyle and his associates sold a large amount of the bonds held by them. The exact prices paid for the stock and bonds have not been made public, but the aggregate amount was nearly \$500,000. The syndicate is the same one that recently purchased the Bleeker St. line in Utica and all these properties will now be united under one management.

When Mr. Boyle took charge of the road there were only 10 cars in operation and the gross earnings were \$96,000 per year. Now there are more than 40 cars in daily operation and the gross earn-



RUINS OF CAR BARN. CINCINNATI.

that the building had accidentally been set on fire by small boys who are in the habit of playing about the barns, while others said that crossed electric wires started the blaze.

Traffic on all the lines that use the incline was resumed the following morning.

### RHODE ISLAND REPORT.

The annual report of the R. R. Commissioner of Rhode Island has just been published, and includes the year from Jan. 1, 1900, to Dec. 31, 1900. The year covered by the report has been a most prosperous one, and the railroads have had a very successful year. It is but a few years ago that there were but two lines of street cars in Rhode Island. Those were the Union Railroad Co., of Providence, and a line from Providence to Pawtucket. The report states that no other period has witnessed as great an extension and improvement in street car lines as the past year, and if the same rate of progress is maintained it will be but a short time before every village and hamlet in the state will be reached and benefited by the street railroads.

There are 13 street railways doing business in the state, two of which are operated by other companies and one which is not yet completed. The thirteen corporations report 205 miles of road, with 248 miles of single track, making an increase for the year of 22 miles of road and 35 miles of single track. The paid-up capital stock is \$16,582,000, an increase over last year of \$5,500,000. The roads own 604 motor cars and 64 other cars. This shows an increase of 24 motor cars and a decrease of 88 other cars. The Union Railroad Co., of Providence, has increased the length of its road by 11 miles of single track and has renewed about 10 miles of existing track. The Rhode Island Suburban Railway Co. has added 38 miles of single track to its length during the year, and a new road, the Providence & Danielson Railway Co., is in course of construction. The latter road will be about 23 miles in length and will connect with the Union Railroad Co. of Providence with

ings last year were about \$250,000. The anticipated earnings for the present year are \$300,000. Mr. Boyle has had many difficulties to contend with. It was necessary for him to go slow on account of the great burden of bonds, but he managed to keep making extensions and improvements, until now the road is a very attractive financial condition.

A number of extensions of this system have been planned by Mr. Boyle which it is understood will be carried out by the new owners. A new line from Rome to Little Falls and an extension to Clayville are already under way.

### TRAFFIC SUSPENDED ON THE NEWARK-JERSEY CITY PLANK ROAD.

The North Jersey Street Railway Co., the lessee of the Newark (N. J.) Plank Road Co., abandoned the use of the plank road between Newark and Jersey City, N. J., on midnight of March 9th, and also left the drawbridges open over the Passaic and Hackensack rivers, thus stopping wagon travel.

There has been considerable controversy over who is to maintain the road and pay for the improvements put in by the traction company. The drawbridges are considered unsafe for traffic, and as the charter of the plank road company has been declared void the street railway company is desirous of obtaining an adjustment of the situation so that the relative rights of Essex and Hudson counties and the street railway company can be determined.

The plank road is of the utmost importance to the manufacturers of Newark, as a large amount of trucking was done over it which is now stopped on account of the bridges, and as the charter for the road has been declared void, the railway company cannot be expected to furnish new bridges.

Meetings of representatives of the various interests have been held and a bill will probably be framed by them to present to the Legislature which will provide for the management of the plank road.



## LONDON LETTER.

(From Our Own Special Correspondent.)

The recent serious accidents which have happened in connection with overhead trolley systems in this country, more particularly that which took place a short time ago in Liverpool, have created considerable excitement in the non-technical press, and at the same time have served the far more useful purpose of calling attention to the enormous number of unnecessary wires which are generally to be found in the immediate neighborhood of a trolley wire. The trolley wire itself is always given the questionable protection of one or more guard wires above and across which great sheaves of telephone and telegraph wires in enormous spans, are only waiting a storm of snow, or gale of wind to bring them down, when in spite of, possibly even because of, the guard wires they twist round the trolley wires, and round themselves, becoming a menace to the unfortunate pedestrian, who may be underneath. In many parts of England, considerable progress is being made in the work of getting the telephone and telegraph wires underground, and it is to be hoped that these very regrettable accidents will have the effect of hastening the removal of all similar sources of danger from above the trolley wires. In the meantime some apparatus similar to that recently devised by Mr. Quin, the borough engineer of Blackpool, will probably be largely used. By this apparatus, which is made by the British Insulated Wire Co. Ltd., of Prescot; in the event of a wire falling across a trolley wire and causing a short circuit, the current is immediately automatically shut off from that section of the line. The Quin automatic switch which is used in this system, consists of a main series coil, and a shunt coil. The series coil is so regulated that if the current in the section to which it is attached, rises over two hundred amperes, a plunger is lifted which releases a catch, thereby switching off the current. The shunt coil is connected by a pilot wire to the further end of the section. So long as the pressure on the section is 500 volts a plunger is kept lifted, but if the wire is broken anywhere in the section the pressure is cut off from the pilot wire and the shunt coil, the plunger falls and immediately the current is switched off from the section. A special switch pillar is made, holding four of these switches, and so controlling four sections of the line. The experiments which were recently carried out with the apparatus at Blackpool, were completely satisfactory and it seems as if it would afford complete safety from anything like the Liverpool accident.

The London County Councils Tramway scheme has brought the question of conduit systems very much to the fore, lately. The technical and other papers have been filled with a vast amount of criticism, most of which has come from engineers with but little knowledge and less experience of the subject. The principal weakness in the design of this London conduit, and it is a very serious one, is the method of supporting the conductors, which consists of a cast iron pedestal supported from the floor of the conduit. It appears impossible to prevent the accumulation of mud round the bars and sides of the pedestal, and this much cannot fail to cause a heavy leakage, if not dead grounds. As it has been generally accepted in America, and on the continent, that the conductors must be suspended from the top of the conduit, it is hard to understand why the advisors of the county council have suggested the other method. There are various minor points in the London design. For instance, the only tie bars used in the construction are from the web of the track rails to the upper part of the yoke, and these bars are only  $1\frac{1}{2}$  in. by  $\frac{3}{4}$  in. and are spaced 5 ft. apart; there are no ties from the track rails to the slot rails. So the slot rails depend solely on their being securely bolted to the tops of the yokes. Also these slot rails are much lighter than is usual, being only 50-lb. rails, instead of from 70 to 80-lb. On the whole it looks as if the construction would be decidedly weak, and in wood paved streets, where it will be subjected to the tremendous pressure caused by the expansion of the wood, there will be some considerable risk of the slot closing up the  $\frac{3}{4}$ -in. which is sufficient to jam the plough. At a test it was found that a pressure of 6,000 lb. was sufficient to close up the slot 1-16 in. on either side, whereas in the case of the standard conduit of the Metropolitan Street Ry., of New York, it took a pressure of 17,000 lb. to get the same amount of closing up of the slot.

I mentioned a short time ago that continental firms were making

great strides in England, in the sale of rails. As an illustration of this, a Belgium firm has recently obtained the contract for 800 tons of rails required for the Yarmouth tramways. Only three English firms tendered, and they were hopelessly beaten by American, German and Belgium firms. The lowest and successful tender was that of E. le Bas & Co., of Belgium, who quoted for 86-lb. rails at \$27.95, while the lowest price tendered by an English firm was \$34.94, and the highest \$36.96 or nearly a third as much again as the successful firm.

The arrival of Mr. C. T. Yerkes in London has caused considerable speculation as to what his intentions are, and as to how large his interest in London underground and street railways really is. At present he only confesses to the Hammersmith-Charing Cross "tube", but there is a persistent rumor going around that he has managed to acquire a controlling interest in the old Metropolitan Underground Railway—the old inner circle. It is impossible to say what—if any—truth there is in this rumor, though personally I think it is very possible that he has obtained a considerable number of shares.

The report of the directors of the Central London Railway Co. for their first five months of working, shows that it carried 14,915,922 passengers, the total revenue amounted to \$577,866 and the working expenses to \$339,491, an abnormally large sum, due to the excessive price of fuel. VAUGHAN.

## BIRTHDAY OF EDWIN REYNOLDS.

On the occasion of the 70th anniversary of the birth of Edwin Reynolds, vice-president and general superintendent of the E. P. Allis Co., of Milwaukee, the employees of the company presented him with a complete set of new office furniture including a \$1,500 desk which has taken the premium at the World's Fair and the Antwerp Exposition as being the finest piece of furniture of its kind in the world. Mr. Reynolds has been associated with this company for 25 years, and under his administration it has grown from a comparatively small concern to its present large proportions. This gift coming from all of the employees of the company was highly gratifying to Mr. Reynolds and in the evening he stood in his office and shook hands with every one of his 2,500 employees as they left the building. In speaking of the high esteem in which Mr. Reynolds is held, the Milwaukee Journal said editorially: "There is honor to be won outside of battlefields and the forum. The struggle for success can be carried on in the shop and the crown be worn for the triumph of brain and skill. Natural and acquired abilities and steady purpose can win laurels in any field and the contest is open to all. Edwin Reynolds celebrates his 70th birthday, with honors equal to those of a hero of many battles. In his long struggle, no man has been made to suffer but the world is made better. It is a triumph of peace. This public attention to a workman is not fulsome; it is earned and the opportunity for another to reach it is ever open."

## NEW CARS FOR DETROIT &amp; CHICAGO TRACTION CO.

President W. A. Boland, of the Detroit & Chicago Traction Co., recently closed a contract with St. Louis Car Co. for 12 closed interurban electric cars for \$120,000. The cars are to be put in service as fast as completed. Each car will be 56 ft. long and will seat 60 passengers. At the front end of each car, on the left side, will be an observation compartment with plate glass end and side. This will be fitted with revolving chairs. The motorman's compartment will be in the front vestibule at the right of the observation room.

A feature of the cars will be the location of the smoking compartment, near the rear vestibule, and on the left side of the car. Passengers can go directly into this room on entering from the rear, or they can pass into the body of the car.

The cars will also contain toilet rooms and will be heated by hot water. The same company has also secured an order for six open cars for this road, each car to be capable of seating 60 passengers.

Selma, Ala., has a new street railway. The first car was run over the line March 19th.

### PHONO ELECTRIC WIRE.

For all purposes where strength, durability and reliability are needed the Bridgeport Brass Co., of New York, strongly recommends its phono-electric wire for which many advantages over hard drawn copper are claimed. It is stated that phono-electric wire is homogeneous throughout and does not depend upon a hardened skin for its strength. According to tests made by the Bridgeport Brass Co. the process of hard-drawing copper makes the greatest change in the texture of the metal at its surface so that the exterior is rendered hard and dense, and its tensile strength is much increased. The mechanical strains which produce this change are far less severe a little way below the surface than just at it, so that toward the center of the wire these strains have lost their effect; the metal is unchanged in character, and remains practically soft copper. Once this thin, hardened skin is broken, or annealed, or in any way injured, the mechanical properties of the wire are greatly impaired. The tests show that on removing successive strata from the surface of hard drawn copper trolley wire, the strength of the wire is gone, and the core remaining has only the strength of a soft copper bolt.

Lengths of phono-electric wire were treated in a similar manner to eliminate from them any characteristics which might be charged to mechanical treatment during drawing, and, when tested, it was shown that phono-electric wire is homogeneous throughout. The comparative results show the valuable qualities of this wire as obtained by chemical rather than mechanical hardening. This homogeneity gives this wire a breaking weight over 40 per cent greater than hard drawn copper. The company gives for example the breaking weight of No. 0000 hard drawn copper as 8,310 lb. and that of the same size phono-electric wire at 11,460 lb. A corresponding difference is shown for the different sizes of wire.

Almost equally important with tensile strength in a wire is the elastic limit, or the power a wire possesses to endure severe strains without taking a permanent set, thereby weakening the wire. The high elastic limit of phono-electric wire enables it to endure stresses which would break any other kind of wire. The makers also claim that its toughness and resistance to bending, breaking and sudden blows make it especially serviceable in electric railway work and for trolley wire which comes in for hard service. It is continually subjected to the pounding and wrenching of the trolley wheel, to say nothing of occasional vicious arcing at curves and frequent heating from overloads and accidental short circuits.

Phono-electric wire does not maintain an arc readily, and as it has no hardened skin its strength per unit section is not decreased by the wear of the trolley wheel. Special experiments were made by the makers to show the annealing effect of arcing. Samples of phono-electric and hard drawn copper were exposed to brief arcing from the surface during a given time with the voltage kept constant. The tensile strength of the samples was then measured, and for No. 00 wire, hard drawn copper showed 52,000 lb. before arcing and 43,680 lb. after arcing. The phono-electric wire showed an original tensile strength of 73,500 lb. and after arcing showed 73,450 lb. The effect of overload on this wire is also small. Samples of hard drawn copper and phono-electric wire were subjected by the makers to half the current required to fuse them and the resulting tensile strengths given show that while carrying this current the breaking weight of No. 00 hard drawn copper was 3,986 lb. and that of phono-electric wire 6,560 lb.

Phono-electric wire resists the action of the weather and of corrosive fumes far better than copper and is particularly adapted for use in situations where wires are liable to rust or corrode.

### ANNUAL MEETING ST. LOUIS TRANSIT CO.

At the annual meeting of stockholders of the St. Louis Transit Co., held March 12, the old board of directors and officers were re-elected for the ensuing year. President Whitaker's annual report states that there has been a heavy increase in earnings during the past year.

The statement of the earnings, income and expenses of the properties for the year ending Dec. 31, 1900, shows gross earnings of \$5,902,479.98, operating expenses of \$3,624,068.69, and net earnings of \$2,368,411.29. Other income amounted to \$6,216.03, which brought the total earnings and other income up to \$2,374,627.32. Deductions from income, including proportion in net income of the

St. Louis Railroad Co., applicable to the minority stockholders, made an aggregate of \$142,053.27, which left a total net income from operation of \$2,232,574.05. Fixed charges, consisting of taxes, rentals, etc., were \$2,264,506.17, leaving a deficit of \$31,932.12.

The operating expenses and taxes were 60.46 per cent of the gross earnings, a marked improvement over the ratio of previous years.

A strike of employees lasted for four months during the past year, during which the earnings were merely nominal, and the expenses grew abnormally owing to the destruction of property.

### SUMMER RESORT OF THE CLEVELAND, ELYRIA & WESTERN RAILWAY CO.

The mineral springs resort which was opened last year by the Cleveland, Elyria & Western Railway Co. is about to enter upon its second season. The springs are located seven miles southwest of Cleveland on high bluffs overlooking the valley of Rocky River, south of Lake Erie. The spot has been laid out as a picnic ground and comprises 30 acres of forest shade and glens and springs of cool, sparkling mineral waters. This park has been fitted up with all the conveniences and amusement features that could be desired for picnic parties. Modern buildings have been erected affording shelter for a vast number of people, and a good telephone service is in connection. There is also a palace pavilion and grand ball-room said to be the finest in the state. The sanitary conditions of the grounds is excellent, and in the evening the buildings and grounds are brilliantly illuminated with electric light. The park and springs are under the management of Mr. J. W. Butler, with whom special arrangements may be made for picnic bookings or for the exclusive use of the pavilion ball-room.

### CONNECTICUT STREET RAILWAY LEGISLATION.

There have been a large number of new bills introduced into the Connecticut legislature during the last session which specially affect street railways doing business in that state, and many of these bills will undoubtedly be hotly contested. One bill makes it necessary for all treasurers of trolley roads operating in that state to reside there, and another bill requires all trolley roads not organized under the laws of that state to pay to the towns in which they operate a tax of  $\frac{1}{4}$ -cent per mile for each passenger carried. This tax would be prohibitory. The other trolley bills introduced are as follows: No company shall lay down a new route without the permission of the towns through which it proposes to operate; each electric road shall pay to the towns in which it is situated a yearly percentage of the gross receipts; each trolley road shall pay a yearly license fee of \$100 for each passenger car and \$50 for each freight car; all trolley cars shall be vestibuled, and no trolley company shall operate an electric express.

A measure that is one of the most important introduced provides for the taxing of all special franchises hereafter procured of the assembly.

### THROUGH LINE FROM DAYTON TO CINCINNATI.

We are advised by Mr. Warren Bicknell, auditor of the Southern Ohio Traction Co., that the Miamisburg & Germantown Traction Co., which has its line between Miamisburg and Germantown partially completed, will give through service from Germantown to Dayton, running from Miamisburg to Dayton over the line of the Southern Ohio Traction Co. An arrangement to this effect has been made with the Southern Ohio Traction Co., and it is proposed to run through cars from Germantown to Dayton upon a 30-minute schedule. The grading of the line has been nearly completed and the work on the pole line and overhead wires is partially done and all of the material for the speedy completion of the road is upon the ground. It is expected that cars will be in operation by May 1st.

The franchises of the Oneida (N. Y.) Street Railway Co. have been purchased by the Utica & Suburban Street Railroad Co.



# THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

## REPAIRING A BROKEN CYLINDER.

A few weeks ago the high-pressure crank of a 15 and 25 x 16-in. Ball compound engine in the power house of the Calumet Electric Street Ry. broke while the engine was under steam and the reciprocating parts were forced back against the cylinder head, with the result that a segment of the cylinder casting about 14 in. long was broken out. The piece broken formed the outer wall of steam passage on the head end of the cylinder.

The chief engineer of the station, Mr. D. Schrockenstien, repaired the cylinder by applying a brass casting shown in place in the accompanying sketch. The rough edges of the fracture were smoothed with cold chisel and file and then plaster of paris was run in so as to form a pattern for the casting it was desired to make.

The 10 holes at the right hand edge of the patch receive  $\frac{5}{8}$ -in. studs in the valve chest. The four holes marked B and C fit  $\frac{3}{4}$ -in. studs, and the two holes marked A are for bolts which extend through the steam passage and are fastened by nuts inside the valve chest.

The two  $\frac{3}{4}$ -in. studs in the holes B are enlarged to fit the square countersink of the holes, which is  $1\frac{1}{4}$  in. in diameter and  $\frac{1}{2}$  in. deep; the lower part of the stud is  $\frac{1}{2}$  in. long and extends through the steam passage, sections of pipe cut to the proper length being put over the studs to serve as distance pieces. Similar distance pieces were also used on the bolts in the holes A. The studs in the holes C have tapered countersinks, they being too near the edge of the casting to make them square.

The joint between the patch and the cylinder is tapered so that it was readily made tight by setting up the studs and bolts. White lead and varnish were used in making this joint. The brass casting being in place, the bearing surface for the cylinder head was filed to the same plane as on the cylinder casting, the studs in the holes B and C serving to hold the cylinder head in place.

An explosion occurred last month in the boiler room of the Indianapolis, Greenwood & Franklin Ry. at Greenwood, caused by a check valve in the exhaust pipe becoming clogged. The head of the heater was blown off making a hole through the wall of the room. No one was injured and no further damage was done.

The Peoples Tramway Co., of Danielson, Conn., commenced operating its large water power plant March 16th. The dam and plant were 16 months building and are said to have cost \$500,000. The plant had only been in full operation for one day when it was damaged to the amount of \$30,000 by the breaking of the dam of an adjacent reservoir. The power house was flooded and most of its machinery rendered useless for an indefinite period. This company operates an interurban line between Danielson and Worcester.

## SOME TYPES OF BRITISH STATION APPARATUS.

In view of the rivalry of American and English railway power station machinery in Great Britain and the large number of orders which have come from that country to America a brief review of

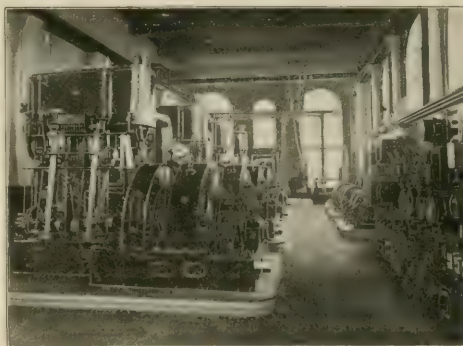


FIG. 1.

some of the prominent types of English station machinery will be of interest.

Fig. 1 gives a general view of the Blackpool & Fleetwood tramway station which is equipped with machinery made by Mather & Platt, Ltd., of Manchester, England. The engine room contains four open marine type vertical compound engines, each of 200

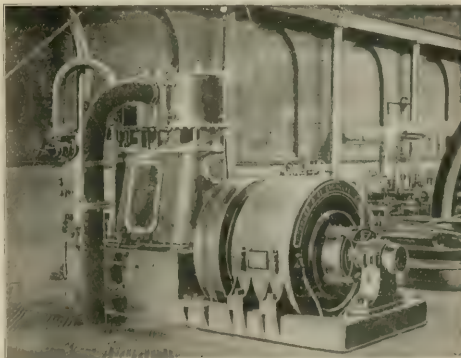


FIG. 2.

hp. which run at a speed of 165 r. p. m. The cylinder dimensions are 12 and 24 x 16 in., and the engines have cast-iron standards at the back and polished steel columns in front which support the cylinders and guides for the piston rod. A throttle governor is used and hand regulation is provided for the expansion



gear. The engines usually run condensing but valves are provided so that they can exhaust directly into the atmosphere.

Direct connected to each engine is a multi-polar dynamo of the same make capable of giving a continuous output of 120 kw. at 505 volts. These machines have six poles and are shunt wound. A notable feature of the design is a collar connecting the field coils and encircling the armature. This arrangement while slightly decreasing the electrical efficiency of the machines, effectually prevents all sparking which more than counterbalances the slight

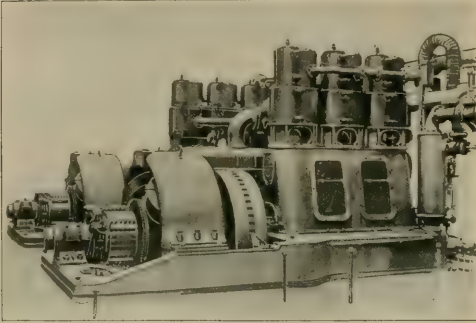


FIG. 3.

loss. The efficiency of these generators is 93 per cent. The armatures are slotted and have drum windings connected in series.

Figs. 2 and 3 represent two types of high speed vertical engines made by Bellis & Morcom, Ltd., of Birmingham, England. The former of these units is in use in the power house of the Southport railway and the latter is installed in the Sunderland station. The engine shown in Fig. 2 is a compound, and that in Fig. 3 a triple expansion engine. This company also makes simple and quadruple expansion engines. These engines are of the ordinary double acting type, the working parts being surrounded by a casing to keep out dust and dirt and to permit of liberal lubrication. The most noticeable feature of these engines is their means of lubrication. Oil is supplied by a simply pump without valves

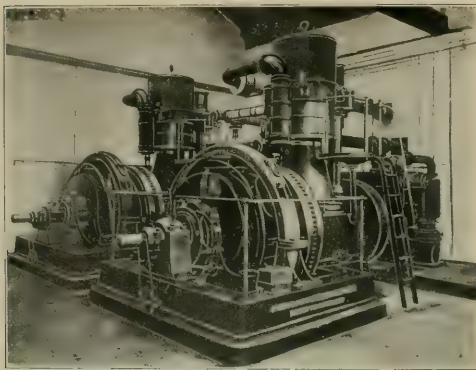


FIG. 4.

or packing working off the eccentric from a well in the framing, and discharging at a pressure of about 10 lb. through oil channels to all of the working parts. The oil being distributed under pressure penetrates thoroughly between the moving parts and the engine is said to show almost entire absence of wear after long service. The casing around the moving parts is fitted with a hinged door at the back, and the whole front of the casing can be removed in a few minutes if required to overhaul the moving

parts. The verticle type and high speed of these engines permits them to occupy a minimum of floor space.

The generator shown in Fig. 2 is made by D. Bruce Peebles & Co., of Edinburg, and is a four-pole 200-kw. machine, having an output of 380 amperes at a pressure of 530 volts. It is the standard type of traction generator built by this company, and is capable of standing a 25 per cent overload for a short time. The machines are compound wound being over-compounded so as to give a pressure of 500 volts at no load and 530 volts at full load. The armature case is slotted and the spider has fan blade ventilating ducts insuring ample ventilating surface. Drum winding is used, the coils being form wound. The poles are of annealed cast steel cast into the yoke and these are fitted with the company's patent pole tips, which are designed to obtain sparkless communication from no load to full load, without altering the position of the brushes. The bearings are self aligning and are fitted with lubricating rings.

The dynamos illustrated in Fig. 3 were made by the India Rubber, Gutta Percha & Telegraph Works Co., Ltd., of London, for the corporation of Sunderland and the plant consists of three shunt wound dynamos, with bar wound drum armatures, each machine giving an output of 544 amperes at 220 to 250 volts running at its normal speed of 400 r. p. m. These machines are running at present at about 250 volts, but it is intended eventually to run them at from 440 to 500 volts, and with this object in view the armatures were double wound so that the conversion to the higher voltage can be made by simply altering the back end connections of the armature winding. For the same reason the magnet windings are connected up in two parallels.

The units illustrated in Fig. 4 consist of Brush generators direct coupled to Bellis & Morcom engines.

## ROTARY TRANSFORMER STATIONS.

Read before the New York State Street Railway Association by R. E. Danforth, Superintendent Buffalo Railway Co.

The largest utilization of water power for street railway purposes in the world is that of the lines owned by the International Traction Co., of Buffalo, N. Y. This company controls the Buffalo Railway Co., and other concerns operating in and between Buffalo and the neighboring cities. The consolidated companies now operate all lines in Buffalo, Tonawanda, Lockport, Niagara Falls, N. Y., Niagara Falls, Ont., and Queenston, as well as the electric interurban lines between these points, with the exception only of the Gorge Road and of three small suburban lines which feed the Buffalo system. The lines operated by these allied companies have an aggregate length of about 300 miles of track and are traversed by about 400 electric cars.

The International Traction Co. possesses one of the most perfect steam power stations in the country, the famous Niagara St. station, with a capacity of 7,500 h. p. in large units driven by condensing engines, supplied from boilers with complete labor saving devices, such as stokers, coal and ash handling mechanism, etc. In this station there were installed in the fall of 1896 two 400-kw. rotary converters and accompanying transformers, built by the General Electric Co., these machines being designed to take some of the 25-cycle polyphase current transmitted to Buffalo from Niagara Falls and convert it into 600-volt direct current suitable for street railway use. These machines were duplicated a year later, giving a total converter capacity of 1,600 kw. These converters, with the engines, assisted by a 3,000-ampere storage battery, operated the lines in Buffalo until 1899, when increased generating capacity, or improved power distribution, became necessary. The operation of the rotary converters in the Niagara St. station, as well as that of others serving lines of the allied companies in Lockport, Niagara Falls and Tonawanda, had proved so satisfactory and economical that the company decided to get this increased capacity by an enlargement and distribution of its converter system rather than by any additions to its steam driven equipment. The rotary converter system has now been extended until it is capable of supplying the whole demand without assistance from the steam plant except during load peaks.

In addition to the lower cost of power derived from a rotary converter system supplied by a hydraulic plant as compared with a steam driven station, the former system possesses the advantage

that the converters may be distributed in a number of sub-stations scattered through the territory to be supplied with power and advantageously located to carry the heaviest loads with short feeders. Having no boilers or engines, the location of the sub-stations is not influenced by considerations of fuel supply or condensing water. Having no objectionable features such as smoke stacks or exhaust steam, the sub-stations can be located anywhere without impairing the value of neighboring property. Requiring but a small area per kilowatt capacity, they can be put in where property is expensive.

Full advantage of these possibilities has been taken by the International Traction Co., which has divided its new equipment into four sub-stations, scattered through the city, giving, with the Niagara St. station, five sources of direct current in the city of Buffalo in addition to the sub-stations in neighboring cities. The effect has been to materially reduce the amount of copper needed, as well as to reduce the drop and loss in the overhead feeders and in the track return. Better voltage is maintained at the cars, allowing them to make fast schedules without overheating of the motors.

The sub-stations have in all cases been located in existing car barns. Each contains two or three rotary converters, all of which are of the same size, and, as the sub-stations are very similar to each other, a description of one will serve for all.

In general, each sub-station consists of a room about 30 x 50 ft. in size, along one side of which are ranged the rotary converters and along the other side the transformers, the switchboard being placed across one end of the room. Each sub-station is served by a hand crane.

Power is received in the form of three-phase currents at 10,500 volts from an underground three-conductor cable of the Cataract Power & Conduit Co., one branch cable running to two of the new sub-stations. At each sub-station the power enters through a Form H oil switch operated by hand, by means of which the whole station can be instantly cut off from the high tension supply cable in case of an emergency. From this oil switch the current passes through automatic circuit breakers actuated by an overload time element relay. This relay actuates the breakers only in case the overload drawn through it continues for a predetermined time, such as three or five seconds. In case a short circuit exists on the direct current side it is quickly removed by the direct current breakers, which do not allow it to exist long enough to actuate the time element relay and circuit breakers in the alternating current supply connection. Thus these breakers are not tripped and the rotaries are not thrown out of synchronism with the supply systems each time a severe overload or short circuit comes upon the direct current lines. In case, however, a short circuit occurs in the station and lasts through the period of the time element relay, this instrument will operate and throw out the high tension circuit breakers, cutting the supply off from the sub-station. From the high tension circuit breakers the current passes to the high tension busbars, from which it is drawn by the step-down transformers.

Each 400-kw. converter is permanently connected to its own group of three 150-kw. step-down transformers with no intermediate switches or busbars in the low tension alternating current circuits. Thus each transformer-converter unit is handled on its alternating current side by the high tension switches through which it receives its power from the high tension busbars. Form F oil switches are used for this purpose, three single-pole switches being connected in the three phases going to the primaries of the step-down transformers. These three switches are located in separate brick chambers with brick barriers between them to prevent a burn-out of one switch from spreading to the others. All of the high tension switches, as well as all high tension instrument transformers, are located on a gallery above the switchboard.

The switchboard attendant can handle all switches and read all instruments from the floor below, the switches being mechanically connected down to handles on the alternating current panels with insulating joints in the connections, the instruments being connected to transformer secondaries only. Thus there is no high potential on the operating board, either front or back, and no necessity for the attendants to visit the high potential gallery in the ordinary course of operations.

The risk of shock to the attendants is thereby reduced to a minimum. The step-down transformers are of the air-blast type and are mounted in a row over a forced draft chamber, on each end of which is placed a centrifugal fan, direct-driven by a 500-volt direct current motor. Each fan is capable of supplying sufficient

air for all the transformers. Thus a duplicate source of draft is provided.

Mounted also over this forced draft chamber and cooled by air taken from it, are three-phase reactive coils of the air blast type. There is one of these for each rotary converter and they are connected between the secondary coils of the transformers and the collector rings of the rotaries. Their purpose is to allow the voltage delivered by the rotary to be varied by adjusting the field rheostat and compounded by the use of a series field.

An alternating current motor driving a direct current generator will obviously accomplish the work of converting alternating into direct current at 600 volts, and such machines have frequently been used for the purpose, but experience has shown that the motor generator is, as a rule, inferior to the rotary converter, since the latter combines both an alternating current motor and direct current generator in one dynamo electric machine, with only one field magnet structure and one armature, and therefore the latter method is here described. It may be stated at this point that the rotary has a higher efficiency and a lower first cost, occupies less floor space, requires no more attention and gives no more trouble than the motor-generator, making it the preferable machine, except in some few special cases where unusual conditions call for motor-generators.

The rotary converter resembles closely, both in appearance and performance, a direct current generator. Since it is self-driven and is therefore not coupled to any prime mover with speed limitations, it is designed more on the lines of a belted than a direct-coupled generator and, indeed, bears a striking likeness to the former. The only apparent difference is the omission of the pulley and the addition of a set of collector rings, through which the alternating current supply enters the armature. There is only one winding on the armature and this winding is exactly like that of a direct current generator, with the sole exception that in addition to being connected to the commutator in the usual way, the winding is also connected at suitable points to the collector rings. Thus the alternating currents enter the same winding from which the direct currents leave. An idea of the way in which both currents can exist simultaneously in the same armature conductors can be given as follows: As is well known, any armature coil or set of coils is the seat of an alternating electro-motive force when the machine is in operation, and it is only by commutation that these alternating e. m. f.'s are changed into a steady direct pressure. These alternating e. m. f.'s act as the counter e. m. f.'s opposing the incoming alternating currents which enter through the collector rings and therefore reach the armature windings uncommutated. The same internal e. m. f.'s rectified by the commutator give the direct current pressure. This partial neutralization between the incoming and outgoing currents gives the machine a large output per pound of weight and a high efficiency.

#### DETAILS OF CONSTRUCTION.

The rotary converters built by the General Electric Co. have many of the same features of structural detail that distinguish the direct current generators of the same make. The external yoke of the field frame is made of cast iron and its upper half is fastened to the lower half by bolts hidden completely within recesses cored in the side supports, thus doing away with unsightly projections and improving the appearance of the machine. The poles also embody the same features, as those of the generators, being solid steel castings bolted to the yoke ring so that any pole can be removed for the repair of its winding without disturbing the yoke ring. This construction is particularly advantageous in the case of trouble with any field coil on the lower half of the ring, the removal of such a coil from a machine with poles solidly fastened to the yoke requiring that the armature be lifted out of the bearings.

The lower half of the yoke ring is cast separately from the bed-plate, so that in large machines the whole field ring may be moved along the bed plate in the direction of the shaft to give access to the armature. The field ring or the bearing pedestals may be shimmed up and the field ring may be moved laterally to render the armature concentric with the poles, and this adjustment may be readily changed at any time as the bearings wear.

The poles have extending tips, which distribute the magnetism over a great number of armature teeth and thereby reduce the density, the iron losses and the heating in this part of the machine. The fields may be shunt or compound wound to obtain the desired regulation and the effect of the series coil may be adjusted



by a variable shunt exactly like that used on direct current generators.

The armatures, like those of the generators, are designed to give forcible ventilation and thereby keep all parts cool. The spokes have wings or vanes cast to them, these wings being enclosed by deep end flanges, so that a powerful centrifugal fan action is set up, blowing air between the armature laminations, across the armature windings and around the field poles. The armatures are, as a rule, bar wound, the upper bars being connected to the lower bars by soldered clips on the collector ring end of the armature, so that an upper bar can be removed without disturbing any other coil and a lower bar can be removed without disturbing more than one-half as many coils as must be disturbed for the removal of one bar of an armature in which the complete turn is made of one piece. The armature winding is held in the slots by wooden retaining wedges, the end connections being fastened by binding bands, these details being the same as those of generators. The connection of the winding to the collector rings serves incidentally the same purpose as the equalized rings used on parallel wound generators, equalizing the field strength under all poles and improving commutation. The commutators of rotary converters are of the same design as those of direct current generators. The collector rings are separated from each other by wooden insulating rings which rise above the collector ring surface to such a height that if an arc is started accidentally between collector rings it will not continue and become a short circuit. The collector rings are cut away at the sides to allow the brushes to bear upon them over their full width, thus preventing the brushes from leaving shoulders beside their tracks in the center of the rings. Carbon brushes in solid shank brush holders of the standard direct current type are used on the commutator, while laminated copper leaf brushes are used on the collector rings.

On the small machines the brush holder rings are supported on the bearing pedestals. On the larger machines the direct current brush holders are supported by a latticed cast iron ring fitting a seat in the field magnet yoke; the alternating current brush holders being mounted on a platform bracketed to the bed plate. The alternative current brush holder rings are conveniently jointed and swiveled to allow easy access to all parts.

To distribute the wear on the commutator and collector rings and to prevent the brushes from wearing grooves in these parts all rotary converters made by the General Electric Co. have automatic oscillators, or end-play devices, which, at frequent and regular intervals, give the armatures a slight motion back and forth in the direction of the length of the shaft.

All converters with a capacity of 500 kw. or more are made six-phase instead of three-phase in order to increase the efficiency by reducing the losses in the armature winding. The larger number of phases causes the alternating currents more nearly to balance the direct current in the winding, distributes more uniformly the remaining losses and provides more equalizing connections, thus improving the commutation. The six-phase converters are supplied by three single-phase transformers, the only difference in structure and connections being the use of six collector rings and six conductors from the transformers to the converter in place of three.

#### THE STARTING OF ROTARY CONVERTERS.

When running at full speed the manipulation and operation of a rotary converter are exactly the same as those of a direct current generator, but, there being no steam engine, water wheel or other outside source of power for bringing a converter from stand still up to speed, the converter must in some way be made self-starting. If there is available in the sub-station some other source of direct current the converters may be started as a direct current shunt wound motor. If there is no other source of direct current than the converter itself it must be made self-starting from the alternating current circuits, since it will not deliver direct current until it has reached full speed. The rotary converters made by the General Electric Co. are so designed as to be self-starting without any special starting device such as a separate starting motor. The alternating currents are simply switched into the windings of the converter itself and the machine comes up to the proper speed.

The rotary converters are six-pole machines and hence, with 25 cycle current, run at 500 r. p. m. They are fitted with magnetic oscillators, which give the shaft an endwise pull at regular intervals of a few seconds, thus preventing the brushes from wearing tracks

in commutators or collector rings. The machines are compound wound and fitted with equalizer switches mounted on the field yokes. They are so placed that the commutators face the central passage ways of the sub-stations, the collector ring ends being turned to the wall.

The switchboards contain both a. c. and d. c. panels in one continuous row. To one end are the a. c. panels, one per rotary, next to them come the d. c. panels of the rotaries, next to which is the main d. c. panel, beyond which are the d. c. feeder panels. Each a. c. panel contains the handle of the high tension switch on the gallery above, in addition to one a. c. ammeter and voltmeter and synchronizing receptacle and lamp. An induction wattmeter is mounted on one panel and connected to a current transformer in the high tension a. c. busbars so as to record the total input of the sub-station. Mounted on the sub-base of one of the a. c. panels is the time element relay and on the same panel is a push button by which the relay circuit can be closed by hand to trip the a. c. breakers in case of necessity or for testing.

Each d. c. rotary panel is of the General Electric standard railway generator type, containing two main switches, an astatic ammeter, circuit breaker, field rheostat and so forth.

The only apparatus required for rotary converters and not required for generators is two switches mounted on the sub-base of the panel. These are used in starting the converter as a direct current shunt motor.

Mounted on the sub-base of the main panel is a rheostat switch, which can be used for starting any rotary, being transferred from one rotary to another by means of a transfer switch on the sub-base of each d. c. rotary panel. In addition to this transfer switch there is a field switch by means of which the field may be excited from the busbars while starting the machine. The main panel also contains a main recording wattmeter for measuring the total sub-station output of direct current, and an astatic main ammeter and voltmeter, the latter being connected to receptacles on the converter panels so that it may be made to read the voltage of any machine. The main ammeter and voltmeter are mounted double-deck fashion on a bracket, so that they may be swung around to face in any desired direction. The outgoing feeder panels are equipped as usual.

Provision is made in all cases to start the rotary converters by means of direct current. Two of the new sub-stations contain storage batteries, from which the rotaries may be started; the other two are fitted with motor-generator sets. Each set consists of a 20-kw. 500-volt generator coupled to a 30-h. p. induction motor, which is supplied from the high tension lines by means of suitable step-down transformers. This induction motor is started by simply closing the high tension side of its step-down transformers to the incoming line. When up to speed the generator is excited and by means of it any one of the rotary converters may be started as a direct current motor and accurately synchronized by adjusting its field strength.

Each sub-station is operated with only one attendant and the amount of attention required by the machines is so small that this one attendant is idle or available for other work a large part of the time. The starting of these sub-stations has greatly improved the service by reducing the amount of feeder copper needed, by raising the efficiency of 500 volt distribution and by steadying the voltage throughout the network.

#### NATIONAL STANDARDIZING BUREAU.

Prof. W. S. Stratton, director of the United States Standardizing Bureau created by the last Congress, recently made an informal statement concerning the scope of the work of the Bureau in which he said it would include the standardization of pyrometers, steam engine indicators, steam gages and other apparatus used in power plants. It is not the intention of the Bureau to compete with private enterprise, but it will be a public institution the facilities of which are available to all who may desire to use them. The users and makers of measuring instruments will not need to send all their apparatus to the Bureau for calibration, but a few of each class having been calibrated carefully can be used as secondary standards.

The Ohio Northwestern Railway Co. has been incorporated in Ohio to build and operate a railway between Fostoria and Munger.

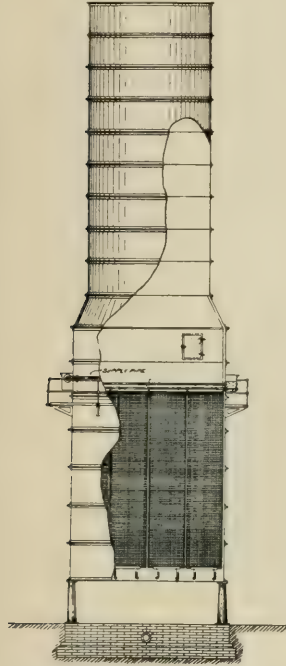


### NATURAL DRAFT COOLING TOWER.

Water-cooling towers wherein a power driven fan was used to supply currents of air for cooling have been built for several years by the Wheeler Condenser & Engineering Co., and last year the company brought out a new design of fanless self-cooling tower, the water being cooled by trickling over the meshes of galvanized wire mats the surfaces of which were entirely exposed to the atmosphere. This tower was described in our issue for August, 1900, page 454.

As a development of the later type the company is now placing on the market a faultless tower, known as the Barnard-Wheeler in which the mats are enclosed in a steel-plate case or shell, and having in addition a steel flue, reaching a total height of from 75 to 100 ft. above the ground, causing a strong draught of cool air to pass over the surfaces of the mats at all times.

This flue or chimney design of tower covers but little ground area and can therefore be used to great advantage where it is necessary to economize ground space, and its extreme lightness permits it to be installed upon roofs if necessary. It possesses the additional advantages of carrying away any undesirable vapors that might arise from the circulating water.



THE BARNARD-WHEELER TOWER.

The mats in the new form of tower are practically the same as those supplied in the previous design of Barnard water-cooling towers and consist of galvanized wire, woven into mats of small meshes, over which a thin film of water passes, so that each drop of water is brought into contact with the circulating air, causing a rapid and positive lowering of the temperature.

Being self-operative, the new enclosed fanless tower is claimed practically to do away with all expense save the initial cost of installation.

### GASKET FOR SEVERE CONDITIONS.

We illustrate herewith the McKim gasket of which McCord & Co., of Chicago and New York, have recently obtained control.

The gasket has been on the market for six or seven years and testimonial letters published in the McCord & Co. catalog seem to demonstrate that all the claims they make for it are true.

This gasket is a rubber gasket or packing encased in soft rolled copper, a combination of material which gives the strength of a copper gasket with the elasticity of a rubber gasket. The rubber or packing

being protected from the steam, or any other medium, retains its elasticity, so that the gasket can be used over and over again. It is especially valuable for high pressure work, as it is impossible to blow it out. It is in service in a great many places carrying very high steam pressures.



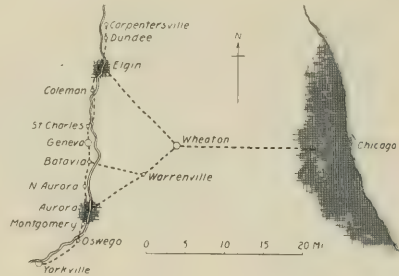
The gasket is made for all sizes of pipe and unions and for all sizes of man-hole and hand-hole plates for boilers. It is also made of aluminum or other metals with asbestos, or any other special packing for use in pipes where it is subjected to the action of acids, gases, or intense heat, and it is claimed that it will stand such service where any other gasket on the market fails.

### CLEVELAND CAPITAL IN ILLINOIS.

March 26th, a deal was consummated whereby the lines of the Aurora (Ill.) Street Railway Co. and the Aurora & Geneva Electric Railway Co. were acquired by the Everett syndicate of Cleveland, which already controls the Aurora, Wheaton & Chicago, the Elgin & Chicago, and the Batavia & Eastern lines. The syndicate projects consolidating and extending these systems under the general title of the Aurora, Elgin & Chicago Railway Co., and will build a main line to Chicago.

The capital stock of the new concern is \$5,000,000. B. Mahler, of Cleveland, is president, and L. J. Wolf, of Mandelbaum & Co., Cleveland, is vice president. Mandelbaum & Co., investment brokers, negotiated for the purchase.

The main line of the new road will extend from Austin to Wheaton connecting at Austin with the Metropolitan "L," and will be 18 miles long, passing through Cicero, Harlem, Maywood,



Bellwood, Elmhurst, Lombard and Glen Ellyn. From Wheaton one branch, 14 miles long, will extend to Aurora, by way of Warrenville. Other branches will connect Warrenville and Batavia, and Wheaton and Elgin. The Aurora Street Ry. comprises 18 miles of track in Aurora, a manufacturing city of 25,000 population, and with this property is included the electric lighting franchise of the city. The Aurora & Geneva Line, 10 miles long, extends from Aurora to Geneva, connecting in the latter city with the Elgin City, Carpentersville & Aurora Ry., a road which was also purchased recently by Mandelbaum & Co. in behalf of the same syndicate.

The Aurora & Geneva line also connects with the recently completed Aurora, Yorkville & Morris Ry. Riverview Park, through which the interurban system passes, has been greatly improved by the street railway company, and for the past few seasons has been liberally patronized. Extensive pavilions, galleries and other modern features have been added to its natural attractions, with the result that the park is unsurpassed as a pleasure resort.

### CHICAGO ELEVATED ROADS.

The South Side Elevated Railroad Co., Chicago, is planning to build a third track between 12th St. and 43d St., so that it can establish an express service north of 43d St. The company is circulating petitions for frontage consents and will for the required ordinance as soon as the consents are obtained. The cost of the contemplated improvements, President Carter states, will be about \$1,500,000.

The Lake Street Elevated has let contracts for the steel necessary for its third track from West 43d avenue to Rockwell street, and if the city authorities do not delay matters the company will soon carry out its plans for an express service.

The Worcester (Mass.) Consolidated Street Railway Co. will lay new 95-lb. rails on several of its lines. The company has ordered 25 new closed cars.

### OFFICE AND CAR BARN TELEPHONES.

To supplement the reduction of the cost of output which is effected by the various other labor saving tools and appliances found in modern shops, and bring all departments into quick communication with each other a telephone system is most useful, and will soon be considered a necessity. The telephone is efficient in saving the time of high priced employees. The accompanying illustrations show two of the intercommunicating instruments made by the Ericsson Telephone Co. of 296 Broadway, New York. Fig. 1 shows the instrument which is made with lever, plug or automatic switches using the hand or small watch case receiver, and Fig. 2 the instrument using the combined receiver and transmitter. Both of these types are well adapted for office or car barn service, such as is needed on street railways. For large systems, where a number of telephones are required, the company arranges for placing all batteries together and to call automatically by taking the receiver from the hook. Also if desired it will supply magnet instruments for calling in the usual manner by turning the crank, either for intercommunication use or with central switch-board.

The Ericsson systems are now in use in shops and factories, hotels, offices and exchanges, and the company will furnish the

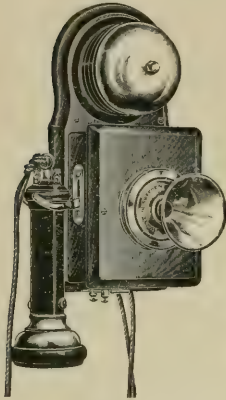


FIG. 1.



FIG. 2.

instruments and adopt the system to any requirements and for any use desired. The signal corps of the United States War Department has placed some large orders for these telephones, and in addition to the sales in this country, the company has filled orders for Canada, Mexico, South America, Africa, Hawaii, the Philippines and Siberia. The Ericsson Telephone Co. has been in the telephone business for nearly a quarter of a century and its goods have been sold outright and not rented as is usual with this class of instruments. In making telephones long experience counts for much, and attention to details is very important as it insures satisfactory service for the longest time. In buying these machines outright a customer wants an instrument arranged to fully meet his requirements and one that will cause little trouble and expense to keep in working order and finally one that will be durable. By purchasing from a reliable maker the customer is assured of obtaining what he pays for, but like and other good machine or tool the telephone requires to be cared for and kept in good condition in order to do good work.

### A. L. JOHNSON'S LOW FARE ROAD.

During the past month the Eastern papers have contained a great deal concerning the plans of a syndicate headed by Mr. A. L. Johnson which proposes to gridiron the city of Philadelphia with street railway tracks, giving 3-cent fare and universal transfers, and to connect Philadelphia and New York by an interurban line on which the fare will be 40 cents at first, to be reduced to 5 cents

after one year. It is also proposed to tunnel under East River to connect Manhattan and Brooklyn.

Mr. Johnson is quoted as follows: "We shall give to Philadelphia a local service with three-cent fares and a universal transfer system, if the people will give us the right to place tracks on streets not now being used and permit us to operate our surface transit system. This local system we desire to operate in connection with our electric railroad between Philadelphia and New York. The New York line will be run at a guaranteed speed of 50 miles an hour, and the fare from this city to the metropolis will be 50 cents.

"Our syndicate now owns the Lehigh Valley Traction Co., which operates 175 miles of road between Allentown, Bethlehem, Easton, Slatington, and towns in that section. We have a clear right of way from Trenton to the city line of Philadelphia, and most of that part of the road is finished.

"We will run cars from Trenton to Philadelphia, and from Allentown to Philadelphia, before the summer is over. Our route from Trenton to New York is not yet complete, but we expect to reach the western bank of the Hudson river before the end of the present year."

Mr. Johnson's tunnel proposition to the New York Rapid Transit Commission was rejected as being "too indefinite"; at the same time the commission expressed its readiness to consider further propositions from Mr. Johnson.

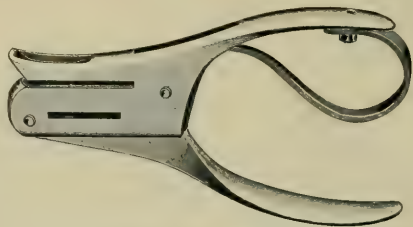
### SIXTH ANNUAL CONVENTION, NATIONAL ASSOCIATION OF MANUFACTURERS.

The National Association of Manufacturers announces that the executive committee has selected the dates of June 4, 5 and 6, 1901, for holding the sixth annual convention of the Association, which will meet in Detroit, Mich. These dates which are somewhat later than the usual time for holding the meeting were chosen on account of the more favorable season in Detroit at that time than would be found in January, during which month the conventions have usually been held. Mr. George H. Barbour, of Detroit, the Michigan vice-president of the Association, is in general charge of the arrangements in Detroit.

### IMPROVED TRANSFER PUNCH.

The R. Woodman Manufacturing & Supply Co., of 63 Oliver St., Boston, announces that it is now supplying its well-known No. 2 ticket punch with elliptic instead of flat spring, in all cases where the former is desired. The flat spring has been giving excellent results, but the company believes the new pattern will come into still greater demand, as the elliptic spring will add considerably to the life of the punch.

The Woodman No. 2 punch was designed to meet street railway requirements, and particularly for punching transfers and tickets,



IMPROVED WOODMAN PUNCH.

It has a long reach and is made in over 500 different patterns of dies. A number of the larger roads use it exclusively, including systems in Boston, Baltimore, Detroit, Cleveland, Milwaukee, Indianapolis and elsewhere. The company feels particularly proud of a large order for punches that it has just received from the tramways at Perth, Australia.

The Woodman company also makes and handles a general line of light railroad supplies, as badges, baggage checks, office and perforating stamps, seals, etc.

### BRILL COMBINATION CARS.

The desirability of the combined baggage and passenger car for suburban and interurban roads is apparent from the constantly increasing use of this style of car. The combination car not only enables baggage and freight to be carried with facility, thus greatly augmenting the traffic to outlying districts, but the baggage compartment furnished, as it usually is, with folding seats, provides a smoking room completely isolated from the body of the car, giving practically all the advantages of a separate smoking car.

The accompanying illustration shows one of an order of cars recently shipped by the Brill company to the Ohio River Electric Railway & Power Co. The body is 28 ft. in length and has 4 ft. 6 in. platforms. The sides of the car are somewhat straighter than usual, being 7 ft. 3½ in. wide at the sills and 7 ft. 10 in. over all. This construction is desirable as it gives a better form of side to accommodate the sliding door in the baggage compartment, which is in this case 8 ft. long. This compartment is separated from the main body of the car by a hard wood partition having a single door in it. It is sheathed inside with hard wood and the roof is



COMBINATION CAR, J. G. BRILL CO.

without a head lining. Portable vestibules are used at each end and Brill patent folding gates close up all the platform openings. The doors at the passenger end are double, at the opposite single. The height inside is 8 ft. 2 in. and the body is 9 ft. 3 in. over the trolley board. The car is mounted on Eureka maximum traction trucks with 33 and 20-in. wheels; this brings the body down, while with a single pair of G. E. 1,000 motors the adhesion is great enough for the most severe service. In the body of the car the seats are longitudinal, made of cherry slats and covered with carpet. The trim is of solid bronze. The inside finish over the windows is of cherry and the head lining of three-ply birch veneer handsomely decorated. The weight of the car complete, without motors, is 18,150 pounds. This type is one which is economical to operate and its adhesion is so great that it can at any time be employed for hauling trailers when the grades are not very heavy.

### SAN FRANCISCO LOW FARE ORDINANCE.

The ordinance passed by the Board of Supervisors of the City and County of San Francisco Jan. 28, 1901, and approved by the mayor the following day is in substance as follows:

Section 1. The rates of fare to be charged by persons or corporations engaged in the transportation of passengers on street railways within the city and county for the transportation of pupils under the age of 18 years, who attend the public or private schools thereof, shall not exceed one-half the regular fare charged for the transportation of other passengers similar distances.

Sec. 2. Tickets for the transportation of pupils as aforesaid shall be sold in packages of 20 tickets each, and shall be received on street railroads between the hours of 8 a. m. and 9 a. m.; 12 m. and 1 p. m.; 2:30 p. m. and 4 p. m., and 6:30 p. m. and 9:30 p. m. during the days in which said schools are in session; and shall be available in actual passage to and from school, with such privileges of transfers as are enjoyed by other passengers conveyed by said persons,

associations or corporations engaged in the transportation of passengers on street railroads, subject to all reasonable regulations which they may impose not inconsistent with the provisions of this ordinance.

Sec. 3. Pupils under 18 years of age desiring to avail themselves of the privileges of sections 1 and 2 shall secure from the principal of the school they attend a certificate showing that they are in actual and regular attendance.

Sec. 4. Any person, association or corporation engaged in the transportation of passengers on street railroads violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding \$100 or by imprisonment in the county jail not exceeding 50 days, or by both such fine and imprisonment.

The ordinance went into effect March 27th, and at first there was a general disposition among the companies to contest the law on constitutional grounds, it being clearly, as the companies claimed, class legislation. After a meeting of the various railway interests, however, at which the subject was thoroughly discussed the companies, with one exception, decided to accept the ordinance and

avoid a long legal fight. An official of one of the roads is quoted as saying: "We are going to accept the ordinance in a broad spirit, and we shall apply it without restriction or limitation. Our best endeavors shall be used to make the plan a success. We reserve all our rights, and if we find that the privilege is being abused we shall withdraw it and fight the ordinance in the courts."

### LARGE ORDER FOR STORAGE AIR BRAKES.

The G. P. Magann Air Brake Co., Detroit, reports that it has recently received an order for the equipment with its storage air brake system the entire service of the United Railway Co., of Detroit, which includes all the urban lines of Detroit and also the Wyandotte & Detroit River line recently acquired by the United company. Three other of the Detroit interurban line use this system exclusively which fact speaks extremely well for its efficiency. The principal advantages claimed by the Magann company are that the central compressing plant works more economically than is possible for a number of small compressors of equivalent capacity to do, and that the individual compressors being absent from the cars there are greatly reduced maintenance charges on machinery and also no noise to annoy passengers. The system has been found reliable in operation.

The Seattle Electric Co.'s Pike St. line has been considerably extended, and what is known as the City Park extension has recently been opened to the public.

The Richmond Beach Railway Co., of Richmond borough, New York City, was incorporated last month to operate a steam or electric road 1¼ miles long, from Arbutus Lake to the tracks of the Staten Island Rapid Transit Railroad Co., near Annadale Station, Staten Island.



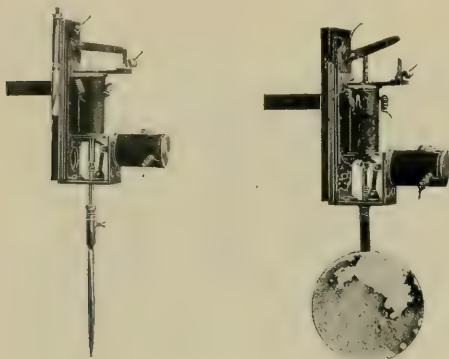
## VALENTINE ELECTRO-MAGNETICAL BLOCK SIGNAL.

Mr. D. Valentine, chief engineer of the Old Colony Street Railway Co., at Brockton, Mass., has recently placed on the market an improved automatic block signal system for single track roads, the working of which will be understood by reference to the accompanying half-tone engravings and wiring diagram.

The system employs as the visual signal two semaphores at each turnout, a white disk for the caution or "permissive" signal, and a red disk for the danger or "stop" signal. "Safety" or go-ahead is indicated by turning the edges of both disks toward the motorman.

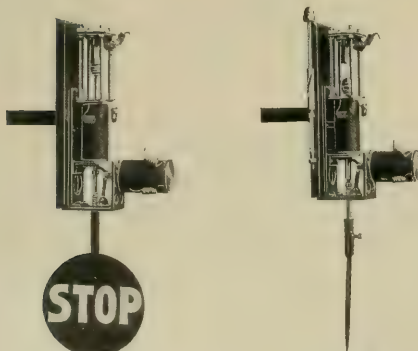
The path of the current in actuating the disks will be seen by referring to the wiring diagram, which shows the complete wiring for one section between two turnouts.

The trolley wheel, just as the car leaves a turnout, makes contact between the trolley wire and a plain piece of bar iron  $2\frac{1}{2}$  in. wide, and 2 ft. long, suspended over the trolley wire. The current



1—Telltale Signal,  
Showing Clear.

2—Telltale Signal,  
Indicating Car in Block.



3—Danger Signal,  
Set at Danger.

4—Danger Signal,  
Showing Clear.

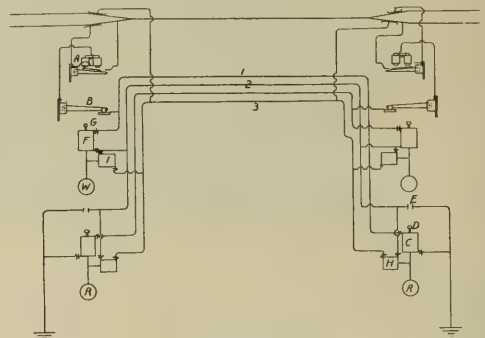
VALENTINE SIGNALS.

is thereby caused to enter the solenoid C at the turnout ahead through the relay A and the switch B. It will be seen this is a closed circuit to ground over the wire 1. The current entering the solenoid C, causes the plunger within it, and to which is attached the red semaphore, to rise. As the plunger rises it is made, by means of a spiral groove on its surface, to make a quarter turn thus throwing the red semaphore to its danger position, in which position it automatically locks. When this plunger has been raised as far as it will go, its insulated head D, enters the opening E, and closes a circuit through wire 2, this action causing the current to flow through the solenoid F, of the white semaphore at the home

station. The plunger within solenoid F at once rises, turning as it does so and setting the face of the white disk at right angles to the tracks, or the caution position, in which position it immediately locks. When this plunger rises, its head, G, lifts the switch B, thereby cutting off all current to the signals, and leaving them locked in their danger positions. The car has now protected itself both in front and rear and may proceed in safety to the distant turnout. As the car enters this distant turnout, its trolley wheel again makes contact with an iron bar and causes current to flow through the closed circuit made by wires 3 and 2, including the solenoids H and I. Within these two solenoids are the plungers which lock the two semaphore plungers in position, by entering grooves in the surface of the latter. When the current passes through the solenoids H and I, the plungers within them are drawn inwardly, thus releasing the two semaphore plungers, which immediately drop of their own weight, at the same time making a quarter turn, and bringing both disks back to safety. This action of course opens the circuit at E, and also permits the switch tongue B to fall, leaving the signals ready to be actuated by the following car.

The other set of signals is operated by a car going in the opposite direction.

The object of the relay at A is to preserve the current in the signal circuit until all the necessary movements have taken place. At the first impulse of the current the two magnets forming the relay attract the bar beneath them, thus closing the circuit and in-



WIRING DIAGRAM.

suring that the current will flow until the switch at B is opened.

At night two incandescent lamps throw their rays upon the semaphores if deemed desirable, but in practice it is found the disks are always plainly visible from the lights of the car as it approaches.

The system has been in use for some time on various lines of the Old Colony system and has given excellent results. It is quick and positive in action, is not complicated; and uses a very small amount of current. It gives promise of coming into extended use on high speed interurban lines.

## AUGUSTA EMPLOYEES ARE ATHLETES.

The Augusta (Ga.) Railway Athletic & Benefit Association gave an elaborate entertainment April 9th on the occasion of the opening of the new association quarters, presented to the street railway employees by Col. D. B. Dyer. The organization is but a year old, and is an outcome of an amateur baseball club. It now embraces more than 200 members who meet each week for lectures or musicals, and who have at all times the privileges of games, baths or athletic training at the club apartments. The newly opened association quarters are perfectly appointed and were the gift of Colonel Dyer, president of the Augusta Railway & Electric Co. Mr. C. O. Simpson, secretary of the company, to whom we are indebted for an invitation to the entertainment, is treasurer of the Augusta Railway Athletic & Benefit Association. He states that both the social and the healthful advantages of club life for the men are showing good results as indicated in an improved street railway service.

### MINIATURE RAILROADS FOR PARKS.

A very novel attraction for parks and pleasure resorts is made by the Miniature Railway Co., 301 Broadway, New York City, as the name implies, this is a complete working model of a steam railroad, consisting of locomotive, tender and open passenger cars running on light T-rails laid on miniature ties.

The locomotive which draws the cars operates under its own steam, burning either coal, wood or oil as preferred, and is an exact reproduction of a standard eight-wheeled American engine, with a leading truck and four coupled drivers. The principal dimensions for a 12½-in. gage locomotive are: Total length, 5 ft 4 in.; width 18 in.; height of top of smokestack from rails, 28 in.; driving wheels, 10 in. in diameter. The cylinders are 2 in. in



MINIATURE RAILWAY.

diameter, with a stroke of 4 in. The boiler is 10 in. in diameter, is built of steel, and tested to a pressure of 400 lb. per sq. in.

The cars are usually about 6 ft. long and 22 or 24 in. wide. They are of the design shown in the illustration, are mounted on springs to give easy riding, and each car holds two passengers.

The "Tom Thumb" train can be operated by any bright boy, and wherever this attraction has been introduced it has at once become exceedingly popular with the little folks, and in a number of places has been paying handsome dividends on the original cost. A miniature railway built in Central Park, last year carried between 1,000 and 1,500 children per day, at 5 cents a ride, and the first few trips in the morning usually paid all operating expenses for the day, leaving the balance of the receipts net profit.

The Miniature Railway Co. has secured a concession at the Pan American Exposition for a railway 1¼ miles long, and intends to run 12 or 15 trains around the grounds.

### NEW MASSACHUSETTS ROAD.

Jas. F. Shaw & Co., of Boston, are interested in a new electric railway which will give good service between Fall River and Providence. The new line, which is partly completed, runs from South Seekonk to South Somerset, a distance of 12 miles. At Seekonk connection is made with the Union R. R., of Providence; and at Somerset connection is made with the local lines of Fall River. Cars will run without change from the center of Fall River to the center of Providence, in one hour and a half.

The roadbed is laid with 60-lb. T-rails, on chestnut ties, 6 x 6 in x 7 ft., 22 in. between centers. At each joint are double Fig. 8 "Crown" bonds.

The car house, which is 59 x 175 ft., is located at Swansea, where are also the general offices. Power will probably be furnished by the Fall River company, which is controlled by the Massachusetts Electric Companies. At first 16 cars will be operated.

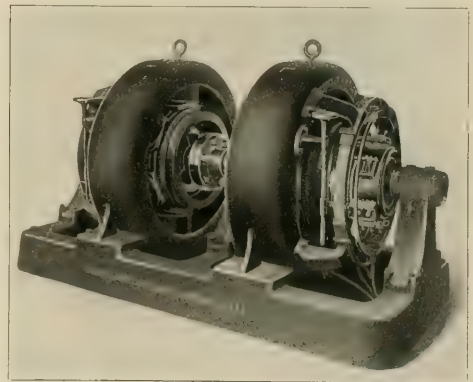
Work was commenced last month on the interurban line which is to connect Dallas and Fort Worth, Texas. It is expected to have the line in operation in eight months.

### CROCKER-WHEELER APPARATUS.

The Crocker-Wheeler Co., whose works are at Ampere, N. J., has recently installed a considerable number of street railway electric equipments, and some of the plants are interesting not only because they show that this company is rapidly getting a foothold in this class of work, but on account of the many interesting original engineering features which have been introduced with a view to improving the efficiency of the electrical operation of the roads and the saving in first cost of the installation.

At Bernice, Pa., the State Line & Sullivan County Railroad Co. has installed one Crocker-Wheeler size 170, 150-kw. engine type generator, the Ohio Railway & Power Co., of Pomeroy, O., has opened a new street railway line, which is driven by two size 224, 200-kw. engine type generators, and at Cumberland, Pa., the Cumberland Valley Traction Co. has installed one 300-kw. direct connected generator.

The Detroit, Rochester, Romeo & Lake Orion R. R. which runs from Detroit through the towns of Royal Oak, Rochester and Romeo on one branch, a distance of 40 miles, and from Rochester to Oxford, Michigan, a distance of 13 miles, on another branch, has its main power plant at Rochester, where there are two 200-kw.



CROCKER-WHEELER RAILWAY BOOSTER.

railway generators, and one 400-kw. generator, all of the direct connected engine type, supplied by the Crocker-Wheeler Co. A further extension of this system is being considered, and the company has installed a Crocker-Wheeler booster set which will be used to keep up the voltage of the line at distant points.

Other orders recently received by the Crocker-Wheeler Co. include a 400-kw. railway generator for the Newton Street Railway Co., Newton, Mass., which will furnish current for the street railway from Cambridge, through Watertown and Newton, complete booster sets for the Indianapolis Railway Co.; the Union Traction Co., of Indiana, Anderson, Ind., and generating power equipment to the Brandywine Traction Co., Brandywine, Pa.

The Rapid Transit Street Railway Co., of Salt Lake City, has leased Calders park for this and probably next season, and some improvements will be made. A spur track will be run from the railway into the park.

The Manufacturers' Association of Kansas City, Mo., has established a catalog library, and requests all manufacturers and mercantile establishments to forward their catalogs, receipt of which will be duly acknowledged. Catalogs will be filed and indexed by the card index system both as to firm name and subject matter of the catalog. The association will maintain standing advertisements in all of the local papers announcing that the catalog library is at the service of any one, and that inquiries by mail, which can be answered by reference to the catalog library, will be promptly and freely replied to.

## PERSONAL.

MR. C. H. NORWOOD will represent the Cutler-Hammer turning Co., of Milwaukee, in Chicago, with headquarters at No. 403 Fisher Bldg.

MR. RAYMOND H. KINNEAR, second vice-president of the Kinnear Manufacturing Co., of Columbus, O., was a recent visitor at the "Review" office.

MR. A. J. PURINTON was recently elected treasurer of the Palmer (Mass.) & Monson Street Ry. Mr. Purinton will continue to act as general manager of the company.

MESSRS. A. B. AND J. J. GODARD have purchased the property of the Freeport (Ill.) General Electric Co. at receiver's sale; the company operated six miles of track.

MR. B. F. STEWART, after a considerable absence, has returned to his old position with the McGuire Manufacturing Co., Chicago, and is in charge of the sales department.

MR. C. P. YOUNG, formerly of Chattanooga, Tenn., has left street railroading and is now with the Fairbanks Co., New Orleans, in the capacity of manager of the valve department.

MR. J. F. M'CABLE of the Charlestown division of the Boston Elevated Ry., has been made secretary to Mr. R. T. Laffin, the newly appointed superintendent of the Worcester Consolidated Street Railway Co.

MR. ROYAL H. HOLBROOK, until recently chief engineer of the Cedar Rapids & Marion City Railway Co., has removed to Ottumwa, Ia., having accepted the position of manager of the Ottumwa Electric & Steam Co.

MR. E. J. LAWLESS, for the past seven years Eastern representative of the American Car Co., of St. Louis, has accepted a position with the John Stephenson Co. and will make his headquarters at the factory at Elizabeth, N. J.

MR. S. S. NEFF, superintendent of elevated lines for the Boston Elevated Railway Co., was born Oct. 24, 1858, at Cincinnati, O. After receiving a technical education at Philadelphia and at Troy



S. S. NEFF.

N. Y., he engaged with the Pennsylvania R. R. as assistant engineer on construction. He remained with the Pennsylvania system for a number of years, severing this connection to become superintendent of coast lines for the Great Northern R. R., in which position he gained exceptional success in organizing and constructing new lines. Mr. Neff after a few years, returned to the Middle West, and was engaged on a number of important engineering undertakings. In October, 1897, he was appointed superintendent of the Union Elevated R. R., of Chicago. In this

capacity he was responsible for the operation of the entire loop including the power station, and again met with signal success. On June 1, 1900, Mr. Neff accepted the office of consulting engineer for the Boston Elevated Ry., and about the first of the present year he was made superintendent of the elevated lines. In this position Mr. Neff will have oversight of all operating details, including the making of schedules, hiring and training of employes, and the general condition of track and equipment.

MR. P. W. WHITTEMORE succeeds the late Col. Edward H. Gilman, as treasurer and general manager of the Laconia Car Co. Mr. Whittemore has for many years been associated with Mr. Frank Jones, of Portsmouth, who is president of the Laconia Car Co.

MR. EDWARD W. ASH who for some time was confined to his home in Rohrsburg, Pa., by sickness, has recovered his health and recently left for Muskegon, Wis., where he has accepted a position with the Muskegon Electric Railway Co.

MESSRS. HENRY WHEELAND, of Philadelphia, and DOUGLAS ROBINSON, of New York, were recently elected directors of the Richmond (Va.) Passenger & Power Co. to take the places of Messrs. Andrew Pizzini and George Ainslee, resigned.

MR. H. C. PAGE, general superintendent of the Lynn & Boston R. R., which is now one of the main operating divisions of the Massachusetts Electric Companies, commenced work on the Lynn & Boston system in 1883 as conductor. He remained in this capacity for three years, and then entered the office of Mr. E. C. Foster, at that time general manager, as inspector or "street aid." After remaining here for three years he went to Newburyport Mass., as superintendent of the Newburyport & Amesbury Street Ry. When the consolidated Lynn & Boston system was formed in 1892, Mr. Page again entered the employ of this company and was made division superintendent of the Salem division, which office he held until August, 1900, when he became general superintendent of the entire property. He was born in 1864 at Brownville, Me.



H. C. PAGE.

MR. E. V. STEBBINS, formerly of the Philadelphia staff of the Electric Storage Battery Co., will henceforth represent that company in Cleveland, where he will be manager of the sales office recently established in the New England Bldg., and handle the business in that territory.

MR. ALLAN L. M'DERMOTT succeeded Mr. F. C. Stevens as president of the Washington (D. C.) Traction & Electric Co. when the latter resigned last month. Mr. J. J. Coleman, general manager, resigned at the same time as Mr. Stevens, and was succeeded by Mr. H. W. Fuller.

MR. P. C. DUGAN has been appointed head of the law department of the United Traction Co., of Troy, N. Y., which department has just been created by the directors of the company. Mr. Dugan will have charge of all accident cases on the road, and the settlement of claims, etc.

MR. JOHN N. AKARMAN, formerly superintendent of the Consolidated Street Railway, Worcester, Mass., was given a surprise last month by his former employes who presented him with a diamond Masonic ring and an alligator traveling bag containing a set of ebony-backed brushes.

MR. J. C. HUBINGER, president and general manager of the Keokuk Electric Street Railway & Power Co., has returned to Keokuk after an absence during which he successfully straightened out the affairs of the Mississippi Valley Telephone Co. and again becomes the head of that enterprise.

MR. W. H. TUCKER has been appointed to succeed the late John H. Bowker, as superintendent of the Globe Street Railway Co., of Fall River, Mass., which now forms the Fall River division of the Old Colony Street Ry., one of the three main operating divisions of the Massachusetts Electric Companies.

MR. R. T. LAFFLIN, who recently resigned from the employ of the Boston Elevated Railway Co., to become superintendent of the Worcester Consolidated Street Railway Co., is one of the most successful, and one of the most popular street railway men of New England. His street railway work began as conductor on the Middlesex Street Ry. in 1881, and since that time his energy



and ability have won for him rapid advancement. He had filled a number of important offices for the Boston Elevated Railway Co., his last position being that of superintendent of Division No. 6, which he leaves to enter upon his new duties at Worcester.

MR. W. R. GARTON gave a practical talk to young men on the subject of the electric railway, before the Y. M. C. A., at the Association Building, Chicago, Friday evening, March 29th.

MR. A. H. STONE has resigned as treasurer of the Consolidated Street Railway Co., of Worcester, Mass., to become cashier of the Mechanics National Bank. He is succeeded by Mr. Justin W. Lester.

MR. JOHN H. STUDLEY who has been identified with the street railway business of Boston for 40 years, was surprised last month on the anniversary of his connection with the street railway business, with the gift of a handsome silver gold-lined loving cup presented to him by his friends and business associates.

MR. CLARK MERCHANT, of Philadelphia, has been chosen president of the Schuylkill Traction Co. Mr. Merchant and J. A. McKee, John F. Finney, A. W. Lippincott, Herman Hoopes, Spenser Cosby and Dallas Sanders were elected directors of the company at its meeting at Girardville, Pa., March 16th.

MR. GARDINER F. WELLS, for several years general manager of the South Shore & Boston Electric Ry., and later superintendent of the Rockland divisions of the Old Colony Electric Ry., has recently accepted the position of general manager of the Plymouth and Brockton Ry., with headquarters in Plymouth, Mass.

MR. C. K. MINARY, treasurer and general manager of the Springfield (Ill.) Consolidated Street Railway Co., was on April 4th married to Miss Margaret Bowmer, daughter of Mr. and Mrs. W. H. Bowmer, Cloverport, Ky. Mr. and Mrs. Minary will be at home after April 10th at the Leland Hotel, Springfield.

MR. E. C. FABER, who on April 1st was appointed general superintendent of the Cleveland Electric Railway Co., has been connected with the company for nine years. He entered the service as an office boy in 1892



E. C. FABER.

and was rapidly promoted to receiving clerk, then to chief clerk, and later to general passenger agent, which position he held until the present promotion. When Mr. McCormack became general manager of the company in April of last year Mr. Faber was his assistant and secretary. In his new position he will have full charge of the transportation department and deal directly with all of its employees. In arranging schedules, which work has been done by him for the last year, Mr. Faber has shown exceptional ingenuity and skill and has done a great deal to better the working hours of the men and eliminate the swing runs which had much to do in bringing about the unfortunate strike of two years ago. The "Review" joins with Mr. Faber's other friends in congratulating him upon the promotion and in wishing for continued success in his new position with its added duties and responsibilities.

MR. JOSEPH P. ORD, who has been for several years the second vice-president of the General Electric Co., has resigned that position to enter the firm of J. P. Morgan & Co. of New York City. It is reported that Mr. Ord will be prominently connected with the management of the new United States Steel Corporation.

MR. J. C. GEORGE has been appointed general manager of the Vicksburg (Miss.) Street Railroad & Power Co. and the Vicksburg Electric Light Co. to succeed Mr. F. S. Mordaunt. Mr. J. C.

Schaffer, of Chicago, is president of both companies and Mr. Mordaunt will remain in the South to look after other interests of Mr. Schaffer.

MR. F. A. ESTEP, president of the R. D. Nuttall Co., of Pittsburg, Pa., spent a week in New York recently in the interest of his company. Mr. Estep reports business in a flourishing condition. The demand for the Nuttall specialties has increased to such an extent during the past few months as to make necessary a large increase in the company's factory facilities.

MR. G. R. SCRUGHAM has recently been elected president and general manager of the Cincinnati & Eastern Electric Railway Co. which has just commenced the construction of an interurban road connecting Cincinnati with New Richmond, a distance of about 20 miles, and which will pass through a number of towns and villages on the route. Mr. Scrugham is well known among electric railway men throughout the country on account of his position as general superintendent of the Creaghead Engineering Co., for over ten years. He has been actively engaged, since the summer of 1899, when the Cincinnati & Eastern was organized, in securing franchises for the road, the last of which has just been granted. Mr. Scrugham is associated in this enterprise with Mr.



G. R. SCRUGHAM.

Lee H. Brooks, vice-president of the company, Mr. J. M. Kennedy, secretary and treasurer and Messrs. W. E. Hutton and Charles H. Davis, all of whom are prominent business men of Cincinnati. Mr. Scrugham has already instituted active work on the new road and the "Review" wishes him every success in the enterprise.

MR. H. M. LOFTON has been appointed Southern representative of the R. D. Nuttall Co., and will have his offices at 238 Equitable Bldg., Atlanta, Ga. Mr. Lofton is not only a well known street railway man, but is also widely known in other mechanical lines through former prominent important positions that he has held, and we predict for him a very bright future in the line he has now chosen.

MR. H. E. CHAMBERLIN who recently resigned as superintendent of the Concord (N. H.) Street Railway Co. was pleasantly surprised by all of the employees of the railway, who with their wives and families held a meeting into which Mr. Chamberlin was inveigled. Here he was presented with a handsome silver service by the men in token of their esteem, and afterwards the ladies of the party served a banquet.

THE WORCESTER (MASS.) CONSOLIDATED STREET RAILWAY CO. elected a board of directors, March 20th, comprising: A. G. Bullock, F. H. Dewey, P. W. Moen, Stephen Salisbury and S. E. Winslow, of Worcester; T. Jefferson Coolidge, jr., of Manchester; F. W. Kendrick, of Cambridge; Oliver Ames, of North Easton; Samuel Carr, of Boston; A. D. Foster, of Milton, and William A. Read, of New York.

PRESIDENT H. M. ATKINSON and MR. J. J. SPAULDING of the Georgia Electric Co. were recently guests of the officers of the North Jersey Street Railway Co. with whom they made a tour of inspection over the latter road in its handsomely appointed directors car. Both gentlemen are interested in the Atlanta lines which were recently purchased by the Georgia company and their visit was for the object of gaining useful information for the management of the newly acquired roads.

MR. E. P. ROBERTS, of the well known engineering firm of E. P. Roberts & Co., of Cleveland, has been the principal partner in that company since 1893, during which time he has become prominently identified with electric street railway engineering and con-

struction. At the present time his firm has in hand nine electric railways aggregating 363 miles in length, in various stages of progress. Mr. Roberts is the subject of a biographical sketch published in the Cleveland "Finance". He is a graduate of the Stevens Institute of Technology, and was employed with the United States Electric Co., the American Electric Co., the Brush-Swan Co. and the Cheyenne Electric Light and Gas Co. He then became associate professor of electrical engineering in Cornell University, which position he resigned to organize the firm with which he is at present associated.

MR. TOM L. JOHNSON was chosen mayor of Cleveland at the municipal election held April 1st.

MR. FRANK E. LOWE, president of the Greenfield (Mass.) & Turner's Falls Street Ry., has tendered his resignation to take effect May 1st.

MR. HUGH J. M'GOWAN, president of the Indianapolis Railway Co., has returned to Indianapolis after a sojourn at Hot Springs, Ark., and is much improved in health.

MR. W. R. GARTON, president of the W. R. Garton Co., on March 29th delivered a lecture on "The Electric Railway" before the Chicago Central Electrical Club, at the Y. M. C. A. parlors in Chicago.

MR. FRANCIS RAYMOND has established offices at 48 West Jackson Boulevard, Chicago, and will act as sales agent for the General Incandescent Arc Light Co. and the Process Copper & Brass Co.

MR. F. B. LEE, who has been superintendent of the Quincy (Ill.) Horse Railway & Carrying Co. for the last year, has resigned to take a position of superintending the construction of a new railroad which is being built from Augusta, Me., to Tioga.

MR. G. W. KNOX, formerly electrical engineer of the Chicago City Ry. and recently with Kohler Bros., of Chicago, has opened an office at No. 1409 Fisher Bldg., Chicago, and will act as consulting engineer, making a specialty of railway and lighting business.

MR. CHARLES T. YERKES sailed from Southampton for New York on April 5th. Mr. Yerkes declines to say anything concerning his plans further than he is contented with the work on the Charing Cross and Hempstead line, and is leaving other ideas for the future.

MR. CHARLES CURRIE, who was general superintendent of the Cleveland Electric Ry., resigned that position on April 1st to become general manager of the Detroit & Toledo Short Line Railroad Co. Mr. Currie will make his headquarters in the Majestic Bldg., Detroit, Mich.

MR. W. A. MARTIN has been appointed superintendent of the Quincy Horse Railway & Carrying Co. Mr. Martin has been superintendent of the Quincy Gas & Electric Co. for the past two years. He was formerly employed by the Pullman Palace Car Co. at the Wilmington shops, as head draughtsman for the construction and remodeling of cars, for three years. He then completed a four years' course in mechanical engineering at the University of Illinois. He then went with the Thompson-Houston Electric Light Co., of Omaha, Neb., and from there was transferred to the Pueblo Electric Street Railway Co. as superintendent.

MR. JOHN W. OGDEN, who recently resigned his position as assistant superintendent of the Leominster & Clinton Street Ry., was entertained on the occasion of his resignation at a banquet given in his honor by employees of the road. At the close of the banquet he was presented with a handsome ring of special design bearing various Masonic emblems in their true heraldic style and colors. Mr. Ogden opened the Worcester & Clinton Street Ry. in 1898, and the Clinton & Hudson Street Ry. in 1900. He was superintendent of both roads until their consolidation with the Leominster & Clinton Street Ry., when he became assistant superintendent of the consolidated roads. This position he resigned

to become superintendent of the Concord, Maynard & Hudson Street Railway Co., and he is now at Maynard superintending the construction of the new road.

MR. RICHARD M'CULLOCH, who in March, 1889, resigned as engineer for the National Railway lines, of St. Louis, to engage in electric railway work in Europe, returned to America last month to take the position of assistant general manager of the Chicago City Ry. While abroad Mr. McCulloch was in the service of the promoters of the Compagnie Genevoise des Tramways Electriques who also had tramway interests in other parts of Switzerland and in France. Until the opening of the Geneva lines for electric operation in August, 1900, Mr. McCulloch spent the greater portion of his time traveling in Switzerland and France, examining and reporting upon electric railway projects; on the completion of the Geneva lines he was placed in charge of operation. As soon as this work had been carried out and the new system was in successful operation, Mr. McCulloch availed himself of the opportunity to return to this country where he has received a warm welcome from his many friends in the street railway field.

## OBITUARY.

MR. WATSON VAN BENTHUYSEN, formerly prominently interested in street railways, and well remembered in New York by the active part he took in the construction of the Poughkeepsie bridge, died at New Orleans, March 30th, aged 68 years.

MR. JOHN H. BOWKER, for many years superintendent of the Globe Street Railway Co., of Fall River, Mass., died on March 9th. Mr. Bowker began his street railway career as conductor on the Union R. R., of Providence, in 1869. In 1881 he was appointed superintendent of the Globe Street Railway Co., which position he held until his death.

COL. EDWARD H. GILMAN, treasurer and general manager of the Laconia Car Co., Laconia, N. H., died at his home in Exeter, N. H., on March 19th, of paralysis. He was born in Exeter in 1855 and attended the town schools, afterward entering the Chandler Scientific School at Dartmouth, N. H. In 1881 he was appointed colonel on the staff of his father-in-law, Gov. Charles H. Bell. He has been a member of the state legislature, and in 1896 was tendered the nomination for governor of his state.

MR. CHARLES P. CLARK, president of the New York, New Haven & Hartford R. R. from 1887 to 1900, died at Nice, France, March 21st, of heart disease. He was a native of Nashua, N. H., and was 65 years of age. Mr. Clark began his railroad career in 1870 as clerk of the board of receivers of the Boston, Hartford & Erie R. R. From 1871 to 1886 he filled successively the positions of general manager, vice president, receiver and president of the New York & New England R. R. During his term as president of the New York, New Haven & Hartford he witnessed and in several instances promoted the absorption by that company of other roads, among them the New York, Providence & Boston, the Housatonic, the New Haven & Derby, the New York & New England and the Old Colony railroads.

## FREIGHT IN OHIO.

In the case of the State versus the Dayton Traction Co. the Supreme Court of Ohio on March 25th decided that interurban electric railways may engage in freight as well as passenger traffic. The decision is a very important one because of the many interurban lines now in operation and building in that state.

## FORDYCE LINE FULLY AUTHORIZED.

Thomas N. Fordyce, of Detroit, has been granted authority to construct and operate an electric road for the propulsion of canal boats along the Miami and Erie canal from Cincinnati to Toledo. The contract will go into effect when Mr. Fordyce shall file a bond to the amount of \$25,000 and when the approval of the governor and attorney general shall be secured. Work will probably be commenced at the Cincinnati end of the line in a few weeks.

### NEW PRESIDENT OF BROOKLYN RAPID TRANSIT.

At a special meeting of the board of directors of the Brooklyn Rapid Transit and the Brooklyn Heights Railroad companies March 20th, Mr. C. L. Rossiter presented his resignation as president and director of both companies. The resignation was accepted and Mr. J. L. Greatsinger was elected president and director to fill the vacancy caused by Mr. Rossiter's resignation. Mr. Greatsinger is about 50 years of age and has been in railroad work all his life, having had experience in every phase of practical railroad work from locomotive fireman to president. He was born in Elmira, N. Y., and was educated at the Elmira Free Academy. He began his business life on the Erie Railroad, firing switch engines, and afterwards served in almost every capacity up to general manager of the various railroad properties comprising the Utica, Ithaca & Elmira Railroad Co., now a part of the Lehigh Valley system. In this company Mr. Greatsinger served under presidents, William E. Burt, Ezra Cornell, H. V. Poor, Dr. Edwin Eldridge and Austin Corbin.

In 1886 he went West to assume the position of master mechanic of what is now the Chicago & Eastern Illinois Railroad Co., and two years later he became master mechanic of the Duluth & Iron Range R. R. of which he was soon promoted to general superintendent. In 1889 he was elected president of this road, which position he has since occupied. In December last he was also elected to succeed D. H. Bacon as president of the Minnesota Iron Co. and all its constituent companies. He has made an excellent record in handling iron ore in the Northwest, and his well known versatility lends to every confidence in his ability to successfully manage the entirely new line of business to which he now succeeds.

In most of his railroad experience Mr. Greatsinger has been closely identified with Mr. H. H. Porter who is a member of the executive committee of the board of directors of the Brooklyn Rapid Transit Co.

### SPECIAL SCHOOL FOR APPRENTICES AND ARTISANS.

The University of Wisconsin has issued a bulletin announcing special courses to be given from July 1st to August 8th for apprentices and artisans. The summer school has been established for the benefit of machinists, carpenters, or sheet-metal workers; stationary, marine, or locomotive engineers; shop-foremen and superintendents; superintendents of power plants; and for young men wishing to qualify themselves for such positions. It is believed that many of the students will be men regularly employed in responsible positions who would have to secure leaves of absence from their employers, but in most cases the employers will doubtless appreciate the advantages of the school and readily grant the desired leaves.

The school for artisans is intended to supplement the work of the correspondence schools, a number of which are giving very good and thoroughly sound instruction in engineering and mechanical subjects.

The courses in steam engineering include: Lectures on the Elementary Theory of Heat. Lectures on Steam Engines and Boilers. Experimental Work in Steam Laboratory. Operation and Management of Engines and Boilers. Gas and Gasoline Engines. Traction Engines.

The courses in applied electricity are: Dynamos and Motors, Electric Wiring, Meters, Transformers and Lighting; Telephone Service; Electric Batteries; Electric Station Records; Elementary Theory of Alternating Currents and their applications; Electroplating and Electro-typing.

A new cable for the Broadway line in New York, which was recently conveyed to the Cable building was drawn by 30 horses. The four miles of cable weighed 42 tons, and the wheels of the

Night service on the Columbus Ave. line of the Metropolitan Street Railway Co. of New York City has been discontinued for several weeks in order to change over the cable to the electric system. The work is done between midnight and 5 a. m.

### NEW PUBLICATIONS.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. issued under date of February, 1901, Circular No. 1040 describing self-cooling transformers and giving dimensions and weights of the various sizes from 10 to 500 kw., for pressures of from 2,000 to 30,000 volts, for both 7,200 and 3,000 alternations. Circular No. 1041, issued in March, 1901, describes the company's round pattern ammeters and voltmeters and supersedes Circular No. 1014.

THE VALUATION SUPPLEMENT of the Economist, Chicago, has just been published making the third annual issue of this supplement. The present issue gives the valuation of Chicago property for 1900 on which the owners are paying taxes, and also gives the name of the owner of each piece of property in the down town district of the city. Facility in finding any particular piece of property is attained by a map and a very complete index. It is sold at 25 cents per copy.

TRACTION AND TRANSMISSION, a monthly supplement to Engineering, (London) has made its first appearance for April, 1901. Volume 1, No. 1, contains a number of interesting articles pertaining to electric railways and kindred subjects. The issue is well illustrated and contains among its contributors the names of a number of prominent men in the electrical engineering field. The initial number of this monthly promises a valuable addition to electrical engineering literature. Price, 2 shillings net.

THE ASSOCIATION OF ENGINEERING SOCIETIES' JOURNAL for February has just been issued and covers a wide extent of territory containing as it does papers from Boston, San Francisco, St. Louis and New Orleans. It contains a series of six papers on concrete metal construction all of which are liberally illustrated. Another paper is upon the "Skeleton Construction of a Tall Office Building", and it also contains a discussion on the relation of the Engineering Society to the engineer and to the profession.

DYNAMO ELECTRIC MACHINERY is the title of a text book by Samuel Sheldon, A. M., Ph. D., published by D. Van Nostrand Co., New York. Price \$2.50. The volume is a somewhat elementary treatise on the theory and design of dynamo machinery, and is designed for the use of students in electrical engineering courses. The descriptive material in this book is very complete and the mathematical theory is touched on but lightly which makes the volume as well adapted to the general reader as to the technical student.

THE KINNEAR MANUFACTURING CO.'S CATALOG K has just been published giving a description of this company's steel rolling doors, shutters and partitions. The book is profusely illustrated with views of numerous buildings in which these appliances are used and shows that they have been very extensively adopted by street and steam railroads for car sheds, round houses and similar buildings. The catalog also shows sectional views of the apparatus by means of which these shutters and doors are operated.

THE ILLINOIS STATE ELECTRICAL ASSOCIATION PROCEEDINGS of the meeting held at Champaign, Ill., Nov. 27, 1900, has just been issued and contains a full report of the addresses, papers and discussions given at the last annual meeting. A number of papers were read bearing on practical points of interest to electric railway and lighting companies. Although a young association the membership list contains the names of 82 companies, while 60 new names stand on the list of applicants for membership. The next annual meeting will be held at Rock Island, Ill., Nov. 26, 1901.

THE GENERAL ELECTRIC CO. has recently issued the following bulletins and pamphlets: "Interchangeable Arc Lamps"; "General Electric Fan Motors"; Catalogs Nos. 7534-5-6-9 covering parts of Brush arc lamps, parts of carbon feed enclosed arc lamps, forms 5 and 1, and repair parts of G. E. 800 railway motors; Flyer No. 2067 on "Protective Device for Transformers"; Bulletins Nos.



4229, 4242-3-4-5 treating of large oil transformers, induction motors, direct driven continuous current motors, switch system for remote control and arc lamps for blue printing.

**BULLETIN OF COMPARATIVE LAMP TESTS** is the name of a large catalog published by the Western Electric Co. It is particularly addressed to central station men and deals with a number of comparative tests on different makes of incandescent lamps. A large number of curves are given for the life, candle power and efficiency tests of different lamps and the methods of conducting the tests are also explained.

### AUGUSTA STREET CARS DERAILED.

The Augusta (Ga.) Railway & Electric Co. is making every effort to apprehend the miscreants who have been placing obstructions on the tracks of the Summerville line. Early in March cross ties and other obstructions were fastened to the tracks of this line and three successive cars ran against them. One car was derailed and required considerable labor to replace it on the track. No serious accidents have been caused so far, but it is hoped the offender will soon be brought to justice.

### DUFF MANUFACTURING CO.

The entire capital stock, factory and real estate of the Duff Manufacturing Co., of Allegheny City, Pa., has been purchased by Mr. J. R. McGinley, of Pittsburgh, Pa. The Duff Manufacturing Co. makes the well known Barrett automatic lever jack. Mr. McGinley, who is one of the foremost business men and financiers of the city of Pittsburgh, and who has for about 20 years been prominently identified with the Westinghouse interests, will take personal charge of the management of the Duff company. He will make a number of improvements in the factory, so as to greatly increase the capacity of the present plant, and he is about to conclude arrangements for the sale of the company's product in foreign countries.

### THE DUTY OF MOTORMEN TOWARD DOGS.

A judgment of \$75 damages against the West Chicago Street Railroad Co. for the accidental killing of a Great Dane, was affirmed by the branch Appellate Court on March 29th. The court ruled that motormen and gripmen must be careful to avoid running over dogs, and not rely entirely upon their alertness to get off the track.

The Consolidated Traction Co. of Jersey City, N. J., which is leased by the North Jersey Street Railway Co., re-elected its board of directors, March 25th, with one exception, that of Henry Lembeck, who will be succeeded by J. E. Hulshizer.

The Brooklyn Rapid Transit Co. on March 23d took radical action to abate the sign nuisance and removed all advertisements from the pillars along the elevated road. The company had a month previously warned the advertisers that their signs would be destroyed if they were not removed within two weeks. When the fortnight had expired 16 days of grace were granted.

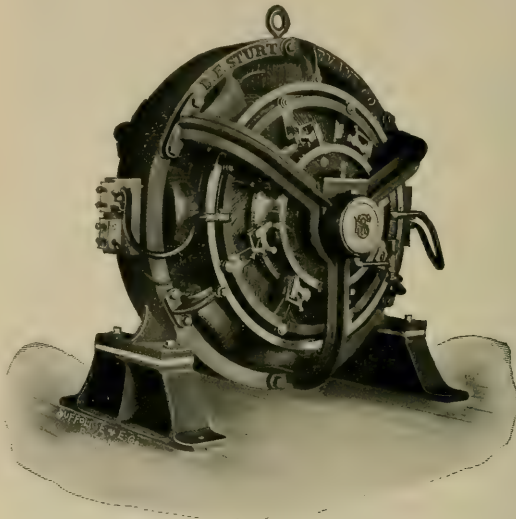
Mr. J. L. Greatsinger, who recently succeeded Mr. Rossiter as president of the Brooklyn Rapid Transit Co., was formerly president of the Duluth & Iron Range R. R. On severing his connection with that road he proposes to acquire a cabinet photograph of each of his old employees, and several hundred of these portraits will be kept by Mr. Greatsinger in a specially constructed album.

The Carnegie, McDonald & Canonsburg (Pa.) Street Railway Co. held its annual meeting in Pittsburgh, March 14th, and elected the following directors: Edward McDonald, of McDonald; R. J. Stoney, jr., of Pittsburgh; Dr. Murray, of Sewickley; E. W. Davis, of Pittsburgh, and W. J. Cassidy and J. W. Nesbit, of Oakdale. The line between Oakdale and McDonald will shortly be completed.

### STURTEVANT 8-POLE MOTOR.

The illustration shown herewith gives a general view of the 8-pole electric motor which has been developed by the B. F. Sturtevant Co., of Boston, Mass., for driving the fans made by that company. The comparative lightness of this type of motor makes it specially applicable for attachment to the side of an ordinary fan. It can also be supported on feet, as shown, and used as an independent machine.

The smallest machines have wrought iron fields, the medium cast steel and the largest sizes cast iron. The field cores are of



wrought iron and the pole shoes are made of cast iron designed so as to avoid sparking with extreme variations of load. The field coils are machine wound and well ventilated. The armature core is slotted and the coils are form-wound.

The commutator segments are made of drop-forged copper and one or two sets of carbon brushes are used according to the voltage of the machines. These motors are built in sizes ranging from 3 to 37½ h. p.

### SERVICE STRIPES IN KANSAS CITY.

The Metropolitan Street Railway Co., of Kansas City, has decided to adopt service stripes for employees. Following the example of the Boston street railway, silver or gold stripes will distinguish conductors from motormen. Employees who have been in the service of the Metropolitan company for more than five years will be designated by stars instead of stripes.

### PROVIDENCE FENDERS ABROAD.

Mr. Henri Bordes has become the sole agent of the Consolidated Car Fender Co., of Providence, for France, Italy and Spain. Mr. Bordes is a wealthy merchant and is the owner of the line of steamships running between New York and Bordeaux. Mr. Bordes has already placed a large order for Providence fenders to be shipped abroad April 16th, and Mr. E. C. Hall, who has been with the company since its organization, sails the same day to assist Mr. Bordes in starting the business.

Mr. William B. Nichols, of Seymour, Conn., has returned to his home after four months spent in Havana, where he superintended the placing of the electric road cable. In laying the cable and tracks for the road the streets were found to be so narrow that it was sometimes impossible to turn corners except by purchasing the buildings on the corners and tearing them down to make room for the tracks.

## RAILWAY TELEPHONES.

The telephone is rapidly coming to be as necessary a part of the modern interurban electric railway equipment, as the telegraph is in steam railroad operation. A telephone system possesses one great advantage over the telegraph in that the chief dispatcher

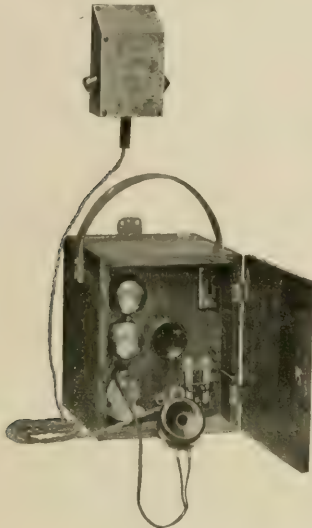


FIG. 1.

is not only able to deliver his orders along the line, but can also hold direct communication with the employe for whom the order is intended, and is therefore able to keep in closer touch with all the train crews on the road, than he could do in any other way.

The Novelty Electric Co., of No. 50, North Fourth St., Philadelphia, makes a specialty of telephone instruments for electric railway service. The portable instrument shown in Fig 1, is fur-

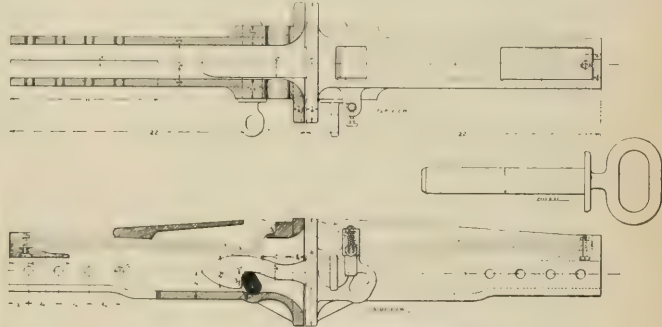


FIG. 2.

nished with metallic plug and cord for plugging into the metallic jack placed on poles along the line, and will be found a very convenient set to carry on cars. Fig 2, is the company's No. 4 instrument, mounted in weather proof box, for fastening to poles along the line. As will be seen the bells for this telephone are placed in a separate box higher up on the pole, the bell box having wire gauze at the bottom

## NEW TYPE OF VAN DORN COUPLER.

The accompanying illustration shows the Van Dorn coupling on modified lines from any formerly built. Especially designed to meet any requirements, it is only intended for elevated roads or roads where the cars are vestibuled, where it is impossible to uncouple from the top. By this method the uncoupling is done from the side of the draw bar heads instead of from the top. There are other advantages to be gained by this method, for this class of service. It is far easier to uncouple for elevated roads where you are limited for space. The pin is provided with a large handle



VAN DORN IMPROVED COUPLER.

for uncoupling. All the difference there is in the whole construction is that the springs are on the top instead of on the side.

The Van Dorn couplings are well known all over the world and are being adopted by companies in every country, their great simplicity and durability having won this place for them. All their motions are positive, and being machine fitted their maintenance is comparatively nothing. The company has issued a new catalog which will be sent on application.

## ELECTRIC SURFACE LINE IN LONDON.

In 1898 the London United Tramways, of which Mr. J. Clifton Robinson is managing director and engineer, applied to Parliament for electric powers and in 1900 had completed its railway from Shepherd's Bush to Uxbridge, a distance of 13 miles. Writing in the "Review" for January, 1901, Mr. Robinson said that the motor cars were standing idle awaiting permission from the Board of Trade.

The London dispatches state that this road was put in operation by electricity on April 3d, and "thousands of people are riding in electric cars and wondering that they have been so long in coming."

## USEFUL SUPPLY CATALOG.

The new catalog of the Frank Ridlon Co., of Boston, just from the press contains in compact form a large amount of exceedingly valuable information for the street railway manager and purchasing agent. In addition to descriptions of the well-known specialties handled by the Ridlon company, which include iron poles, bracket arms, overhead material, gears, pinions and trolleys, electric heaters, the Wilson trolley pole catcher, and various other supplies, the catalog gives considerable general data that will be appreciated by purchasers.

Under the heading "Electric Heaters," is given a table showing the maximum current supply that has been found to meet the demands of managers and patrons for satisfactorily heating cars of different lengths, and a diagram is reproduced illustrating the best way of arranging the heaters in a car to secure the proper distribution. The table states that for heating cars 14 to 16 ft. long requires from 7 to 8 amperes; 22 to 26 ft. long, 10 to 12 amperes; 36 to 40 ft. long, 18 to 21 amperes; the pressure in each case being 500 volts. The Ridlon company sells the "American" heater made by the Simplex Electric Co., of Cambridgeport, Mass. The catalog will be sent on application.

### HALF FARES.

Two street railway companies, the Greensburg & Southern and the Westmoreland are competing for a franchise in Greensburg, Pa.

The Pittsburg & Birmingham Traction Co. was recently defendant in a case to recover \$1,000 damages for injuries done a cork leg.

The Toledo & Monroe Electric Ry. is negotiating with the Toledo, Fremont & Northern concerning the erection of a joint freight terminal.

A right of way through the Lakeside, Ohio, camp meeting grounds has been granted to the Lakeside, Napoleon & Western Electric Ry.

The Selma (Ala.) Street & Suburban Co., which operates an electric railway, has purchased 120 acres of land and will improve it for a pleasure park.

The Sioux City (Ia.) Traction Co. plans to abandon its elevated railway and utilize a portion of the superstructure to build viaducts over railway tracks.

It is announced that work on grading for the electric road between Rockford, Ill., and Belvidere, will begin at once and that rails can be had in May.

An electric road from Des Moines, Ia., through Altoona, Mitchellville and Colfax to Newton is projected; Cleveland parties are said to be back of the enterprise.

The Kansas City (Mo.), Parkville & St. Joseph Electric Ry. is endeavoring to secure franchises for a road to compete with the Kansas City & St. Joseph Electric Ry.

The Cincinnati Traction Co. will increase the amount annually donated to the sick benefit fund of the Mutual Protective Association of its employes from \$5,000 to \$6,000.

The Boston Elevated Railway Co. successfully demonstrated the working of the new third rail electrical system, March 25th, to a party of city officials and other guests.

During the two principal days of the carnival in New Orleans, La., last month, the city railways handled about 1,000,000 passengers without a serious accident of any kind.

The Market Street Railway Co., of San Francisco, put an observation car in service March 30th. The car makes three round trips per day over a 20-mile route; the fare is 25 cents.

The New Orleans & Carrollton R. R. has engaged a carefully selected stock company of entertainers and will inaugurate the amusement season at Athletic Park on May 12th.

A bond of \$100,000 has been filed with the city of Columbus, O., by Tom L. Johnson and Frank Monnett who have agreed to operate the street railway lines in the city on a 3-cent fare basis.

The construction of the City Hall loop of the New York City rapid transit tunnel, which will form the southern terminus of the system, was commenced last month by the contractor, John B. McDonald.

Several trolley roads to serve the fruit-growing region of Michigan are projected. Among these are a 25-mile line to connect South Haven, Benton Harbor, and Paw Paw Lake, the Michigan West Shore Traction Co. to run between New Buffalo and Grand Rapids.

A number of tests are being made almost daily on the Boston (Mass.) elevated railway tracks north of the new subway. These are being made by Mr. Paul Winsor, the electrical superintendent of the road.

The Buffalo (N. Y.) Railway Co. has announced an increase of 20 cents per day in wages.

The Omaha Railway Co. has opened bids for the carpenter and brick work on the new barn which will be erected in the place of the Harney street building, destroyed by fire February 8th.

The Chicago Union Traction Co. has recently arranged to issue \$4,800,000 of 4½ per cent 30 year bonds to retire outstanding 5 and 6 per cent bonds; only \$1,614,000 of the total will be issued now.

The village of Navarro, Ohio, is offering inducements to the Canton-Massillon railway to construct a branch line to that place, and agents of the company have already commenced to secure rights of way.

A fire started in a car in the barns of the St. Catharines (Canada) & Thorold Street Railway on March 16th, which spread to the building damaging it to the extent of \$2,500. The loss is covered by insurance.

It is reported that the Adams Express Co. which has long desired to effect an independent entrance into Detroit will avail itself of the opportunity offered by the electric interurban lines radiating from Detroit.

The Cincinnati Traction Co. has made the Bartels Brewing Co. of that city an offer of \$150,000 for certain property on Canal and Walnut streets for a site for a new power plant. It is almost in the heart of the city.

The Johnstown (Pa.) Passenger Railway Co. has broken ground for the erection of its proposed new car barn in Maxham. The structure will be 50 x 240 ft. in dimensions, 21 ft. high, and will have a capacity for 20 cars.

A bill before the Tennessee legislature to require the street railway companies to operate separate cars for whites and blacks found few supporters when put on third reading, and these came from the country districts.

A number of boys were caught in the act of stealing the copper bonds from the rails of The Schuylkill Valley Traction Company's lines near Swedeland, Pa., last month. The boys had just removed the bonds from 16 joints when arrested.

Plans have been completed by the Youngstown & Sharon Electric Railway Co. for the erection of a large power plant and car barn in the suburbs of Youngstown, O. The company will provide its employes with fine quarters in the new building.

It is stated that the Clegg-Winters syndicate, controlling the Dayton (O.) & Troy interurban, has absorbed the McKnight-Schwab interests and that the Troy, Tippecanoe & Dayton line will not be built unless as a part of the former.

March 21st the Chicago City Railway Co. transferred Sans Souci Park, Cottage Grove avenue and 61st street, to the Metropolitan Amusement Co. for a nominal consideration. The park will be operated by the Metropolitan company this season.

Professor Robenan, the Berlin electrical expert, who is studying the applicability of electric traction to the Transiberian Railroad, is reported by the daily press as stating that within ten years one will be able to travel round the world in 22 days.

The Mill-Creek Valley Street Railroad Co., of Cincinnati, has asked the commissioners of Hamilton County for a franchise from the city corporation lines to the northern corporation line of the village of St. Bernard. The proposed extension is to be double tracked.

The commissioners of Clark County, Ohio, have granted a franchise to the Dayton, Springfield & Urbana Electric Ry. through



that county for a new line to Fairfield, with the provisions that the company erect a power house in that county or pay \$15 per mile each year.

The right of way has been secured by the Mahoning Valley Railway Co., of Youngstown, O., for the extension of its line from Lowellville to Mahoningtown, where it will connect with the New Castle Traction Co. to New Castle. Orders have already been placed for the equipment.

The surveyors on the Rock River Electric railway have completed the cross-section work from Dixon, Ill., to Grand Detour and will continue from the latter place north as soon as the weather permits. The section of the road between the two places mentioned will be built first.

The Glenwood & Polytechnic College Street Railway, at Fort Worth, Tex., has been transferred to a syndicate which controls the local Twin City Railway, and of which Fred Howard Porter of New York is the representative. Col. J. T. Voss was formerly chiefly interested in the purchased line.

The Urbana & Champaign (Ill.) Railway, Gas & Electric Co. was recently robbed of copper wire to the amount of \$1,000. It is the opinion of the police that the robbery was committed in broad daylight, the passersby mistaking the thieves for linemen at work in the ordinary way repairing the wire.

A bill has been introduced in the New York legislature requiring street railroads to carry on all cars signs indicating their destination. In case a car be delayed more than five minutes the bill provides that transfers shall be issued upon request to be accepted in lieu of fare on any line operated by the company.

March 22d a 50-lb. box of dynamite accidentally exploded in the new rapid transit tunnel in New York City, 120 ft. below the surface of the ground. None of the workmen was injured seriously, although the shock of the explosion was sufficient to blow a dirt car at the mouth fully 50 ft. from the outlet of the workings.

Attorney General Sheets of Ohio, has rendered an opinion to Railroad Commissioner Morris to the effect that the latter has no jurisdiction over the crossing of two electric railways, and cannot require safety devices and switches in such cases. He states, though, that he does have jurisdiction over the crossing of a steam and electric railway.

A new game called "A Crosse" is being introduced by the employees of the Hartford (Conn.) Manchester & Rockville Tramway Co. It is played with an indoor baseball, large tennis rackets and polo cages. Several tournaments between the Tramway Men's Mutual Benevolent Association and the athletes of a local military company have been arranged.

At a special meeting on April 8th the stockholders of the Metropolitan Elevated, of Chicago, authorized the issue of \$5,000,000 4-per cent bonds to be used in building the extensions now contemplated and under way. One of the extensions is 1.85 miles long and another about half a mile long. The latter will connect with the Aurora, Wheaton & Chicago electric line.

The first car was run over the new Colorado Springs & Cripple Creek District Ry., March 23d, carrying the president, Irving Howbert, and the general manager, A. C. Ridgway, with a party of guests. The line will be put in regular operation between Colorado Springs, Cripple Creek, Cameron and Victor probably by June 1st. Its length is 45 miles, and its cost \$2,500,000.

A number of electric railway extensions are planned in and around Wilmington, Del. The Wilmington City Railway will extend its line on Maryland Ave. to the city limits, with a view of building a line to Newport and Staton. The Wilmington, Newark & Elton Railway Co. proposes to build a line on West Seventh St. to Clayton St., and thence to the Newport turnpike. This company intends to build a finely equipped road from Wilmington to Elkton, Md., with a possible extension to Chesapeake

City and other points along the eastern shore of Maryland. The Park Railway Co. will operate in conjunction with the People's company to build a line encircling South Brandywine park.

The suburban railroads running into Detroit, assessed on personal valuations including franchise valuations in Detroit, claim that the recent Supreme Court decision in regard to the roads in the city does not apply to them. The receiver of taxes is preparing to seize under levy a sufficient number of the cars of these companies to cover the amount of tax assessed.

The Girard & Lowellville Belt Line Co., and the Girard, Thornhill & Hazelton Belt Line Ry., have been incorporated in Ohio. The two companies will eventually be consolidated into a single belt line company. Surveys have been made for a double track, encircling the entire city and connecting with all the industrial plants from Girard through Youngstown to Lowellville.

A company is seeking incorporation in Massachusetts under title of the Massachusetts Electric Express Co., which proposes to make contracts with electric lines to carry express matter and baggage. The company intends to furnish special cars and pay the carrying company for services rendered on a mileage basis. A large saving is expected to be realized over the method of wagon delivery.

The initial trip over the Toledo & Monroe Ry. was made on April 4th. A car containing the officials of the road, the engineers of the J. G. White Co. and a few invited guests left Monroe at 2:30 o'clock and returned from Toledo at 6:30. The roadbed is in excellent condition and for stretches fast time was made, particularly on the return trip, when a speed of 45 miles per hour was reported.

The Mauch Chunk, Lehighton & Slatington Ry., which has now four miles of track and operates six cars will add 35 miles of track this spring. The officers of the company are: President, J. A. Swaigard, Philadelphia; secretary, T. Durham, Philadelphia; treasurer, W. H. Bartlett, Atlantic City, N. J.; superintendent, J. A. Bonnell, Mauch Chunk. The general offices are 713 Reading Terminal, Philadelphia.

Mr. B. G. Hudnut, of Terre Haute, who is president of the Vincennes (Ind.) Citizens' Street Railway Co. has petitioned the commissioners of Knox County for franchises over the highways and proposes to build a system of electric railways radiating from Vincennes and connecting the towns of Monroe City, Wheatland, Decker, Bruceville, Bicknell, Edwardsport, Westphalia, Sandborn, Freelandville, Emison, Gebner and Oaktown.

The Cleveland Electric Railway Co. and the Cleveland City Railway Co. together paid the city of Cleveland, O., \$7,580 in car licenses, the fee being \$10 per car. Of this sum, \$5,080 was paid by the former company, being an increase of \$310 over last year. The latter company paid a license fee of \$2,500, an increase of only \$10 over last year. A number of new cars have been added this year, which were offset by the abandonment of its cable cars.

The Birmingham (Ala.) Railway, Light & Power Co., among other important improvements of the year, has completed a branch line to Owenton, and an extension on Cottonwood Ave. The company now operates more than 100 miles of street railways, and employs 500 men. Thirty-six cars were recently added to the rolling stock, making a total of 164 cars. In connection with its extensive park system the company runs two or three summer theaters of the first class.

At a recent meeting of the stockholders of the Youngstown Sharon Electric Railway & Lighting Company, 21 directors were chosen and these selected the following officers, all of New York: President, A. M. Hyatt; vice-president and chairman of the board of directors, N. W. Whipple; secretary, Leighton Calkins; treasurer, O. W. Bright. This company, through the Penhale syndicate, recently purchased all the lighting plants in Youngstown and Sharon, O., and Sharpville, Pa., and is building an electric line from Youngstown to Sharon.

## ECHOES FROM THE TRADE

THE JACKSON & SHARP CO., Wilmington, Del., is filling a large order for summer cars to be used on the People's Ry., Wilmington.

THE TENNISS CONSTRUCTION CO., of Philadelphia, will shortly commence the construction of the Louisville (Ky.) Anchorage & Peuee Valley Ry.

THE RAIL ORDER received by the Lorain Steel Co. from the Boston Elevated Ry. was for 25,000 tons instead of 2,500 tons, as was stated in our March issue.

THE SWEDISH GOVERNMENT has just ordered from the Burt Manufacturing Co., of Akron, O., eight special "Cross" oil filters for use on torpedo boats.

THE NATIONAL ASSOCIATION OF MANUFACTURES has removed its headquarters to the Real Estate Trust Building, Broad and Chestnut Sts., Philadelphia, Pa.

THE MAYER & ENGLUND CO., of Philadelphia, has just closed contract with the Consolidated Traction Co., of Pittsburgh, for 250 latest pattern of International registers.

THE LORAIN STEEL CO. has been awarded the contract for 3,000 tons of straight rails, 150 tons of curved rails and 150 tons of fish plates by the city of Glasgow; the material is for the city's electric railway extensions.

THE BETHLEHEM STEEL CO. will on May 1st remove its Chicago offices to Nos. 1520 and 1521 Marquette Bldg., the change being made to secure more room. Mr. E. Nelson will represent the company as sales agent as heretofore.

THE B. F. STURTEVANT CO., of Boston, Mass., has issued an illustrated catalog of the Sturtevant disk and propeller fans which are types in which the resistances are slight and the velocities low. Where the conditions permit these fans can be used with excellent efficiency.

THE STERLING-MEAKER CO., of New York, reports many orders on hand for sterling brakes, over 70 roads in the United States having ordered equipments during the past 18 months. The brake is one of the most powerful on the market, and its comparative low cost and well-known "safety" feature make it a very desirable appliance.

THE KINNEAR MANUFACTURING CO., of Columbus, O., reports a very extensive business in steel rolling doors and shutters for railway buildings. These doors which are made of any size desired are becoming standard for car barns throughout the country. This company is also doing a large foreign business in all parts of the world.

THE HEYWOOD BROTHERS & WAKEFIELD CO., OF WAKEFIELD, MASS., sends us the following letter describing the various lines of goods it handles: "We make complete rattan seats, and backs for side (or longitudinal) seating, and also complete seats of the cross or reversible type. We also sell rattan for sweeper use, and most of that used for this purpose is imported by us. We likewise make and sell in any width the close woven rattan for covering new seats or for repairs, as the case may be. This article is generally termed 'Rattan Car Seat Webbing,' of which we are the sole manufacturers in this country, with one trifling exception."

THE BARNEY & SMITH CO., of Dayton, O., was awarded a contract last month for 20 cars to be used on the Columbus, Lon-

don & Springfield, and the Columbus, Buckeye Lake & Newark railways. These roads are being built by the same syndicate that owns and operates the Dayton, Springfield & Urbana Electric Ry., and the work of construction is progressing rapidly on both roads.

KOHLER BROTHERS have closed contracts for grading, track laying and overhead work with the Rockford (Ill.) & Belvidere Railway Co., which is building a 14-mile line, and to rebuild and equip the Paris, Tex., road, including power house machinery.

THE JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J., is distributing a card calling attention to the Dixon silica-graphite paint which is particularly adapted to places exposed to rain, snow, heat and dust. A large order of this paint was recently supplied for painting the roof of the Wanamaker store in New York City which has an area of 57,000 sq. ft. This paint is made in but one grade, of which there are four colors.

THE BEVERLY ENGINE & MACHINE CO., of Beverly, Mass., is shipping its ratchet brake handles to Switzerland, Germany, England, Canada and various parts of the United States. This handle is made of the best materials; the clutches are steel and machine cut. The company is also making a vertical wheel with ratchet clutch for use on vestibuled cars. The wheel takes up but 10 in. of space on the platform and with it a leverage may be obtained, equal to a 15-in. handle.

THE FOREST CITY ELECTRIC CO., of Cleveland, has purchased from the Van Wagoner & Williams Hardware Co., the latter's commutator bar business, including dies, finished bars, and good will. This plant added to the previous equipment of the Forest City company will enable it to make a complete line of standard street railway motor bars as well as many bars of special types. This company is now one of the foremost in the manufacture of drop forged and cast commutator bars.

THE GARTON-DANIELS ELECTRIC CO., of Keokuk, Ia., has published a small pamphlet in regard to the Garton lightning arresters entitled "About a Street Railway Company," giving the experience of a Chicago street railway company with Garton arresters since its introduction to them in 1896. The railway company commenced with a small sample order, and the number was gradually increased until it has 600 cars now equipped with them and over 1,000 in all of the different types of Garton arresters in use.

M'GILL, PORTER & BERG, of No. 309 Dearborn St., Chicago, report having taken some very nice contracts recently for the specialties and supplies, which they handle. This firm represents some of the largest and most prominent manufacturers in the country of electrical supplies, and their specialties are being recognized as standard wherever used. Electric street railway companies may be assured of prompt shipments when ordering such articles as Ohio Brass Co's. overhead material, I-T-E circuit breakers, Speer carbon brushes, "Monarch" insulating paint, Ham sand boxes, Morris rail bonds and a complete line of trolley supplies.

THE BABCOCK & WILCOX CO., 29 Cortlandt St., New York, has closed a large number of contracts for boilers, recently. Among the sales reported for last month are 1,000 h. p. to the Atlantic Coast Electric R. R., Deal Beach, N. J.; 2,500 h. p. to the Independent Electric Light & Power Co., San Francisco; 500 h. p. to the Everett Railway & Electric Co., Everett, Wash.; 3,000 h. p. to the Powellton Electric Light Co., Philadelphia; 1,500 h. p. to the Buffalo Railway Co., Buffalo, N. Y.; 800 h. p. to the Commonwealth Electric Co., Chicago; 500 h. p. to the Quincy Electric Light

& Power Co., Quincy, Mass.; 1,000 h. p. to the Worcester & Southbridge Railway Co., Worcester, Mass.; 400 h. p. to the Memphis Street Railway Co., Memphis, Tenn.; 7,500 h. p. to the Rhode Island Suburban Railway Co., Providence, R. I.

THE INTERNATIONAL CONSTRUCTION CO., Detroit, Mich., has presented each of its patrons with a street car. The car is of cardboard nearly two feet long, and each of its 12 windows is inscribed with a calendar page.

THE GOHEEN MANUFACTURING CO., of Canton, O., publishes a catalog of testimonials in regard to its protective paint, known as carbonizing coating, which is made specially for the protection of iron and steel under conditions where ordinary structural paints fail to give lasting results. The pamphlet shows a large number of metal buildings and other structures upon which the paint has been found very satisfactory. It is also highly endorsed by testimonials from the company's customers.

H. M. SHAW & CO., 115 Broadway, New York, have closed a contract for 34 car loads of electric construction material, including galvanized cross arm braces, bolts, washers, pole steps, shovels, wooden cross arms, locust pins and pole paint; also a contract for 5 miles of Medbery street railway overhead material. The company has increased its office room and force, and intends to break ground about May 15th for a new factory building at Ampere, N. J.

THE ST. LOUIS CAR CO. now has on hand a large number of orders for electric cars, among which are: 5 open cars, to be mounted on Peckham trucks, for the Jackson & Ann Arbor Interurban, of Jackson, Mich.; 15 open 12-bench cars for the Columbus (O.) Railway Co.; 10 open 12-bench cars for the Scranton (Pa.) Street Ry.; 38 40-ft. combination cars for the San Francisco & San Mateo Electric Ry.; 35 open 12-bench cars for the Lynn & Boston R. R.; and an order of 34-ft. closed cars mounted on No. 23 St. Louis trucks for the Lehigh Valley Traction Co., Allentown, Pa. The company is now shipping 45 elevated cars to the Boston Elevated Ry.

THE SIEGRIST SYSTEM of automatic lubrication has been specified for the new electric light plant of the Anhaeuser-Busch Brewing Association, St. Louis, and for the power station of the Memphis (Tenn.) Light & Power Co. On account of its increasing business, the Siegrist Lubricator Co. has purchased the property at the northeast corner of Second and Vine Sts., with a frontage of 44½ ft. on the east side of Second St., a depth of 138 ft. on the north line of Vine St. and a frontage on the west line of the alley of 63 ft. A four-story brick structure to cover the entire lot is to be erected, and will be used as a factory for the manufacture of its lubricators.

THE WHEEL TRUING BRAKE SHOE CO., of Detroit, Mich., has recently shipped to the Boston Elevated Ry., Boston, Mass., 100 pairs of brake shoes; the Milwaukee Electric Ry., Milwaukee, Wis., 50 pairs; the Market Street Ry., San Francisco, Cal., 50 pairs, besides large orders to the Old Colony Street Ry., Brockton, Mass., the Cincinnati Street Ry., Cincinnati, O., and the Springfield Street Ry., Springfield, Mass. Messrs. Griffin and Brinkerhoff, owners of the Canadian patent on this brake shoe are supplying the Canadian trade from Windsor, Ontario, and report that the device is meeting with favor in Canada. Both of these gentlemen are connected with the Detroit company.

THE FILER & STOWELL CO., of Milwaukee, reports the sale of three large engines through its Chicago agent, Mr. Frank Engelhardt. One of these is a 32 and 64 x 60 in. cross compound condensing engine of the Detroit United Ry. which is to be direct connected to a 1,500-kw. railway generator. The engine is to be built in accordance to specifications of Mr. Thomas Farmer, superintendent of motive power of the railway. The second engine is an 800-h. p. cross compound for the Mishawaka Woolen Manufacturing Co., Mishawaka, Ind., and the third a 700-h. p. cross compound for the Anglo-American Provision Co., Chicago, being the second order from this company. The 700 h. p. engine is to run at 125 r.

p. m., the Filer & Stowell Co. having had wonderful success in operating its corliss type valve and valve gear at this speed.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has recently closed several large contracts for storage batteries among which is one for the United Electric Light & Power Co., of Baltimore, Md., consisting of a battery of 132 elements with a capacity of 1,200 ampere-hours, and with tanks allowing an ultimate increase to 2,100 ampere-hours. It will be used 5,000 ft. from the power station. Another order is for the Hamilton, Grimsby & Beamsville Electric Railway Co. for a battery to be used 10½ mi. from the power house. The battery consists of 229 cells, with tank capacity for a 50 per cent increase, and gives a discharge of 160 amperes used to maintain the voltage on the trolley line. The estate of Henry Villard is also to be supplied with a storage battery, to be used for residence lighting, which has a normal rating of 280 ampere-hours.

THE AMERICAN STREET RAILWAY PAVING & IMPROVEMENT CO., of Springfield, Mass., has closed a contract with the Hartford (Conn.) Street Railway Co. to furnish Buckland paving blocks for all the girder rails the company has in its tracks. The city council recently passed an ordinance requiring grooved rails and the Buckland paving block being endorsed as a substitute; the work of laying it has been commenced. The block being furnished is not exactly like the one used in Springfield, which has been illustrated in the "Review," and the maker is prepared to furnish blocks suitable for any size or shape of train head rails. The American Railway Paving & Improvement Co. has also contracts with the Jersey City, Hoboken & Paterson Street Railway Co. for blocks to be used in the two latter towns and is about to close some other large orders.

THE W. R. GARTON CO., after May 1st will occupy its new quarters at No. 118-132 Jackson Boulevard, West; the move is made on the company's third anniversary and was necessary in order to accommodate its rapidly growing trade. The Garton company acts as manufacturer's agent and as engineer serving its patrons with supplies and advice, and is acting as engineer for some of its largest customers. In the new quarters the company will carry large stocks of all classes of railway material, being the representative of some of the oldest and most reputable makers in the country. The company has recently taken the agency for the U. S. Projectile Co.'s gears and pinions, which have a fine reputation, and for the Bernstein Electric Manufacturing Co.'s "Lowatt" lamp. It is claimed that the "Lowatt" requires but one-fourth the energy per candle power of other lamps on the market; it is well adapted for desk and ceiling lights.

The individual strap holders in use on the Rochester (N. Y.) Ry. and described in our issue for March, page 162, are made of brass and not of malleable iron as stated.

Two of the largest exhaust heads in the country, one 30-in. and one 36-in., were recently installed by the Edison Electric Illuminating Co. of Boston, Mass., in its new station. They are of the Sturtevant centrifugal type, built by the B. F. Sturtevant Co.

Fourteen gripmen and conductors on the Metropolitan lines in Kansas City has been fined \$5 each for violating city ordinance which makes it a misdemeanor for anyone to take a car across an intervening track without having first been signaled by a flagman. All the cases were appealed.

#### CHEAP RATES TO CALIFORNIA.

Each Tuesday until and including April 30th, Special Low Rate Colonist Tickets will be sold via the Southern Pacific Company's Ogden and Sunset Routes to all points in California.

The rate will be: From Chicago \$30.00, from St. Louis, Memphis and New Orleans \$27.50, from Omaha, Kansas City, etc., \$25.00. Corresponding low rates from all other points east and north.

For particulars and detailed information pertaining to the Southern Pacific Company's Routes, and these special rates to California, call upon or address W. G. Neimyer, General Western Agent, Southern Pacific Co., 238 Clark St., Chicago.



## SARGENT CO'S. TROPENAS STEEL.

The Sargent Co., of Chicago, has for some time been manufacturing small steel castings by what is known as the Tropenas process. The advantage claimed for this method is that the metal produced is much purer and consequently much more fluid than that produced by any other process. This makes it valuable in the manufacture of small and intricate castings and the metal can be poured in a very thin stream and will run into small sections without producing blow holes or cracks. The grade of metal may be varied by the addition of ferro manganese and ferro silicon so as to obtain either a low carbon steel of



RAILROAD SHOP WRENCHES—TROPENAS STEEL.

maximum permeability for electrical castings of special grades of hard steel for other purposed. The accompanying illustrations show some of the tools for which certain grades of Tropenas steel is specially adapted. It is said to be equal to forgings or drop forgings for small tools, and is used for all kinds of wrenches, machinists' and blacksmiths' hammers, etc. It is used either rough or finished, and is considerably cheaper than forgings for tools. These castings may be made either as hard or as soft as desired.

An order has been issued from the Post Office Department directing the electric car mail service furnished by the United Railways & Electric Co., of Baltimore, Md., to be restored.

A trolley express line is to be established between Camden, N. J., and Merchantville, and the Camden & Suburban road has received eight new cars to be used for this purpose as soon as the extension of the road to Moorestown is completed, which will be about May 15th.

The abandonment of the Maryland & Columbia Electric Railway scheme, which was published in the "Review" of March, 1897, page 154, has concluded with the sale of all the lumber in the newly completed power house at Ilchester to an Ellicott City contractor. Nearly a quarter of a million dollars was expended on this structure, which is almost a total loss.

## NEWS NOTES.

**PITTSBURG, PA.**—The Crawford County Street Railway Co. and the Eastern Crawford County Street Railway Co. have been incorporated to build a total of 29 miles of electric railways, connecting Meadville, Towson, and Titusville. A direct route from Franklin to Oil City and Erie will eventually be opened. Stephen Newburn and David Morrison, of Allegheny, are interested.

**TOLEDO, O.**—The Toledo & Chicago Railroad Co. was incorporated March 15th with a capital stock of \$500,000, by B. C. Winston, of New York, and F. J. Reynolds, George H. Beckwith and C. H. Newton, of Toledo. A 65-mile electric line to connect Montpelier and Toledo is projected.

**CINCINNATI, O.**—The Cincinnati & Columbus Traction Co., of Cincinnati has been incorporated by Henry Burkhold, F. O. Squire, W. C. Swing and A. J. Becht. A line to connect the cities named in the title, passing through Hamilton, Clermont, Brown, Highland, Fayette, Ross, Pickaway and Franklin Counties is projected.

**HARTFORD, CONN.**—The Modus & Marlborough Transportation Co. has applied for a charter, and proposes building an electric line from Modus, through Haddam, East Haddam, Chatham, Marlborough and Colchester.

**ITHACA, N. Y.**—The Ithaca & Burdett Railway Co. has been incorporated to build a 30-mile interurban electric line between the cities named in the title. Charles L. Hathaway, Marcus M. Cass and Norman C. Crofut, of Ithaca, are directors of the company.

**BRIDGEPORT, O.**—The Wheeling & Western Railway Co., of Bridgeport, has been incorporated by A. A. McCaslin, W. H. Joplin and D. J. Jaeger to build an electric line from Bridgeport to St. Clairsville.

**KANSAS CITY, MO.**—The Independent Electric Railway Co., of Kansas City, has been incorporated by A. M. Hayes, J. W. Crowley and Sidney Moore, who propose to build a short electric line in Kansas City.

**ZANESVILLE, O.**—The Zanesville Belt & Terminal Railway Co. has been incorporated by Charles Andrews, T. F. Spangler and W. M. Shinnick, with a capital stock of \$400,000. Either a steam or electric belt line will be built in Zanesville when the necessary franchises shall have been obtained.

**CARO, MICH.**—The Caro & Lake Huron Electric Railroad Co., capitalized at \$300,000, has been incorporated and is being promoted by local capitalists.

**JANESVILLE, WIS.**—The Janesville, Beloit & Delavan Lake Railway Co. has filed articles of incorporation, and proposes to build an electric line between Janesville and Rockford, via Beloit, with a branch from Beloit to Delavan Lake. Ultimately, the line will be extended to Madison. The company has a present capitalization of \$100,000. H. H. Clough, of Elyria, O., is principally interested.

**BRUNSWICK, ME.**—Application has been made for the incorporation of the Harpswell & Brunswick Electric Railroad Co. with a capital of \$100,000. The proposed line will be 15 miles long, connecting the towns named in the title. The directors are: James O. Brabury, of Sacco; Charles B. Harmon, of Biddeford; Herbert J. Jordan and Benjamin Thompson, of Portland.

**CHARLESTON, S. C.**—The Charleston, Suburban & Summerville Railway Co. has been chartered with a capital stock of \$600,000 to build a 28-mile standard gage electric railway connecting Charleston and Summerville. The capital stock will later be increased to \$1,000,000. The incorporators are: J. J. O'Connell, B. P. Evans, J. W. Simons and Jonathan Lucas, all of Charleston.

**ALBANY, N. Y.**—The Richmond Beach Railway Co. has filed articles of incorporation at Albany with a present capitalization of \$20,000, and proposes to operate an electric or steam railway from Arbutus Lake to the tracks of the Staten Island Rapid Transit R. R. The board of directors comprises: William E. Rockwell, John Eliot Bowles, M. J. Wightman, Russell S. Foot and Frank Coenen, of New York City; Everett L. Brown, of Perth Amboy, and Charles Johnson, of Seaside, S. I.

**LYONS, N. Y.**—The Lyons & Sodus Bay Railway Co. has been incorporated with a capital stock of \$400,000 to build a 16-mile electric line from Lyons to Sodus Point. The proposed road will parallel the Northern Central R. R. Daniel B. Platt, I. M. Ludington and Stephen G. Hollister, of Rochester; S. W. Case, of Sodus, and Daniel Barton, of Lyons, are directors.

**GIRARD, O.**—The Girard & Lowellville Belt Line Co. and the Girard, Thornhill & Hazelton Belt Line Co. have applied for charters. The incorporators of both are: Gen. T. W. Sanderson, L. E. Cochran, Henry K. Wick, J. Craig Smith, Robert Bentley and Hugh B. Wick, of Youngstown, and C. S. French, of Mansfield. A double track electric railway connecting Girard and Lowellville, Thornville and Hazelton is projected, and surveys for the line are being made. The two companies will eventually be consolidated and the belt line may be leased to the Richland & Mahoning R. R.

**WAUSAU, WIS.**—The Wisconsin River Valley Electric Railway Co. has been incorporated by Thomas F. Frawley, C. T. Bundy and Roy P. Wilcox, of Eau Claire, who propose to build an electric line from Wausau to Merrill to be eventually extended south to Nekoosa and north to Eagle River.

**PINE BLUFF, ARK.**—The Citizens' Light & Transit Co., capitalized at \$200,000 has been incorporated and proposes to build an extensive electric railway system through Pine Bluff and suburbs. J. B. York, William Galbraith and William Burke, are principally interested.

**DOVER, N. H.**—The Dover, Concord & Rochester Street Railway Co. was incorporated March 12th by the New Hampshire legislature.

**SCOTIA, N. Y.**—The Scotia Traction Co. has been organized by G. W. Lynch and William H. Delaney, of New York, and H. W. Mynderse, of Schenectady, to build an electric road from Scotia to Schenectady. The Scotia company will be incorporated with a capital of \$30,000, which may later be increased.

**FOSTORIA, O.**—The Ohio Northwestern Railway Co., of Fostoria, has been incorporated by William D. Clark, J. M. Peavey, Levi Harbaugh and John A. and H. E. Bradner, to build an electric line from Fostoria to Mungen. The line will pass through Seneca, Hancock and Wood counties.



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NO. 5

The "Street Railway Review" for June, which will appear on its regular publication date, the 15th, will be a special number in honor of the Pan-American Exposition. This issue will be a souvenir edition, printed upon coated paper and handsomely illustrated, and in every respect fully conforming to the high standard which the "Review" has set in its former special numbers. The exposition, which will be officially opened May 20th, is expected to far surpass, particularly in all that pertains to electricity, all former international fairs, and therefore cannot fail to be of the liveliest interest to our readers, and it is the intention of the "Review" to present the electrical and transportation features coming within its field in a manner commensurate with their importance.

The Pan-American Exposition is held under very favorable conditions as to time and place. The date originally fixed was 1899, but early in 1898 the threatening aspect of the Cuban situation led to a postponement, which, though a cause of regret at that time, is a circumstance upon which the management is to be heartily congratulated. When the plans for this exposition were conceived the country was just recovering from the financial depression consequent upon the panic of 1893, and none could have foretold the era of prosperity which we are now enjoying. The business situation is far more favorable for the success of the enterprise than was the case with the World's Fair at Chicago. The location at Buffalo, within the effective radius, so to speak, of the great electric installations at Niagara Falls is very appropriate for an exposition in which electricity will have so prominent a place. The city also is the center of an immense electric railway system, which in itself is an attraction for street railway men.

For some time there have been articles appearing in our foreign contemporaries which indicated that with the development abroad of really efficient systems of urban transportation the public were becoming dissatisfied with the municipal regulations limiting the number of passengers on street cars to the number of seats and a

few prescribed standing places on the platforms. It was quite apparent that it was physically impossible to provide enough cars to carry all the would-be patrons during rush hours, unless the much-abused American plan of permitting passengers to stand were adopted. In Paris the practice has long been to strictly limit the number of passengers allowed on an omnibus or car, but the advent of the Metropolitan road has brought about a change. According to Paris dispatches a gentleman attempting to board an already crowded car was prevented from doing so by the conductor, and appealed to the court, which decided in favor of the passenger.

The adoption by the Kansas City street railway of gold stars, one for each five years, to be worn on the collars of its employees' uniform coats as badges of faithful service, again calls attention to the great diversity in such badges adopted by street railway companies in different cities. The service badge is intended for the information of the passengers, and its effect will be greatest when all passengers know its meaning. In the larger cities the proportion of non-resident patrons of the street railways is a very considerable one, and we think it would be well worth while, for the benefit of visitors, to seek uniformity in such decorations. A committee appointed by the A. S. R. A. could easily recommend a system that we believe would be widely adopted.

Immediately upon the conclusion of the Spanish war many investors turned their eyes to Cuba, it being recognized as a particularly attractive field for electric railways. The policy of our government has been such as to discourage American investors, while at the same time having but little effect on the plans of capitalists of other nationalities. English, German and other companies are carrying out plans for public improvements in Cuba and are quite confident that arrangements satisfactory to them will be made as soon as the "stable government" which we guarantee is established. Perhaps this is due to the belief that their own governments would interfere to prevent inequitable action, while the Americans cannot tell what course Congress will pursue.

The reports from Cuba concerning the progress made by Sir William Van Horne in carrying out his railway enterprises on the island are very interesting. The general franchise law being suspended, Sir William has proceeded under an old law permitting the owner of land to build such railways as he sees fit, and has purchased whole farms contiguous to each other along the routes of the proposed lines. The Cuban municipalities have authority to grant rights over their streets, and have been very ready to do so, in some cases voting a bonus. The only obstacle presented is in the crossing of highways between plantations, these being under the control of the United States War Department as military roads.

One of the interesting questions to be considered by the Accountants' Association at its convention in October is that of the adoption of the car-hour unit as the standard for comparing street railway properties. The subject was first considered at the Chicago convention in 1899 when Mr. H. C. Mackay presented a paper before the association. Last year at Kansas City a committee, of which Mr. Mackay was chairman, submitted a report in which the adoption of the car-hour unit was warmly urged. As brought out in the discussion of this report the car-hour offers a ready means of comparing the earning capacity of the different lines of companies operating both urban and interurban divisions, while it is quite as suitable as the car-mile for companies which maintain practically the same speed on all lines.

The principal expense of operation, the wages of car men, is based on the hour, and the cost of power is more nearly constant for an hour than for a mile when suburban and city lines are compared because the larger number of stops on the latter compensate for the higher speed on the former. The point in greatest controversy in comparing the car-hour and the car-mile is in regard to how a trail car shall be treated.

The association last year recommended that the car-hour unit be given a practical test by all companies that are members of the Accountants' Association and we understand that the committee having the matter in charge has already collected considerable



data, which give promise of enabling it to submit a strong report in October.

We note that a suit has been begun in Michigan with the object of securing an adjudication on the right of the railroad commissioner of that state to supervise the crossings of electric railways and steam roads and determine whether they may be made at grade. Presumably the suit is an attempt to overthrow the authority now being exercised by the commissioner, and the plaintiff believes that a decision in his favor would be an advantage to the electric railways. We believe that it is only a question of time until existing grade crossings will be abolished and that it is for the best interests of all parties concerned that no new ones should be built, save in rare cases. The increased cost of making the crossings underground or overhead may seem a hardship to the promoters of a new road, but it will be found cheaper to build the crossing properly in the beginning than to make the change afterwards.

High speeds are now the rule, and the time is not far distant when it will be found a serious annoyance for cars on electric interurban lines to stop and wait at railroad crossings while an employe goes forward to see that the track is clear or to manipulate derailing switches. If interlocking signals and men to operate them be substituted, which is the alternative, the wages of the men becomes a serious burden.

The steam roads are adverse to crossings at grade and in a number of instances that have recently come to our knowledge the steam railroad has been glad to share the cost of building viaducts or subways, even where the law required the electric road as the junior company to bear all the expense of installing and maintaining interlocking signals and watchmen. As one manager said: "If we let you cross at grade, it is only a question of time until there is an accident that may cost each of us more than it will to build the subway and be on the safe side."

A few months ago the Indiana law requiring interlocked signals at grade crossings was held by a circuit court to be unconstitutional on the most trifling sort of a quibble. This is, however, not a court of last resort, and the step backwards thus indicated has not yet been taken.

The definition of what constitutes a "street railway" is steadily undergoing modification to bring the meaning of the term into agreement with the intent of recent legislation. In Booth on Street Railways, published in 1893, the three elements of the definition were, that the street railway is constructed in a street (either on, below, or above the surface), that it is a common carrier of passengers, and that it is for the convenience and accommodation of the people living upon and near such highways. The litigation prior to 1893 had settled the fact that the motive power used did not fix the status of a company as a "railroad" or a "street railway."

The gradual expansion of urban street railway systems by extending their lines beyond city limits, and the more recent development of interurban roads made possible new uses for the street railway, and the element of the definition confining it to a "common carrier of passengers" exclusively has had to give way in many jurisdictions, the courts holding that the carriage of express and freight were not additional burdens on the highways and were proper "accommodation of the people living upon and near such highways." Engineering difficulties, or the advantages in the way of lower maintenance charges and increased safety of operation offered by removing interurban lines from the highways have led to more or less departure from the principal that a street railway is first of all constructed in a street.

In the case of the State against the Dayton Traction Co., decided March last, the Supreme Court of Ohio said in effect that in Ohio the only limitation on the construction and operation of street railways is that they shall be consistent with the former and ordinary use of the highway.

One great advantage that the electric interurban railway has over its steam competitors lies in the fact that the street railway systems of the towns it connects afford it convenient terminal facilities; its cars can be run to all points in the city to suit the need or convenience of its patrons. It cannot be presumed that

the interurban lines will abandon the terminals thus available, and hence it is highly probable that the term street railway will continue to be used as a general designation of both urban and interurban lines. Further development may lead to the conception of a street railway as a common carrier operating over a railway that is sometimes constructed in streets.

The committee chosen by the American Street Railway Association to report upon the subject of "Standardizing Street Railway Equipment" has set about its work in a manner which indicates that its report will be one of the most comprehensive and valuable papers ever presented before the association. It is the intention to work in conjunction with the leading manufacturers and thus insure that the recommendations shall be thoroughly practicable from a commercial standpoint.

In the editorial columns of the "Review" for February and March, 1900, there was some discussion of the sad state of affairs that confronted the managers of the consolidated street railway properties because of the great diversity of equipments. Perhaps the master mechanic and the store-keeper best appreciate the disadvantages of the lack of uniformity in cars, motors, and the multitude of car fittings which must be kept in stock. It is not to be expected that the committee in its first report can recommend an entire set of standards but a great deal can be done.

The subject of standardizing is not necessarily confined to the sizes of the numerous mechanical and electrical fixtures on the cars themselves, but could be profitably extended to all or at least a greater part of the electrical equipment of street railway power houses. Take for example the question of standard sizes and capacities of engines and generators. While no actual standard outputs are recognized as such, there has been a tendency among both engine and dynamo makers to adopt a regular sequence of sizes for these machines which do not differ materially between the different makers. The question of speeds might profitably be standardized for both engines and dynamos, especially those of the larger sizes commonly used in street railway work. The practice of building armatures directly upon the engine shafts which is now so common is sufficient reason for adopting a standard speed for both engines and generators of any definite capacity, and such a practice would avoid either a special winding to accommodate the engine speed or a change in the engine to accommodate the requirements of the generator. The types of generators might also easily be standardized. There is considerable similarity now between the products of different makers and but little change would be required to build different makes of machines of a similar number of poles for any definite output. These and many other station appliances, if standardized, would save both money and labor in making extensions and repairs and would enable the product of any manufacturer to be used with that of any other maker without recourse to special designs.

Years ago recognition of the fact that competition is not compatible with the economical operation of urban street railways led the stockholders of such corporations to consolidate the various properties, with results that were very satisfactory to the stockholders and at the same time beneficial to patrons of the consolidated company. More recently, particularly within the last three years, there have been a great many railway consolidations effected where there was no fear of injurious competition; the objects were to reduce operating expenses by centralizing the administration, to extend over a larger area and create new business by serving the larger field in a better manner than a small system could afford to do, and to form corporations of such magnitude and stability that their securities would be attractive to a wider circle of investors. One of the largest of these consolidated electric railway properties is that of the Massachusetts Electric Companies whose system is described in this issue. It only requires a glance at the diagram showing the organization of the operating departments, for one to appreciate that the administration must be vastly more efficient and economical that it could be with the same mileage operated by thirty or more separate companies.

The unprecedented demand for high class investment securities will probably have even more to do in encouraging further consolidations than will the evident possibility of reducing expenses.



## Street Railway System of the Massachusetts Electric Companies.

By the purchase, at various times during the past two years, of a controlling interest in the stock issues of some 33 separate and distinct street railway properties, comprising—if the system of the Boston Elevated Railway Co. be excepted—practically the entire street railway mileage lying along the shore country of Eastern Massachusetts for a distance of 50 miles inland from the coast, there has been brought to partial consummation plans, that by reason of their magnitude and scope, must be given rank among the great financial operations of the day. The term "partial consummation" is used advisedly, for the purchase of these properties is but a step in the movement that is now well under way, and which when fully carried to completion will bring under one operative head, 780 miles of electric railway tracks—a mileage greater than that controlled by any other one company in this country.

Ownership, either partial or entire, in the several companies controlled, is vested in an organization called the "Massachusetts Electric Companies," which has no corporate existence and is in reality but a voluntary association of owners of stock, formed for the purpose of bringing about a mutual improvement and betterment in their properties. The "Massachusetts Electric Companies" is not an operating organization and issues no capital stock or bonds of its own, within the true meaning of the words. Its controlling head is a board of 15 trustees, five of whom are elected for three years, five for two years, and five for one year. The street railway corporations in which the association owns shares issue no stock or bonds and effect no consolidations except under the supervision of the Board of Railroad Commissioners and upon an exhibit of corporate property and a sworn statement of corporate financial conditions. Under the terms of a trust agreement the association issues what are known as trustee certificates, which are divided into two classes, preferred and common. At the present time there have been issued preferred shares to the amount of \$15,057,400, and common shares to the amount of \$13,718,100, par value. The Companies have authorized an issue of 4½ per cent coupon notes to the amount of \$3,500,000, of which \$2,700,000 have been actually issued. These notes are secured by the deposit in escrow of shares of stock in certain of the controlled companies.

	Capital Stock
Beverly & Danvers.....	\$12,000.00
Brintree.....	100,000.00
Brockton.....	700,000.00
Brockton, Bridgewater & Taunton.....	225,000.00
Brockton & East Bridgewater.....	50,000.00
Boston, Milton & Brockton.....	80,000.00
Dighton, Somerset & Swansea.....	175,000.00
Globe.....	700,000.00
Gloucester.....	180,000.00
Gloucester, Essex & Beverly.....	250,000.00
Gloucester & Rockport.....	30,000.00
Lowell, Lawrence & Haverhill.....	1,520,000.00
Lowell & Suburban.....	1,200,000.00
Lynn & Boston.....	1,266,000.00
Mystic Valley.....	90,000.00
Needham & Boston.....	10,000.00
New Bedford.....	325,000.00
New Bedford, Middleborough & Brockton.....	75,000.00
Norfolk (central).....	187,500.00
Norfolk Suburban.....	100,000.00
Providence & Taunton.....	175,000.00
Quincy & Boston.....	500,000.00
Reading & Lowell.....	100,000.00
Rockport.....	100,000.00
Salem & Wakefield.....	75,000.00
South Shore & Boston.....	650,000.00
Taunton.....	350,000.00
Taunton & Brockton.....	100,000.00
Wakefield & Stoneham.....	150,000.00
West Roxbury & Roslindale.....	200,000.00
Woburn & Reading.....	60,000.00

It is not necessary for the purpose of this article to give a lengthy historical review of when and how the several properties were acquired, and it is sufficient to say that the trustees of the Massachusetts Electric Companies now hold all or a controlling interest in the foregoing Massachusetts street railway companies, a number of which, however, no longer have a corporate organization, having been merged into other companies.

There are also controlled one electric lighting company, a park company, and the Newport & Fall River Street Railway Co. (which is a Rhode Island corporation).

Territorially, the 780 miles of track are divided into two nearly equal divisions, as will be seen by reference to the map. One, comprising 415 miles of track, lies to the north of Boston, and reaches to, and for a short distance into the state of New Hampshire. The other, comprising 375 miles of track, lies to the south of Boston, reaches to, and for a short distance into the state of Rhode Island.

In many respects the section covered is perhaps the best street railway territory to be found in the world. The tracks lie in 23 cities and 62 towns, and with very few exceptions the Companies enjoy a monopoly of the street railway transportation business in those cities and towns. The centers of population are closely connected by thickly populated suburban districts, and in many cases merge one into another, making it impossible as far as the distribution of population is concerned, to tell where one city or town ends and another begins.

In addition to the resident population, the many localities and buildings in Eastern Massachusetts, renowned in song, romance and Colonial history, every year attract thousands of tourists and sightseers to the region, and by far the greater part of this special travel is secured by the electric lines. Moreover, there are some 30 parks and pleasure resorts distributed over the system, all of which have become local centers of attraction and draw an enormous travel from nearby towns and cities.

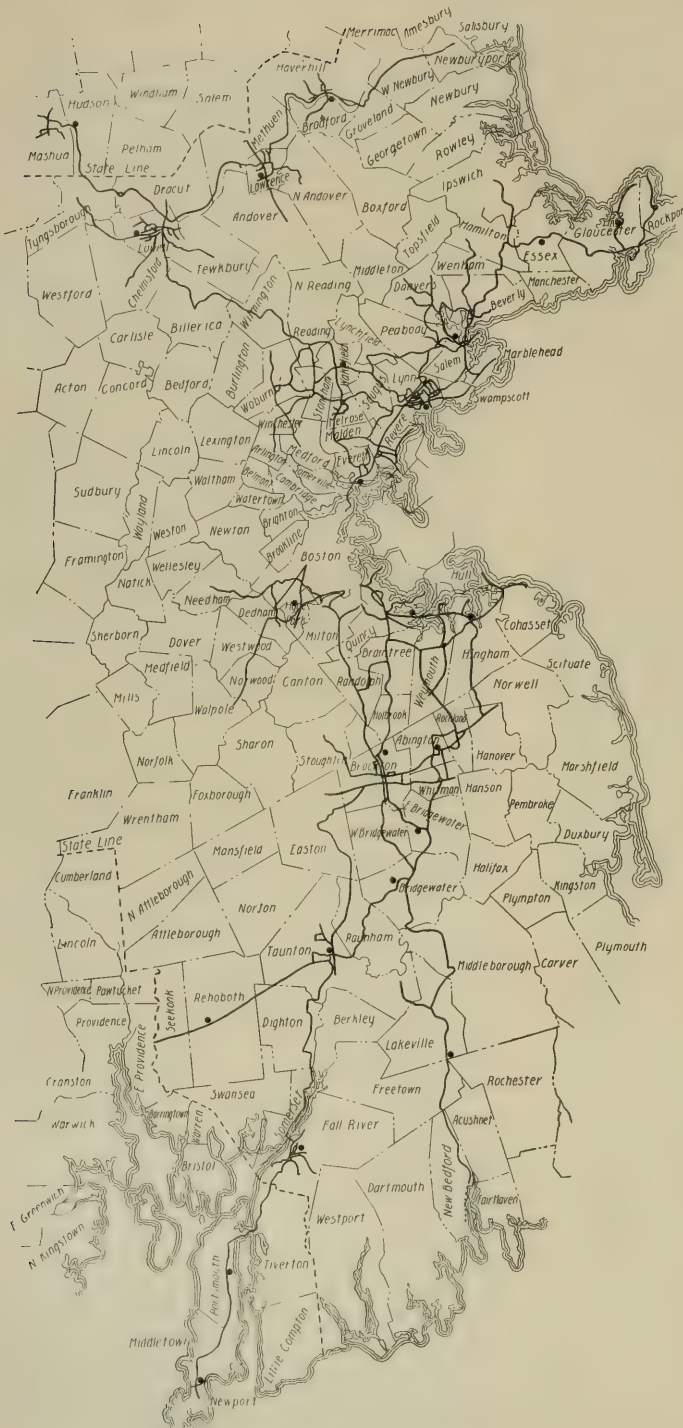
As illustrating the value of the franchises controlled by the Companies and the possibilities that lie before the united system, it may be said that all the cars on the division north of Boston can reach the heart of that city, by virtue of a traffic agreement with the Boston Elevated Railway Co., thus giving a cheap and frequent service between the metropolis and the cities of Lynn, Salem, Gloucester, Woburn, Nashua, Lowell, Lawrence, Haverhill, Newburyport and the tributary territory. The Companies control every street car that accommodates the great summer travel to the north shore of Massachusetts, which stretches for 40 miles from Boston to Rockport and includes the famous state reservation at Revere Beach, which is the summer bathing resort for all that section of country.

The same conditions prevail on the division south of Boston. The Companies transport the crowds that go to Nantasket Beach, which during the past year has been taken over by the state to be developed as the Metropolitan Beach resort south of Boston. The lines give through connection between the cities of Quincy, Brockton, Taunton, Fall River and Newport, and have exclusive control of the street railway business in these cities. Connection is also had with Providence and New Bedford.

As before stated, the Massachusetts Electric Companies is not an operating organization. For purposes of operation the various properties controlled were first, by merger and lease, reduced to three operating companies, the stock issues of which are held by the trustees of the Massachusetts Electric Companies. The three companies were as follows: Lynn & Boston Railroad Co., known as Division No. 1; Lowell, Lawrence & Haverhill Street Railway Co., known as Division No. 2; and the Old Colony Street Railway Co., known as Division No. 3. On May 6th the Lowell, Lawrence & Haverhill Street Railway Co. and the North Woburn Street Railway Co. were consolidated with the Lynn & Boston Railroad Co., and as the Beverly & Danvers Street Ry. had been also consolidated a short time previously, there is now but one operating company north of Boston.

The Lynn & Boston has 390 miles of track and its stock represents what 18 months ago were 14 corporations. The Old Colony Street Ry. controls all the Massachusetts roads south of Boston; it has 382 miles of track and represents what were 17 corporations. There now remains but one company, the Newport & Fall River, a Rhode Island corporation, that is not consolidated with one of the two operating companies; the lines of this company connect with the Old Colony at Fall River, Mass., and its lease to the Old Colony has been authorized by the Legislature of Rhode Island and Massachusetts so that the consolidation will soon be complete.

Nearly all of these consolidations were effected under general



STREET RAILWAYS OF THE MASSACHUSETTS ELECTRIC COMPANIES.

laws and approved by the Board of Railroad Commissioners, special legislation being asked in but a few cases. The present Massachusetts Legislature passed two acts ratifying and confirming all locations ever granted to the Old Colony and the Lynn & Boston, the management considering this necessary in order to enable it to carry out a plan, now under consideration, to refund the outstanding bonds.

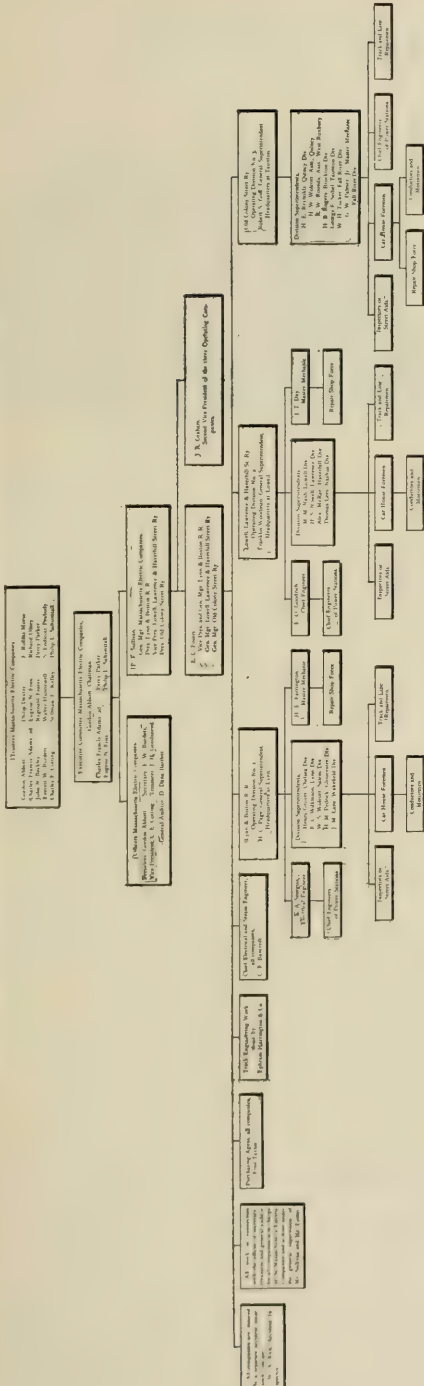
The extended area covered by the combined lines, and the general makeup of the properties themselves, has made difficult in the extreme the task of so organizing the executive and operating force as to secure the most harmonious, efficient and economical action throughout the many departments and ramifications of the system. The way in which the problem was finally solved is shown in the accompanying diagram.

The accompanying diagram shows the organization as it was prior to the consolidation of the Lowell, Lawrence & Haverhill and the Lynn & Boston on May 6, 1901.

From this it will be understood that the organizing has been done partly along territorial, and partly along departmental lines. In other words, that work which would more properly come under what might be termed the executive offices, as the purchasing, accounting and auditing, has, so far as possible, been placed under central departments, and is performed for all the companies by one set of officials at the general offices of the parent company. For directing the mechanical details of operation, however, the system has been divided territorially, and a general superintendent placed over each division. As before stated, there are at present three operating divisions, and therefore three general superintendents. These officials are given almost exclusive authority within their territory. They engage and discharge their subordinates and employees; have general oversight of track, rolling stock and power houses; and all matters pertaining to operation, and not involving special expenditures of money, are left entirely in their hands, with of course the advisory counsel of the executive head at their disposal. On the other hand, they are held strictly accountable for everything in their territory, and it should be added here that this same principle of reckoning is carried throughout the organization. Every man is made directly responsible for results in the proportion that authority is conferred upon him.

Under each general superintendent are division superintendents, and here again the organizing is along territorial lines, the number of division superintendents depending upon the extent of territory to be covered. These division superintendents report to, and act under the direction of their general superintendents, but they are given considerable authority and take general charge of the routine work in all departments of their sub-divisions.

DIAGRAM SHOWING ORGANIZATION OF MASSACHUSETTS ELECTRIC COMPANIES PRIOR TO MAY 6, 1901.



On two of the three main operating divisions, there is a chief engineer, who visits the power stations on his division at frequent intervals and keeps in close touch with the various power station engineers; also a master mechanic who is responsible for the general conditions of rolling stock, and takes charge of the repair shops. These officers report directly to the general superintendents of their divisions, this arrangement enabling each general superintendent to keep in closer touch with the details of the work than would be possible if he tried to rely upon his own observations or upon his division superintendents alone. This arrangement, it will be remembered, is for ordinary operating purposes. Matters involving questions of design, radical changes or extraordinary expenditures of money on all the divisions, are worked out in the office of the chief steam and electrical engineer in whose department all this work for the entire system is centralized.

For the present there is no office of chief engineer of track and buildings, but such work of this nature as is necessary is being performed for all the divisions by a separate firm, Ephram Harrington & Co., of Boston.

All of the companies controlled by the Massachusetts Electric Companies are insured against accident claims in a separate mutual insurance company formed expressly for this purpose and known as the Massachusetts Street Railway Accident Association.

As indicated, all purchasing is done by a central purchasing de-



FIRST ELECTRIC CAR ON SYSTEM.

partment acting under the general managers. Recommendations and suggestion, as to kind and make of materials and supplies, are encouraged and invited from the general superintendents and through them from division superintendents and car foremen.

In reviewing the working organization of this property, it is a pleasure to speak of the esprit de corps that pervades every department of the institution from the trackmen to the general managers. Seldom is a closer union between employer and employed found in any industrial or commercial establishment and this feeling is all the more noteworthy when the nature and extent of the property is considered. One chief cause may perhaps be assigned for this altogether desirable condition, that is, that the gentlemen to whom has been entrusted the task of welding what were formerly 33 independent and more or less disconnected properties into one well-organized and centrally managed system, have realized the important part that subordinates and employees have necessarily to play in the operation of an extended property of this nature, and have in every way possible by encouragement and reward, brought the men of all ranks to take a personal, active interest in the welfare of the property as a whole. One way of accomplishing this has been by filling the subordinate positions with men, known in and familiar with the territory in which they work, thus inducing them to take a local as well as a general interest in the company's affairs.

While the earnings as shown in the accompanying table are very gratifying, the management feels that the next few years will show a marked increase in both gross and net income. The



work of the past two years has been necessarily more in the direction of unifying and perfecting the organization rather than in instituting comprehensive economies in operation. Inasmuch as the number of companies has now been practically reduced to the point decided upon as the best for permanent operation, the question of changes in the physical property will be taken up one by one and satisfactorily settled.

#### THE COMPANIES' EARNINGS.

Companies.	Gross Earnings.	Income Applicable to Dividends.	Earnings Car Per Car Miles.
Lynn & Boston.....	\$2,070,917.15	\$232,323.36	8,184,901 .2530
North Woburn .....	50,172.23	15,188.40	201,185 .2403
Lowell, Lawrence & Haverhill..	1,115,052.99	289,817.50	4,372,720 .2550
Old Colony .....	1,989,228.68	314,579.53	8,504,876 .2339
Newport & Fall River.....	128,654.17	25,086.34	467,043 .2754
Total all roads.....	\$5,354,025.22	\$827,005.13	21,730,725 .2463
Newport Illuminating Co.....	81,266.08	23,453.80	
Hyde Park Electric Light Co..	83,546.44	14,747.53	
Grand total .....	\$5,518,837.74	\$865,206.46	

#### PLANS FOR THE FUTURE.

In a general way it may be said that future changes will be mainly in the direction of centralization of power houses, car barns and repair shops. There are at present about 20 power houses distributed almost equally between the lines north of Boston, and those south of Boston. The plans of the management contemplate replacing if practicable all of these by four central, high-tension stations, two north of Boston and two south, with transforming and converting sub-stations at convenient points. By locating the stations where coal can be secured with low freight charges, and taking into consideration the greater economy in transmitting

two main repair shops, one north and one south of Boston. The car house at Brockton for the south system is nearly completed and is fully described in this article.

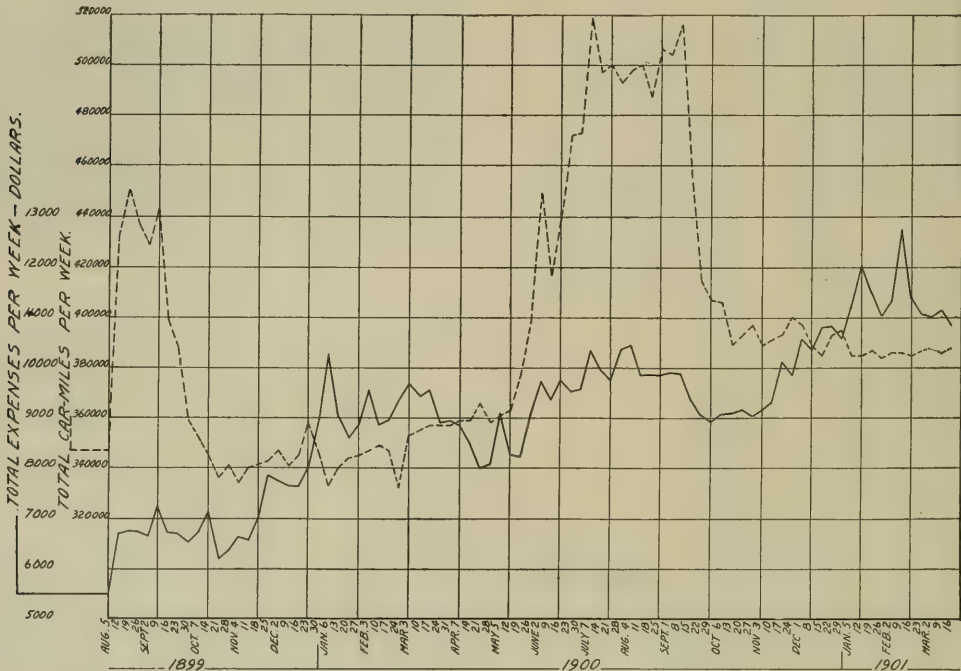
It is planned to practically do away with the single-truck cars and substitute therefor long double-truck cars, plans of which are



STANDARD CLOSED CAR.

shown herewith. It is believed the high speeds and greater economy that these long cars will make possible will further effect a considerable saving in operating expenses.

Another important improvement will be the building of connecting lines. At present lines are under construction between Lowell and Woburn. The management is also building an ex-



MILEAGE AND EXPENSES OF MASSACHUSETTS ELECTRIC COMPANIES.

high potential currents, it is believed an annual saving of from \$125,000 to \$150,000 will be made in the cost of power.

At present there are large repair shops at Chelsea, Lowell and Brockton, and a number of car barns scattered over the system. Many of the car barns will be abolished and there will be but

tension out of Fall River to connect with a new line to Providence, and franchises have been secured for double tracking the line from Salem to Lynn.

Where T-rails are laid, a 75-lb. section known as the Pennsylvania Steel Co's. No. 87 section has been adopted as standard.

## CAR HOUSE AT BROCKTON.

A new car house has recently been completed at Brockton and will soon become the main storage and repair center for all the lines of Boston. As completed it has capacity for 100 double truck cars at one time, and in its construction embodies three novel features of rather more than ordinary interest. These are the heating arrangements, the fire precautions, and the unique way of getting the cars into the barn, made necessary by the limited space available at the entrance.

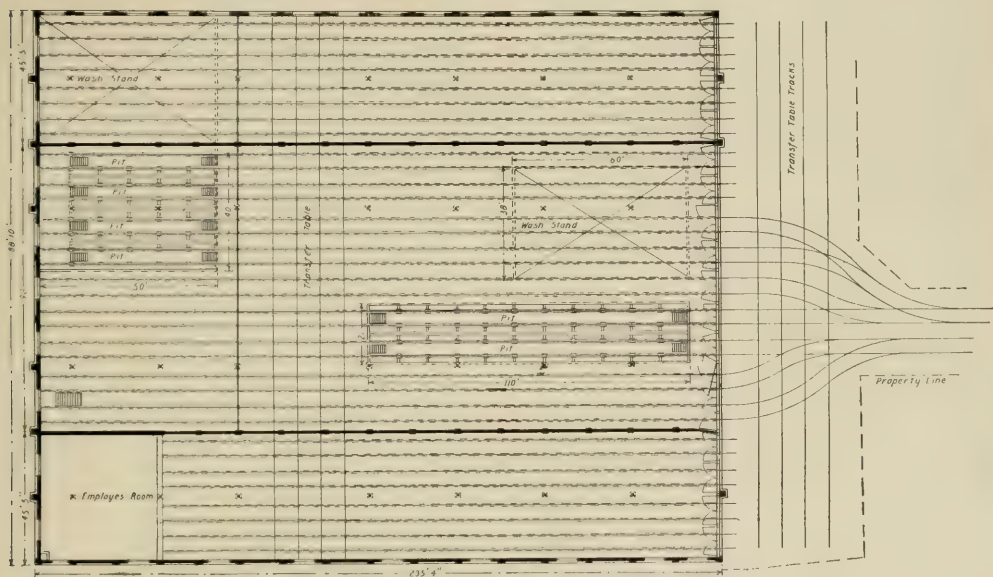
The new building, which is of brick, is 190 ft. wide by 235 ft. deep, and is located in Campello, a section of Brockton, about 30 ft. south of the old wooden car house and repair shops, which will be retained as an annex to the new barn.

For better fire protection the interior of the structure is divided by two brick fire walls into three divisions, the center one 100 ft. wide, and the two side sections each 45 ft. wide. There is also a wooden partition with door at every track, dividing the building into a front and rear section, this arrangement greatly facilitating the heating of the interior. In two of the divisions this partition is 67 ft. from the rear wall, and in the third, 40 ft. from

with plank bottoms. The barn flooring between the pit tracks is omitted, enabling workmen to stand between the tracks and work to advantage on journal boxes or brake shoes. In both of the wash rooms a slot floor is laid through which the water passes and is caught by a concrete floor below, whence it is led into a sand catcher and drain.

The roof of the building is of the monitor type, covered with 2-in. spruce planks on which is laid a five-ply tar and gravel covering.

As before stated, the most thorough precautions against fire have been taken. The building itself is as near fire proof as it is possible to make it, and the greatest danger from fire lies in the rapidity with which fire starting within a car always spreads to other cars. Every effort, therefore, has been made to isolate the various sections of the building, and to this end the two 12-in. fire walls, and also the north wall are extended 3 ft. above the roof. On the main floor wherever it is necessary to have doors in the fire walls, the openings are protected by a 2-in. tinned door on each side of the wall. The doors are hung from inclined rails and counterbalanced by weights so that they may be opened or



FLOOR PLAN BROCKTON CAR BARN.

the rear wall. The space between the wall and the partition is over a room in the basement devoted to the heating and ventilating apparatus, and the floor in this space is 4 ft. higher than in the rest of the building to give room for the boilers below.

For supporting the floor throughout the entire structure, brick piers, 16 in. square and resting on stones 30 in. square by 1 ft. thick, were placed every 10 ft. under each track rail, there being over 800 piers under the building. The piers that carry the roof posts are 24 in. square on stones 3 ft. square and 18 in. thick, with special castings on top to hold the end of the square post and receive the anchor bolts. The piers vary in height from 6 in. at one corner of the building to 5 ft. at the corner diagonally opposite.

The track rails are spiked directly to 8x12-in. hard pine track sticks, which rest on cast iron cap plates 16x16x1 in. placed on the brick piers. Between the tracks a 2-in. spruce flooring is laid with a strip of scantling between the floor and the track sleepers, thus making the top of the rail but 1 in. above the car house floor. The tracks are spaced 10 ft. 6 in. between centers.

The arrangement of pits and wash and storage rooms is shown on the floor plan reproduced herewith. The pits are 4½ ft. deep,

closed without great effort. A fuse link from which the weight is suspended is placed near the top of each door, and if the temperature rises to an unusual degree, this fuse will melt, dropping the weight, and causing the doors to automatically close. On the north side, which is in close proximity to the old wooden car house, all the windows are protected with 2-in. tinned fire shutters, and the monitor roof is protected by tinning and wire glass windows. There are three 6-in. double nozzle hydrants, two in the front yard and one in the rear. These are housed in hose sheds and provided with 150 ft. of 2½-in. hose connected to each nozzle. There is also on the roof at the rear of the building a 12,000-gallon tank supported on a 30-ft. steel trestle. The tank is made of wooden staves and is 12 ft. in diameter by 14 ft. high. It is supplied from the city water mains, and when necessary the water in the tank can be warmed by admitting steam through a 1½-in. pipe.

Each section of the building has an independent automatic fire sprinkling system, supplied both from the tank and from the city mains, so that if the yard hydrants when opened in case of fire, should reduce the pressure on the sprinkling system, the sprinklers, by means of an automatic check valve, will be thrown

onto the tank supply. As the top of the water in the tank is 66.35 ft. above the floor level, there is secured a pressure of 26 lb. at the gages, 5.5 ft. above the floor, and 15.6 lb. on the highest sprinkler 31 ft. above the floor. The city pressure averages 66 lb. at the floor level and 55.6 lb. on the highest sprinkler.

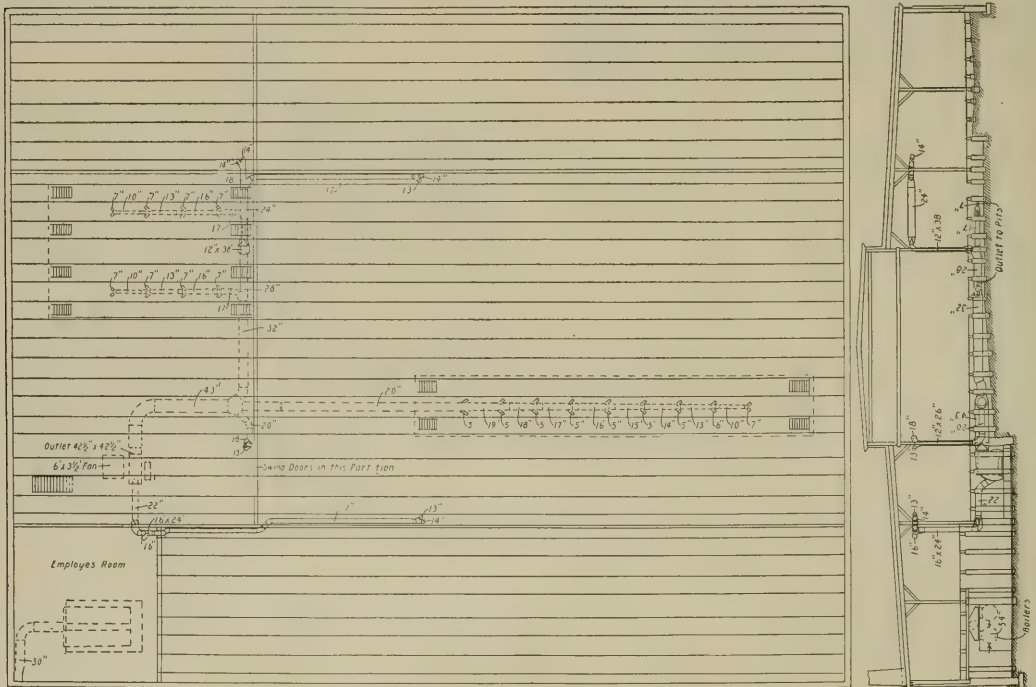
Normally there is no water in the pipes of the sprinkling system, but they are filled with air kept at a pressure of 20 to 30 lb. by an electrically driven air compressor in the boiler room. When the fuse indicators placed at frequent intervals melt, the air pressure is at once reduced, and the water from the main supply pipe flows into the sprinkler pipes through check valves. The automatic sprinklers were installed by the General Fire Extinguisher Co., of Providence, in accordance with the rules of the New England Underwriters' Bureau.

Over 60 fire pails filled with water are distributed through the building.

The entire heating and ventilating system, including boilers and

containing a wheel 6 ft. in diameter which is driven by a direct connected horizontal engine. The fan is provided with regular top horizontal discharge and also with a small angular up-discharge at the rear, from which a special pipe leads to the employees' room and to the adjoining main storage room. The entire apparatus is located beneath the tracks, thus occupying no valuable floor space and permitting of the carrying of all air distributing pipes beneath the floor.

The essential heating of the main room is secured through an underfloor pipe which extends down between pits in the middle of the room. Branches from this pipe distribute the air to the pits, whence it is designed that it shall escape in even volume upward and across the bodies of the cars upon the tracks above. This arrangement makes possible the rapid melting of snow and ice from the running gear during the winter season, which is of course the only period at which heating is required. The time during which a car must be kept out of service is thus measurably



PLAN OF HEATING SYSTEM FOR BROCKTON CAR BARN—B. F. STURTEVANT CO.

apparatus, was designed and installed by the B. F. Sturtevant Co., of Boston. So far as the heating and ventilating is concerned the building may be considered as consisting of four essential parts.

First—The wings upon either side which are used for permanent storage of cars and for which no heat is required.

Second—The center front of building designed for temporary storage of cars and requiring that the temperature be maintained above freezing, on account of the sprinkler system.

Third—The shop at the back of this room. Here a temperature of 60 degrees was called for.

Fourth—Room in one corner provided for the use of employees and required to be heated to 70 degrees.

The novelty of the heating system consists essentially in the concentration of the entire heating surface in a relatively small steel plate heater casing in connection with a fan. The heater is of the standard Sturtevant type consisting of a series of steel pipe sections through which steam circulates and across which the air is drawn. The fan is of the three-quarter housing steel plate type

reduced. The heated air quickly absorbs all moisture given off, and therefore prevents the formation of steam or mist.

Supplementary heating of this same room is secured by means of risers on either side, which are supplied from other underground pipes. The air distributed from these risers is forced to the front and colder portion of the building. The shop at the rear is also provided with a double set of heated pits supplied in the same manner as those at the front and maintaining a comfortable temperature throughout the room. Additional supply is here provided through risers which discharge from the inner towards the outer walls. A similar arrangement of a single riser is used in the employees' room. Beneath this room are two 54 in. by 17 ft. horizontal return tubular boilers, steam from which is not only supplied to this car barn but also to the old barn adjacent.

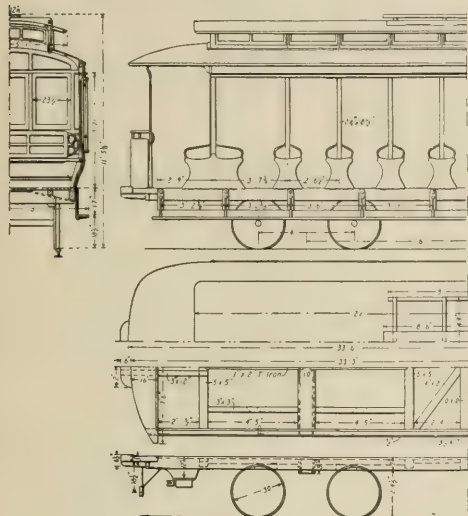
This system absolutely eliminates all direct steam piping with the inconvenience and uncleanness incident thereto, and concentrates all piping within a very small area.

The direct connected engine makes possible the operation of the fan at any desired speed to deliver the required amount of air.



This air, delivered under pressure, causes all leakage to be outward from the building, thereby preventing cold inward drafts and securing equality of temperature throughout the entire structure.

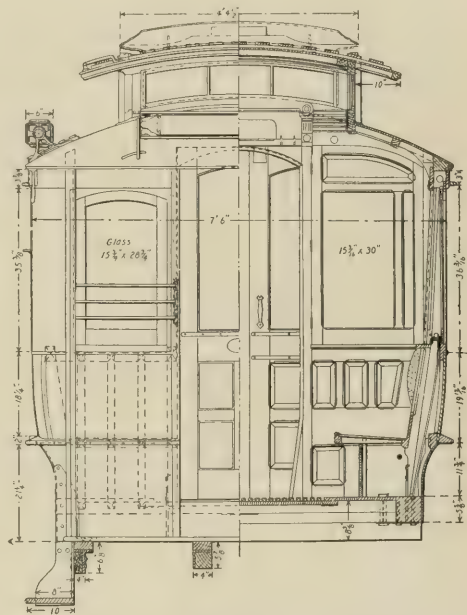
The track layout at the entrance to the barn will be understood by reference to one of the accompanying drawings. The front of the building is 212 ft. from the street, and there are seventeen tracks leading from the car house, but owing to the company's inability to secure adjacent property there was room to bring but two tracks from the entrance to the street. As a solution of the



STANDARD OPEN CARS.

problem four lateral tracks were laid in front of the building, intersecting the tracks from the car house at right angles. Upon these cross tracks is an electrically operated Taunton transfer table, one track wide, and long enough to take a 40-ft. car. By this arrangement two of the barn tracks go straight to the street; five are connected by curves to the two main tracks, and ten can be used only with the aid of the transfer table. The tracks on which the table runs are on the same level as the tracks in the house and yard,

and investigation, has decided upon certain standards for open and closed cars, trucks, wheels and axles, which will be followed closely in all future work. We are permitted to present these



SECTION AND END ELEVATION OF CLOSED CAR.

standards herewith, and coming as they do from authorities responsible for the operation of this important property, they are worthy of the most careful study and consideration. In adopting these standards local conditions of service have necessarily been an important factor, the subway having considerable influence upon the general dimensions. As all cars north of Boston are designed to enter the subway over the tracks of the Boston Elevated Railway Co., the maximum width and length had to be



STANDARD OPEN CAR.

and cars are run onto the table by means of inclined aprons, which lift up out of the way when the table is being moved.

The architect and constructing engineer for the building was Mr. E. H. Kitfield, of Boston.

#### STANDARD CARS, TRUCKS AND AXLES.

In line with this policy of centralizing and systematizing the work in all departments, the management, after much experiment

placed within certain limits to clear obstructions at the subway entrances.

For box cars, a 25-ft. body has been decided upon, vestibuled to comply with the state law. The following extracts, taken from the company's specifications together with the accompanying drawings, will give an excellent idea of the framing details, fittings and finish of these closed cars. The Lynn & Boston Railroad Co. has constructed many of the cars at its own shops, and

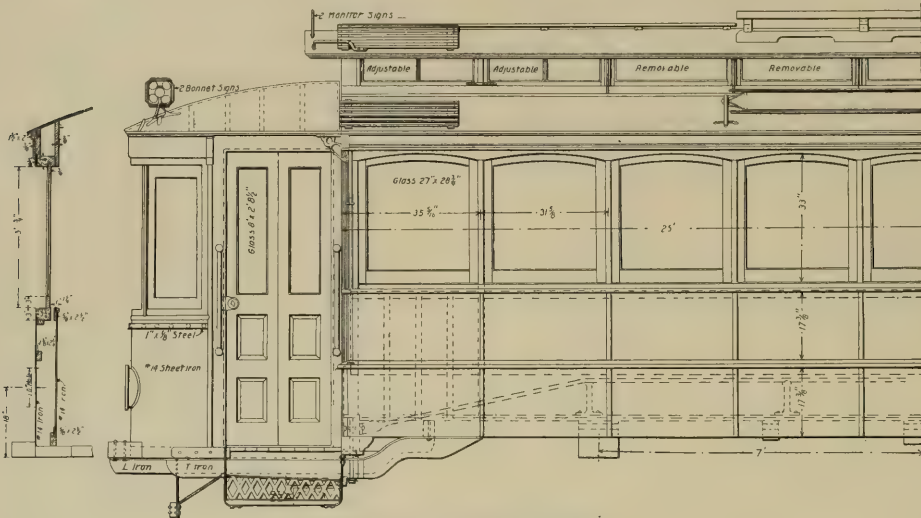
others have been built by different car builders after the company's plans and specifications.

#### 25-FT. VESTIBULE BOX CAR.

General Description: Length of body, 25 ft.; length over plat-

form header, 34 ft.; length over bunters, 35 ft.; length over bonnets, 34 ft. 4½ in.; width of bottom over panels, 6 ft. 8 in.; width over posts, 7 ft. 6 in.; width over drip rails, 7 ft. 10½ in.; height from floor to ceiling, 8 ft. 1¼ in.; height of doorway, 6 ft. 4¾ in.; height from bottom of sill to top of trolley board, 8 ft. 9½ in.

oak and the doors and window sash mahogany. The trimmings are of solid bronze, polished.  
The outside of the car body is to be painted as follows, 48 hours being allowed between coats: One coat of oil and lead priming; puttied with white lead putty; three coats of lead; three coats

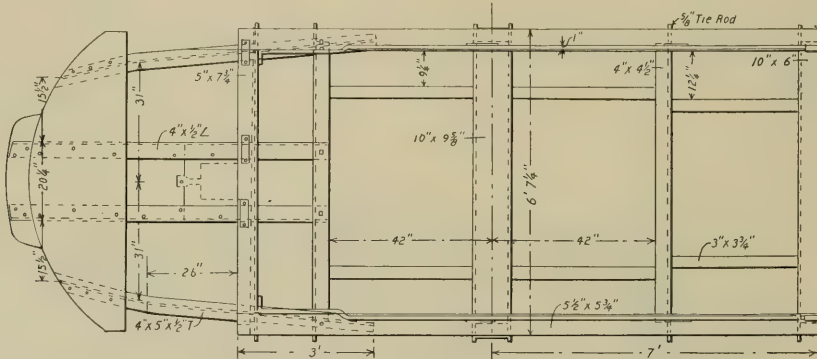


ELEVATION OF STANDARD CLOSED CAR.

form header, 34 ft.; length over bunters, 35 ft.; length over bonnets, 34 ft. 4½ in.; width of bottom over panels, 6 ft. 8 in.; width over posts, 7 ft. 6 in.; width over drip rails, 7 ft. 10½ in.; height from floor to ceiling, 8 ft. 1¼ in.; height of doorway, 6 ft. 4¾ in.; height from bottom of sill to top of trolley board, 8 ft. 9½ in.

of rough stuff; scoured to a surface; one coat of ground color; two coats of color; two coats of wearing body varnish.

The standard open car have 12 benches with enclosed ends. The general dimensions are: Length over bunter sills, 33 ft. 7 in.; length over bonnets, 33 ft. 10 in.; width of bottom over sills, 6 ft.

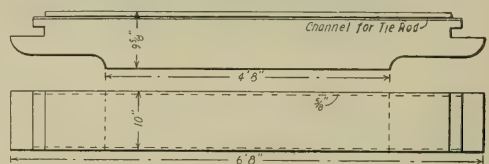


FLOOR FRAMING OF CLOSED CAR.

**Main Features:** Car to be vestibuled; to have 9 windows on each side, 1 door and 2 windows at each end, 3 windows and 2 double doors in vestibule; 9 windows on each side to be curtained; doors and windows on each end to be curtained inside the vestibule. Also revolving signs, ratchet brake handles and chains, buffers, spring boxes, drawbars, cages, foot gongs, signal bells, grab handles, window guards, hand pole brackets, and all attachments usually found on electric cars, which are more fully described in the specifications.

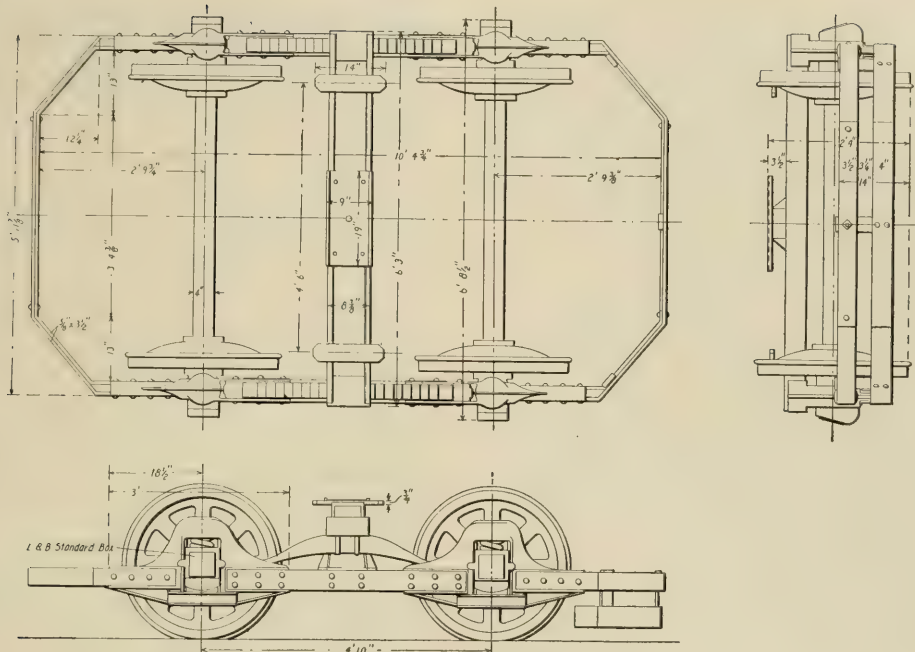
The side sills are of best hard pine, and the end sills, bolsters, cross timbers and braces of best white or yellow bark oak; tenons are coated with white lead, and the framing is painted before the floor is laid. Door and side posts, and body and roof framing are of white ash. Panels are of soft whitewood. Carline are of soft steel. The inside finish is cherry, the headlinings and card racks

10 in.; width over posts, 7 ft. 1 in.; width over running boards, 8 ft. 2 in.; height from floor to ceiling, 8 ft.; height from bottom



BOLSTER FOR CLOSED CAR.

of sill to top of trolley board, 9 ft. 5½ in.; center to center of posts, except at ends, 2 ft. 7½ in.; at ends, 3 ft. 7½ in.



STANDARD DOUBLE TRUCK.

**Main Features:** Cars to have eight benches with reversible backs and two at each end back to back, being a part of the enclosed end. To have three sash in each enclosed end to drop. Monitor top.

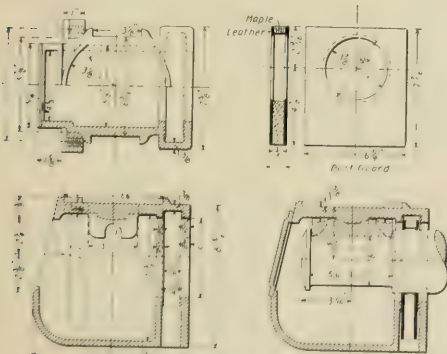
The side sills are to be of Georgia pitch pine, the bunter sills of selected ash or oak, and cross timbers and braces preferably of oak or second growth ash. The card racks and headlinings are to be of three-ply bird's-eye maple or birch.

color. All hardwood such as seats, posts, headlinings, etc., to be filled with light cornstarch, and to have 2 coats of best white shellac cut with pure grain alcohol, 2 coats of rubbing varnish and 1 coat of one-third rubbing and two-thirds body varnish.

One of our illustrations shows the first electric car regularly operated by the Lynn & Boston Railroad Co. The car was equipped with two F 30 motors, of 15 h. p. each, and regularly mounted a 12 1/2 per cent grade. It ran around a two-mile line, known as the Highland Circuit, which was built by the Thomson-Houston Co. about 1889. The car is still in service with new motors, and is painted a varied hue in imitation of a Scotch Highland plaid.

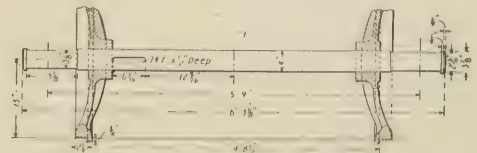
## TRUCKS.

The subject of trucks has been given exceptional study and investigation by the management, and after a number of tests a type



STANDARD JOURNAL BOX.

Woodwork on outside of car body to be painted as follows: Lead and oil priming; 2 coats of lead; white lead putty; 1 coat knifing lead; scoured to a smooth surface; 2 coats of flat lead; 2 coats of color; 2 coats of body varnish. Iron work showing on outside of car is treated thus: Scoured free from all rust and scales; primed inside and outside with red lead; putted with lead putty; treated with 3 coats of rough stuff and scoured to a smooth surface; 2 coats of flat lead mixed thin; two coats of



STANDARD WHEEL AND AXLE.

illustrated in one of the accompanying drawings has been developed and adopted as standard. Its design is largely the work of Mr. E. C. Foster, now general manager of the operating companies. The object in developing a type along the lines finally adopted has been to secure double trucks that could be used under both summer and winter equipments, and this form seems to entirely fill the requirements. The frame, as will be seen, has been narrowed, and the side frames are hung very low, bringing the running board of the open cars to within eighteen inches of the top of the rail. The company has made some of these trucks at its own shops, and others have been made from the company's



plans by outside truck makers. Both the built-up and forged frame types are used.

The standard journal boxes used with these trucks closely resemble the M. C. B. standard. In a great many of the boxes the company is using wool waste for packing.

All trucks are fitted with special axles and wheels. The standard axle is forged from hammered steel. By shortening the journals as indicated, the check plates at the end of the axles have been dispensed with, and sufficient space has thereby been secured for clearing the steps on open cars. The axle between hubs is 4 in. in diameter. The wheels are 30 in. in diameter, and are of the St. Louis Car Wheel Co.'s reinforced spoke type.

### OHIO FREIGHT DECISION.

In the "Review" for April brief mention was made of the decision of the Supreme Court of Ohio in the suit brought to prevent the Dayton Traction Co. from carrying freight, and we now give the opinion in this case, which is regarded as of great importance to Ohio companies.

Jan. 31, 1899, the attorney general of the state filed a petition in the Montgomery Circuit Court against the Dayton Traction Co. and the Cincinnati & Miami Valley Traction Co., alleging that they were offending against the franchise laws of the state in that they were transporting merchandise and freight for hire. The Circuit Court was of the opinion that the petition did not show a cause of action and decided in favor of the defendants. The attorney-general then appealed the case.

The Supreme Court rendered its decision March 26, 1901, the opinion written by Justice Shauck being as follows:

The petition does not call upon the defendants to show by what authority they assume to exercise the franchise or privilege in question; but conceding that they are common carriers authorized to carry passengers on Main St. in Dayton, it charges the carriage of freight and merchandise on said street for hire as the usurpation of a franchise not conferred. In any view quo warranto is a prerogative writ to be employed to shield the sovereignty of the state from invasion and to prevent the abuse of corporate powers. We have become familiar with its use to prevent combinations among artificial persons to stifle competition. It is quite obvious that it should not be resorted to at the instance of a competitor, for the purpose of preventing competition.

We have therefore to inquire whether the carriage of merchandise for hire under the conditions presented is the exercise of a franchise not conferred upon carrying companies of this character. Because the petition avers that the defendant companies have entered into an agreement for the conduct of the road on Main St., and impliedly avers, or at least permits the inference, that one of them is an electric interurban road, having its termini at Cincinnati and Dayton, and the other an electric company owning the road upon Main St. in Dayton, it will justify the judgment of the circuit court if the right in question might result from any operating agreement or arrangement into which the said companies are authorized to enter.

Counsel for the plaintiff in error urge as conclusive of the subject numerous texts and decisions in which street railroads are defined as carriers of passengers. Unusually they have been so defined for the obvious reason that until recently they were exclusively engaged in the carriage of passengers; but the general definition cannot be material in view of recent legislation in which the term is applied to roads constructed upon highways, interurban as well as urban, the only requirement being that in construction and operation they shall be consistent with the former and ordinary use of such highways, and in which legislation provision is made for the carriage of merchandise. It is well known that it was in response to a general demand for increased traffic facilities between cities and the regions surrounding them that the act of May 17, 1894 (91 O. L., 285), which is now included in sections 3443-8 to 3443-13 of the Revised Statutes, was enacted. In that act railways of this character, wherever located, are called street railways. The second section authorizes them upon obtaining the consent of the authorities controlling them, and of the owners of the property abutting them, to occupy and use highways outside of cities and villages. The fourth section of the act (3443-11, R. S.) is as follows:

"Any street railroad company shall have power to lease, purchase or make traffic arrangements with any other street railroad company as to so much of its tracks and other property as may be necessary or desirable to enable them to enter or pass through any city or village, upon the same terms and conditions applicable to other street railroads. And any existing street railroad company owning or operating a street railroad shall receive the cars, freight, packages or passengers of any other road, upon the same terms and conditions as they carry for the general public."

Since the provisions of this section contain definite authority for the making of a traffic arrangement by which defendants might have and exercise the powers which the petition alleges they are now exercising, the view taken of the petition in the Circuit Court is correct. Judgment affirmed.

### LARGE ISSUE OF REFUNDING BONDS.

The Connecticut Railway & Lighting Co. which now owns and controls the following companies: Bridgeport Traction Co., Shelton Street Railway Co., Milford Street Railway Co., Westport & Saugatuck Street Railway Co., Derby Street Railway Co., The Norwalk Tramway Co., Norwalk Street Railway Co., Waterbury Traction Co., The Central Railway & Electric Co., of New Britain, Norwalk & South Norwalk Electric Light Co., Norwalk Gas Light Co., Naugatuck Electric Light Co., Southington & Plantsville Tramway Co., and Greenwich Gas & Electric Light Co., has arranged for an issue of \$8,355,000 in 4½ per cent, 50-year gold bonds to refund outstanding obligations.

The total railway property comprises 161.6 miles, measured as single track, and Mr. Thomas Dolan, president of the United Gas Improvement Co., of Philadelphia, which owns a controlling interest in the Connecticut Railway & Lighting Co., states that the net earnings of the constituent companies for the year ending June 30, 1900, were \$505,335.68, and during the year the companies were run at great disadvantage. Upon the business done by them, under economical management, there should have been not less than \$50,000 additional profit earned.

### TROY & NEW ENGLAND CARS TO ENTER TROY.

The Troy (N. Y.) & New England Railway Co. has about completed negotiations with the United Traction Co. for an entrance into Troy over the latter's tracks. Connections will be made between the cars of the Troy & New England company and those of the United Traction Co. at Franklin Sq. so that practically a through trip will be made from Averill Park to Albany and vice versa. Such a proposition, embracing provisions relative to the adjustment of fares and transfers; the jurisdiction of inspectors in the employ of the United Traction Co. over cars of the Troy & New England Co., and the equipment of the latter's cars with emergency brakes and fenders, is receiving the favorable consideration of the United Traction Co.

### CHICAGO TUNNEL SUITS.

In July last the city of Chicago began legal proceedings to enforce an ordinance requiring the street railway companies now consolidated as the Chicago Union Traction Co. to lower the tunnels under the Chicago River occupied by its tracks. The city was believed to have a stronger case in regard to the Van Buren St. tunnel because that was built by the company on property purchased by it, while the other two tunnels were built by the city and leased to the railways.

The Circuit Court has had the case under advisement since February, and made its decision on April 26th, holding that to require the railway company to lower the tunnel would be to take its property without just compensation. Judge Neely said: "It has been shown by the testimony that the defendant laid out a million dollars in buying land and \$900,000 in constructing the tunnel, and that it would require the expenditure of a vast sum of money to lower it, which testimony shows the value of the property to the defendant, and the cost there would be in changing the tunnel."

## CANADIAN NOTES

The Guelph Railway Co. has secured a charter for the construction of an electric railway to Hespeler and Berlin, via Puslinch Lake.

The St. John Ry. has found a novel market for its old cars, poultry raisers in the vicinity of the city purchasing them for hen-houses.

The Toronto Ry. intends putting in another large generator, and has issued plans for 80 new cars, to be constructed during the summer.

The County of King has granted a bonus of \$12,000 to the Metropolitan Ry. to aid in the construction of the Schomberg and Aurora branch of that road.

A company has been organized under the name of the Port Dover Building & Improvement Co. to build an electric railway from Brantford to Waterford and Port Dover.

Considerable new track will be built by the Toronto Ry. during the present season, and the city council has recommended that tracks be laid on several additional streets within the next year.

Pocock & Russell, of Hamilton, have invented a friction brake for steam and electric cars, by which it is claimed a car running at a high rate of speed can be stopped within a few feet.

The Sum Life Assurance Co., the owner and operator of the Cornwall Electric Ry., has purchased a fine water power. Contracts will be let very shortly for the necessary apparatus.

It is stated that the Niagara, St. Catharines & Toronto Railway Co. has secured control of the Port Dalhousie, St. Catharines & Thorold Electric Ry. The latter line was the first electric railroad in Canada.

An electric lighting and power plant, with a capacity of 1,000 h. p., is to be erected at Three Forks, Slocan, B. C. Mr. J. M. Harris, principal owner of the Recco mine, at Sandon, is behind the project.

The Stave Lake Power Co. have been granted an eighteen-year franchise to supply light and power within the city of Victoria, B. C. In the event of the city wishing to carry on its own lighting system, the company is bound to supply power at a certain rate.

On March 10th the new works of the Electrical Construction Co., of London, Ltd., were formally opened by a banquet tendered by the company to the employees. The new building was elaborately decorated and illuminated, and a pleasant evening was spent by all.

The Quebec Electric Ry. has received permission from the city council to make considerable extensions to the system by prolonging the present Champlain St. line as far as the Cap Blanc gate. It is expected that the company will begin work on this extension immediately.

The power at the head of Sheik's Island, at Cornwall, Ont., is being developed, and will be utilized for operating the canal locks. The Bullock Electric Manufacturing Co., of Cincinnati, Ohio, has secured the contract for the building of the first of four three-phase generators to be installed.

The Hamilton Street Ry. is at loggerheads with the city council over the percentage of earnings due the city for the past year. The auditors claim that the receipts being over the \$150,000

mark, are liable to assessment of 7 per cent, while the company claim that 6½ per cent only is due.

Application for right of way along one of the streets of Brantford, Ont., to a central point, has been made by the Von Echa Construction Co. The company desires to include Brantford in a circuit of lines now under construction between Galt, Preston, Hespeler, Berlin, Waterloo and Guelph.

The Cape Breton Electric Co. held an important meeting on April 17th, at which it was decided to build an electric railway in Sydney and the suburbs. Preliminary work is now being proceeded with by experts from Boston, and it is expected that an up-to-date electric system will be installed during the summer.

The Peterborough Hydraulic Power Co. has been incorporated with a capital of \$50,000 and head office at Peterborough, Ont., the object being to develop a water power, and supply the local railway, electric light, and other companies. Hon. George A. Cox, of Toronto, and Mr. W. G. Morrow, of Peterborough, are among the promoters.

The Maitland River Power Co. has been formed for the purpose of developing a water power near the city of Goderich, Ont., and have secured from the council of that place a franchise to supply the necessary power for the water works and electric lighting supply. Messrs. James Clark and J. A. McIntosh, of Goderich, are the prime movers in the enterprise.

A 13-year-old lad was recently awarded \$630 damages against the Toronto Street Ry. On the 13th of January last the boy jumped on a car, and the conductor who thought he was stealing a ride, chased him off with a switch iron just as the car started, and in falling the boy injured his leg. Passengers on the car testified that the boy had already paid his fare.

The new Montreal Light & Power Co. is adding to the generator capacity at Chambly power house, the additions to be Westinghouse apparatus, and voltage now will be 20,000 stepped up by transformers, and not taken directly off the generators, as was the case with the original S. K. S. generators, current from which was taken off at 10,000 volts.

The petition of the Dawson City Electric Ry. for an extension of time, in which to commence work under their charter, has been refused and the charter has now lapsed. A number of other companies are seeking privileges in the neighborhood of Dawson City, notably one from the adjacent lignite mines to the city, and it was held that a renewal of the charter forfeited by the Dawson City Electric Co. would prevent any other concerns obtaining entry.

Mr. M. J. Kennedy, who has been acting as superintendent of the Montreal Street Ry. Co., since the departure of Mr. D. McDonald, was, at the regular meeting of the board, officially named for that position. Mr. Kennedy, who has been connected with the local road for a number of years, is well known to railroad men throughout the United States, having been at one time connected with the Twin City Rapid Transit Co., of Minneapolis, Minn., and his friends will all be glad to hear of his well-deserved promotion.

The statistics for 1900 show an increase in the electric railways of Canada of 49 miles over 1899. The number of passengers carried was 118,129,862, an increase of 14,097,203. The car mileage for the year was 30,924,355, as compared with 29,646,847 for the preceding year. The number of cars in service was 1,642, an increase of 98, and the employees numbered 4,493, showing an increase of 164 over 1899. Total receipts were \$5,422,540, and the expenses \$3,268,001. At the rate at which construction is going on this season, the returns for 1901 will show an increase of several hundred miles over 1900.

The St. Lawrence Power Co. is now applying for power to develop a water power at a point near Dickensons' Landing. The applicants—M. P. Davis, Judge McTavish, D'Arcy Scott, R. J.



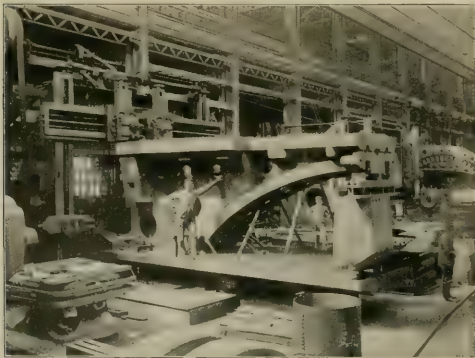
Devlin, and W. H. Currie, all of Ottawa—are seeking for most extensive privileges. The company wants to manufacture, use, supply and dispose of electricity, water and gas, and water, electric or other power; to maintain works for the production, sale and distribution thereof, and for these purposes may construct and operate canals, water courses, race ways and water powers in or adjacent to the St. Lawrence river.

The various committees which have in hand arrangements for the annual convention of the Canadian Electrical Association to be held at Ottawa in June, are working enthusiastically. Interesting papers are promised, and other features of an interesting and instructive programme are rapidly taking definite form. The local committee of arrangements includes representatives of all the electrical companies in Ottawa and vicinity, besides a number of citizens prominently connected with other enterprises, and with the experience of the gentlemen who so successfully arranged the Ottawa convention some six years ago, there is sufficient assurance that nothing will be left undone which would ensure a pleasant and profitable meeting.

Mr. P. E. Lane, representing American capitalists, has been given a contract by the council of Three Rivers for the construction of an electric railway to connect Three Rivers, Que., and the large manufacturing center of Shawanigan Falls, with the privilege of carrying both passengers and freight. The system is to be built through the streets of Three Rivers, thence along the shore of the St. Maurice river to Shawanigan Falls, where power will be generated by the North Shore Power Co. The city of Three Rivers has donated 10 acres of land upon which to build shops, car barns, etc. The company is also to furnish light and power within the city limits. It is estimated that the construction will cost in the neighborhood of \$500,000. The engineers are at present hard at work locating the line, and construction will be actively pushed.

### SOME HEAVY WORK IN THE WESTINGHOUSE SHOPS.

So much has been said and written during the past few months on the progress and development attained during the past decade along electrical engineering lines that the topic has perhaps become tiresome. But with all the references to the subject that have appeared, none have presented the matter more forcibly than does a bare statement of the size and output capacity of some of the larger street railway generating units now in process of



Planer Operating on Lower Section of Yoke of 5,000-kw. Generator for Manhattan Elevated; Weight of This Section, 82,400 Lbs.

building at the main shops of the Westinghouse Electric & Manufacturing Co., at East Pittsburgh, Pa.

Not so many years ago 800 and 1,000-kw. machines were looked upon as practically the limit in capacity for street railway work, but among the orders now in hand at the Westinghouse are to be found six direct current generators rated at 2,700 kw. each,

four at 2,250 kw. each, and eight alternating current revolving field generators each rated at 5,000 kw. but capable of delivering for an extended period 7,500 kw. or 10,000 e. h. p. The following is a partial list of the large units recently undertaken by the Westinghouse company:

Eight 5,000-kw. alternators for the Manhattan Elevated Railway Co., of New York.



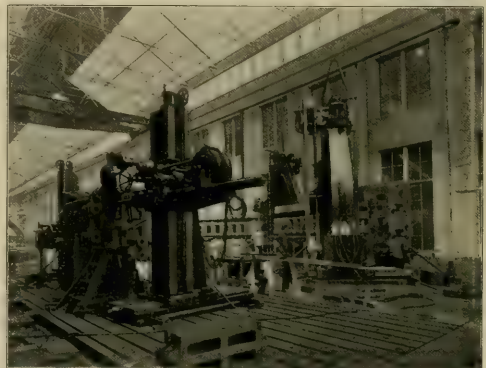
Working on Inside of Field of 2,700-kw. Direct Current Generator for Boston Elevated.

Three 2,700-kw. direct current generators for the Boston Elevated Railway Co.

Three 2,700-kw. direct current generators for the Brooklyn Rapid Transit Co.

Three 2,700-kw. alternators for the Brooklyn Rapid Transit Co. Four 2,250-kw., four 1,500-kw. and three 650-kw. generators for the St. Louis Transit Co.

As can well be imagined, the main aisle of the constructing shops in which the parts for several of these machines are being planed, drilled and fitted together presents a lively and interesting scene.



Vertical Tools Preparing Yoke of Manhattan Machine for Laminations and Coils.

The new machine shop of the Westinghouse company has been designed almost expressly to accommodate large work of this nature, the equipment of heavy planers, drills, boring mills and labor and time saving devices for heavy service, probably surpassing anything of the kind in this country. A feature of the shop is a new iron flooring nearly 200 ft. in length, consisting of a series of heavy plates, with holes and bolt grooves arranged in such a way that pieces of machinery of any size and shape can be placed anywhere on the floor and bolted thereto in any desired position. It is interesting to note that in working on these



heavy generator frames, some of which are over 40 ft. in diameter and weigh nearly 550,000 lb., the great pieces of metal are not carried to the different planing, boring and drilling tools in various parts of the shops, but the frames themselves remain stationary on the floor and the cutting tools are brought by enormous overhead cranes, and set up close to the work to be done. All of these tools, some of which weigh 25 tons, are each equipped with an independent alternating motor, which is usually mounted on the tool itself, sometimes inside the frame, so that the machines are entirely independent of any driving shafting. The accompanying half-tone engravings give views of work in progress on the large Boston and Manhattan units.

It is a fact worthy of attention, that in passing from the moderately high capacity machine, say 800 to 1,000 kw., of a few years ago, to the increased sizes of which we are speaking, there has been almost no departure from the general principles embodied in the earlier and smaller machines—save, of course, that alternating currents have now been introduced to some considerable extent in street railway work. The changes have been in the di-

rum construction, thoroughly ventilated. The dimensions are as follows: Diameter of frame, 336 in.; diameter of armature, approximately, 150 in.; weight of machine complete, 320,000 lb.

### MORE POWER FROM NIAGARA.

Announcement has just been made that the Niagara Falls Power Co., acting under the charter of the Canadian Niagara Power Co., has secured concessions from the Canadian government which permit the building of a 70,000-h. p. water driven plant on the Canadian side of the Falls, practically duplicating the company's power house installation now in successful operation on the American side. The plans include an inlet canal at the head of Cedar Island leading to the power house, which is to be just below the Convent of Loretto, familiar to all who have visited Niagara.

The water after actuating the water wheels will be returned to the river below the Horseshoe Falls. The first installation will provide 25,000 h. p. to be transmitted to Niagara Falls, Ont.; Toronto, Ont., and intermediate points. Cables will unite the American and Canadian plants, so that the two stations can work together when necessary, and enabling either station to carry the other's load in times of emergencies. It is said the street railway company of Toronto has made contract to take sufficient current from the new plant for operating its entire system. Ground was broken for the intake tunnel on May 7th.

### NEW COMPANY AT RICHMOND, IND.

The Richmond (Ind.) Street & Interurban Railway Co. was incorporated May 1st, with a capital stock of \$500,000, and has purchased the property of the Richmond Traction Co. with a view to extending its lines to Cambridge City, Milton and Dublin. The promoters of the project are: James Murdock, William Wallace and Daniel W. Simms, of Lafayette; L. G. Neely, J. W. Van Dyke, J. B. Kerr and H. L. Brice, of Lima, O.; H. B. Smith, of Hartford City, and John M. Lontz and Perry J. Freeman, of Richmond, who have organized with H. B. Smith, president; John W. Van Dyke, vice-president; Charles Murdock, secretary and treasurer; John M. Loutz, assistant secretary and treasurer; Perry J. Freeman, local attorney, and E. Kessler, superintendent. Mr. Kessler was superintendent of the road when it was operated by the Richmond Traction Co. Among the directors of the new corporation are Hugh J. McGowan, president and general manager of the Indianapolis Street Railway Co., and Philip Matter, of the Union Traction Co. of Indiana.

A committee comprising Messrs. Murdock, Smith, Neely, Wallace and Matter has been appointed to effect immediate improvements of the local system. Work will be commenced in May on the large and modern power house which the company proposes to erect in place of the one from which the road is at present operated. It is announced that the line to Dublin will be built this summer. By fall Richmond will have a completely modern street railway and will be the center of an extensive interurban system. The Dayton & Northwestern company has applied for the privilege of entering Richmond over the tracks of the Richmond Street & Interurban Railway Co.

### TO PREVENT MISEUSE OF HALF-FARE TICKETS.

Last month we gave the provisions of an ordinance recently passed in San Francisco granting a half-fare rate to school children under the age of 18 years. For the protection of the street car companies which give these half-fare rates another ordinance has been introduced which provides that any person not entitled to receive the benefits of the reduced rates of fares upon street railroads provided for by this ordinance, who shall secure or attempt to secure the benefits of said ordinance by falsely representing himself or herself to be thereunto entitled, shall be deemed guilty of a misdemeanor, and upon conviction shall be punished by a fine not exceeding \$100 or by imprisonment in the county jail not exceeding 50 days, or by both such fine and imprisonment.



Planer Working on Inside of Field of Manhattan Elevated Rotary Converter.

rection of improvements in the method of electrically insulating the parts; in reducing the friction and weight of the moving parts; and in securing greater compactness and symmetry of design.

As has been mentioned in these columns, all the power required by the Manhattan Elevated Railway Co. for operating its system after the present steam locomotives have been discarded, will be generated at one central station located at 74th St. and the East River. This plant is to contain eight direct driven three-phase Westinghouse alternators of 5,000 kw. rated capacity each, generating current at 11,000 volts. From the station the power will be transmitted at this potential to seven sub-stations, where it will be reduced through step-down transformers to low potential and delivered to 1,500-kw. rotary converters, of which there are 26, passing from these to the third rail conductors on the elevated structure as 625-volt direct current.

The generators are of the revolving field type, the 32-ft. field ring acting as the fly-wheel for the engine. The total height of the alternators is about 42 ft. and they each weigh complete over 900,000 lb. The engines for driving these machines are being built by the E. P. Allis Co. Each engine unit is rated at 8,000 h. p. and consists of two compounds with the 44-in. high pressure cylinders arranged horizontally, and the 88-in. low pressure cylinder arranged vertically, this design rendering the rotating impulses to the shaft unusually uniform and regular. The cylinders all have 60-in. stroke and the speed is 75 r. p. m. Steam is taken from 64 Babcock & Wilcox water tube boilers of 500 h. p. each, arranged in batteries of two.

The new 2,700-kw. generators for the Brooklyn Rapid Transit Co. and the Boston Elevated Railway Co. are all of the same design. They are of the 24-pole Westinghouse engine-type, i. e., direct connected, rated at 575 volts and running at 75 r. p. m. They have revolving armatures, of what is known as the slotted

## A SUCCESSFUL STREET RAILWAY MANAGER.

Mr. John N. Akarman, general manager and superintendent of the Worcester Consolidated Street Railway Company is one of the most successful street railway managers in the country. He began his career in 1873 as conductor on one of the Boston roads, and after filling all the minor positions in the service of a street railway company, from starter to assistant superintendent, he became the superintendent of the Charles River Street Railway Co., in April, 1882. This road was organized in opposition to the Cambridge Railroad Co., which road had had a monopoly of the business from Cambridge into Boston, and which, on account of high fares and conservative management, had become unpopular with the public. After a successful fight, extending over four years, the old road was forced to buy its young competitor. Mr. Akarman was immediately engaged to go to Worcester, Mass., to become the superintendent of the Citizens' Street Railway Co., which was a new road organized to oppose the old Worcester Railroad Co. After Mr. Akarman had been at the helm about two months, the two roads were consolidated under the title of the Worcester Consolidated Street Railway Co., and he became the superintendent, and a few months later the first dividend on the stock of a street



JOHN N. AKARMAN.

railway in Worcester was paid to the shareholders. A year or two later he resigned this position and associated himself with some Worcester capitalists and built a road in Maine, running from Biddeford to Old Orchard Beach. When this enterprise was completed he was engaged to become manager of the Newark & Elizabeth Railroad Co. at Newark, N. J. Appreciating the value of the horse system in Newark, he obtained an option on the properties and interested a syndicate of Philadelphia capitalists, headed by Thomas C. Barr, who purchased the roads and equipped them electrically. Mr. Akarman was associated with Mr. Barr for the four succeeding years in the successful operation of this system, and then securing an option on the stock of the Worcester Consolidated road, of which he had been superintendent, and of which he had a complete knowledge, he induced his associates to acquire the property and equip it electrically. He was sent to Worcester, and in seven months completely changed the system. In doing this 25 miles of track was rebuilt, the old stables were torn down, and a large car house built on the site, a power station built, the electric equipment bought and assembled, and the horses and old material disposed of. During this year 150,000 more miles were run than during any previous year, and one million more passengers were carried. During the succeeding eight years Mr. Akarman has been general

manager and superintendent of the company, and has increased the earning capacity of the property from \$315,000 in 1892 to \$710,000 in 1900. The property has been very successfully operated, having been made to earn and cover into the treasury of the Traction company (the owning road) an amount equal to 20 per cent on the capital of the operating company. This success made the property a much coveted one, and Boston and New York capitalists have recently acquired it, and consolidated all the suburban roads running into Worcester with it. Mr. Akarman and his associates having sold out their interests, he retired from the management.

## FOUR ENGINE-BUILDING FIRMS COMBINE.

The Allis-Chalmers Engine Building Co. has been organized with \$12,500,000 preferred stock and \$20,000,000 common stock, and on April 27th consolidated four of the most prominent engine-building companies in the world—i. e., the E. P. Allis Co., of Milwaukee; the Frazer & Chalmers Co., of Chicago and London; the Gates Iron Co., of Chicago, and the Dickson Manufacturing Co., of Scranton and Wilkesbarre. It is stated that the works of the Dickson company at Scranton will be operated as a separate concern for the present. The capitalization of the Dickson company is \$800,000, but the valuation, exclusive of the locomotive works, is \$15,000,000. The other properties will be operated under one management known as the Allis-Chalmers Co., in which William L. Elkins, jr., Philadelphia, is a director. Mr. Elkins has resigned as president and one of the directors of the Pennsylvania Iron Works Co., which has not been included in the combine. He is quoted as stating that a large plant will be erected by the Allis-Chalmers company in the vicinity of Philadelphia, and will be put in operation with 15,000 hands.

## DEVELOPING ST. JOSEPH RIVER.

Mr. Charles A. Chapin is giving much attention to the development of water powers on the St. Joseph River, having undertaken the construction of plants at Buchanan and at Berrien Springs, Mich. The contracts have been signed for a 1,500-kw. installation at Buchanan at the present time and it is intended to double the capacity. Mr. Geo. M. Brill, Marquette Bldg., Chicago, is the electrical and mechanical engineer for Mr. Chapin.

## OPENING OF BUFFALO & DEPEW RY.

The officers of the recently completed Buffalo (N. Y.) & Depew Ry. on May 8th took a party of invited guests over the line on a tour of inspection. The trip was made in a special car which left the city limits of Buffalo early in the afternoon and completed the seven-mile trip to Depew in good time. A stop was made at the car barn and power house of the company, and the party examined the many modern appointments which have been incorporated in the construction of the station and car house. The road is built throughout after the most approved plans, a noticeable feature being that all grade crossings are avoided either by tunnel or trestle work. After the return trip the guests were royally entertained at lunch by the railway officials.

Mr. William B. Cutter, of Buffalo, is president of the company, and Mr. Herbert P. Bissell is secretary and treasurer. The road was built under the supervision of Mr. George A. Ricker, of Buffalo, consulting engineer.

## TROLLEYS ON THE NEW YORK & NEW HAVEN.

Extensive plans for equipping a steam road with electricity have been formally announced by the New York, New Haven & Hartford R. R. The Waterbury, Meriden and Middletown line is to be equipped with the trolley system and the cost of the electrical equipment alone will be \$300,000. The entire cost of making the transfer from steam to electricity will be nearly \$1,000,000. The road is about twenty miles in length. Work on the change in motive power will be begun immediately.



## BONDS, BONDING AND BOND TESTING METHODS.

BY ALBERT B. HERRICK.

The question of the best bond to use and the proper section of bond to be used for a given current density in the rails is one that has been given much consideration by street railway managers. There are so many types of bonds, all of which have their individual merit, that it is hard to distinguish which would be the best under given conditions of rail, fish-plate and paving.

It is required of any bond that it make good electrical connection between the bond wire and the rail itself; and this connection should present ample surface, not exceeding 90 amperes per sq. in., for the mean current flowing through the bond. The terminal of the bond should be of such a metal as not to naturally corrode by contact with the iron rail.

The wires or rod forming the bond should possess either welded or cast contacts with the terminals connected to the rails. A new bond presenting large surfaces of contact will show very low resistance, but my remarks refer principally to those bonds which are between two and five years old and which were connected on rails in service subject to vibration and corrosion. It is found in measuring a great many of these bonds that, whereas a large area gives a low resistance under laboratory conditions, the surfaces in contact are not under sufficient pressure to prevent moisture from creeping in and gradually corroding them.

It is found that better results are obtained by reducing the surface and increasing the pressure. In this connection it may be mentioned that the channel pin bond has shown with a time test a very small contact resistance. The channel pin referred to is the half-round pin, which forces the bond wire itself against the internal surface of the hole drilled in the rail. The type of channel pin which surrounds the bond wire and acts as a wedge between the bond wire and the hole in the rail, presents two surfaces of contact to the current flowing through the bond and consequently doubles the hazard of a poor connection.

To amalgamate the surface of a bond of copper (brass cannot be amalgamated because it disintegrates when amalgamated) will improve any bond, and besides increasing the area of contact under lower pressure the amalgam will fill any crevice, through which the moisture works by capillary action between the contact surfaces. Very often copper in railroad work is misplaced in the bonds, due to the use of a common-sized bond throughout the whole length of road, whereas in localities adjacent to the power station the current density is greatly in excess of that received at the outlying points on the road. The rule to be followed should be that there should be in a bond a cross section at least 100,000 c. m. per 100 amperes returned on the rail. Of course this is the sum of the two bonds on each rail or the four bonds in the case of double track. The application of this rule gives the tapering bond system, which would cost the same in copper as the continuous bond system of uniform size; but the conductivity in the graded case would be much greater than in the case of uniform bonding.

Often the trackman puts the bonds in, and in his judgment a mechanical connection must be an electrical connection. It has been my experience that a great many bonds have been condemned because of improper work in placing them. The bond can be made just as tight in a rusty hole as in a clean one—but in the one case it is worthless and in the other it forms good contact. A bond for which the hole has been drilled with oil shows slightly higher resistance when new, but with age the difference between the hole drilled with oil and the hole drilled without it does not appear.

In bonding rails it is most evident that there should be no moisture present. The rail should be dry as well as the bond, and bonding should never be attempted during rainy or foggy weather. This depreciates the contact surfaces so quickly that it can be easily detected in testing over the track. In those sections which have been bonded during rainy or damp weather the action of the moisture seems to start corrosion between the iron and copper.

Bonds can be put down on a merit system with the best results, for then the men will find out for themselves the best method of bonding to insure electrical connection. The following method has been used with success: To pay 18 cents for the application

of a bond, whose resistance is .002 ohm or less and 9 cents for a bond whose resistance does not exceed .0025 ohm; all bonds having a resistance of over .003 ohm to be replaced without cost. This, of course, is for a certain bond with an area of contact of 1.37 sq. in. and  $\frac{3}{8}$  in. diameter of wire, the web of the rail being  $\frac{1}{2}$  in. thick and the hole in the rail  $\frac{3}{8}$  in. The copper was expanded into the hole by a plug.

In new tracks bonding can be tested as soon as the current is turned on the trolley wire, by methods explained later on. In roads where the rail is exposed bonds placed under the fish-plate are being extensively used on account of the exposed bond wires being stolen. In this case the bonds should have sufficient flexibility to allow the rails to contract and expand without fracturing the connections between the flexible and riveted portions of the bonds.

It will be noted that expansion and contraction does not fall equally on all rail joints but that an occasional joint catches most of the movement of the rails due to temperature changes. Consequently to test this type of under-fish-plate bond the movement should be greater than individual contraction and expansion of rail lengths. In order to test whether this type of bond has the proper flexibility, two levers can be fixed so that the movement of the bond can be made greater than the normal movement of the rail and this change in position of the rivet heads can be made four or five hundred times in order to ascertain whether the connection between the head and the flexible portion of the bond will stand this movement without a fracture.

An expanded bond will allow some little variation between the hole and the shank of the bond, which fits the hole, but in the riveted bond there should be a close driving fit. Where the rails have been ordered drilled before being laid, it is well to have them drilled 1-64 in. smaller than the shank of the bond so that reaming the hole will remove the rust and still the bond will be tight fitting. Where there is a face contact to consider, the reamer should have a rose on it which will ream the face of the rail as well as the hole. Generally with expanded bonds, also having face contact, the expanding of the bond forces the face out of contact, and the true contact is on the internal surface of the hole.

It has been and is still sometimes the practice to use a supplementary wire connected to the bonds and zigzagging from the bonds on one track to those on the other.

For the same cost per mile, using the same amount of copper in the bond, or using the same amount of wire for the bond that would be used for the supplementary wire, great deal better results will be obtained; for a section of a 50-lb. rail is equivalent to 20 No. 0000 B. W. G. wires or approximately 4,000,000 c. m., whereas a No. 0 wire, which is generally used, has 1-40 the conductivity of the rail. The greatest economy in ground return losses is largely in favor of increasing the bond at the joint instead of using the supplementary wire. There are certain treacherous parts of the road which should not be depended upon to continue the conductivity of the track, especially at railroad crossings. Here the bonds should be supplemented by using an auxiliary bond wire having a section of 150,000 c. m. per 100 amperes; this should be connected back to at least eight bonds each side of the crossing, so as to give no greater current density than 60 amperes per inch of contact to both tracks adjacent to the crossover.

On railroad bridges, both wood and iron, it is very difficult to maintain bonding, and here supplementary wires should be provided in the same way as on railroad crossings. Draw bridges, of course, should be bonded with copper sufficient for the maximum current flow on the rails adjacent to each side of the draw. The inside rail on curves shows a decided tendency to break the bond connections. I have not been able to satisfy myself as to why this is so, but I have found it so in many cases. At the tangents to each end of a curve there should be a cross connection between the tracks. Both the bottom and top of steep grades show a tendency to loosen the bond connections and here special attention should be paid to the bonding.

The function of cross bonding is to equalize the conductivity of the two rails in case bonds are open in some part of the track. The general rule is to place the cross bonds every 500 to 1,000 ft., and have them connect all parallel rails.

In some soils, especially blue marl and red clays, supplementary wires should be protected from actual contact with the clays, as they show a tendency to rapidly corrode the bond wires, due both



to the natural action of the soils and to electrolysis. Ground plates were largely employed in the early days of the return circuit construction, but while at first they give some assistance to the return circuit, they rapidly depreciate with age. In one case where a ground plate was employed, having an area of over 100 sq. ft., it carried 85 amperes when first installed; at the end of a month this fell to 14 amperes and at the end of a year to only 3 amperes. The outlying ground plates from a track depreciate more rapidly than the negative or receiving plate at the station where the trolley is positive, and these ground plates from which the current leaves to earth have been found fairly well insulated after several months' use. Rails partly imbedded in the than the negative plate, and these have been found fairly well insulated after several months' use. Rails partly imbedded in the earth run as high as 10,000 ft. of contact surface per mile, which is enormously more than the area of contact of a ground plate,

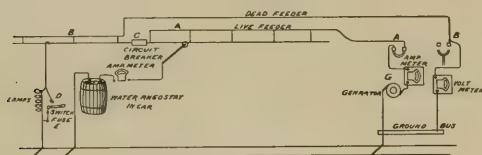


FIG. 1.

and the former surface is more effective as it is near the surface of the earth, where the earth is mixed with decomposed vegetable matter and the electrolyte adjacent to the rails is being continually replenished by rainfalls. Paving greatly increases this resistance, the concrete having a much higher resistance than the soils.

#### RETURN CIRCUIT TESTING.

In determining the conductivity of a ground return, the aggregate resistance of the return circuits should be obtained. Where the line is broken up by line circuit-breakers this can be done at any time, when the cars are not in operation, at each circuit-breaker point on the line. The method of making these connections for the determination of the ground return drop is diagrammatically shown in Fig. 1.

The test car is sent out with a water rheostat, which carries from 100 to 200 amperes (an ordinary oil barrel will make such a rheostat) having iron plates from 12x24x1-16 in. in size and the barrel being three-quarters filled with water, using bicarbonate of soda for reducing the resistance of the solution. Slats can be put across the rheostat, so as to prevent the plates coming in contact, and wooden chips can be floated on top of the water to prevent it from splashing when the car is running.

When the car arrives at the line, breaker C, the circuit-breaker to the section fed by B is opened, and the line side of this circuit-breaker is connected through the voltmeter to the ground bus. The most appropriate voltmeter for this purpose is one having a 500-volt scale and 50-volt scale. The 500-volt scale is connected across the bus to see if there is any leakage into this feeder B, which is to be used as a pressure wire. Feeder B is connected to the rail by means of a hook and pole, and also furnishes current to five lamps in series which are bridged by a fuse wire and small 500-volt switch. When connection between the trolley wire and ground is first made, the lamps will burn until the circuit-breaker in the station at B is open. If the line is clear these lights go out, then the switch D can be closed including the fuse E; then, when the load is put on the line (which can be read either on the car by ammeter F or by ammeter G in the circuit of the feeder A at the station) this will include the current used by the lamps and the heaters in the car. Then the amperes of G divided into the voltmeter readings across feeder B to the ground bus will give the resistance of the return circuit at the point tested.

By concerted action—by plotting out in sequence the different points to be tested, and having the car not leave a given test point until the circuit-breaker at the station is opened—a considerable number of these ground returns are readily tested, and the relative resistance of the ground returns throughout different parts of the track determined. Those sections showing high resistance per mile require first attention.

There are a number of ways in which a joint to joint test can be made. One is to use millivoltmeter across the joint and also

across a portion of the adjacent rail; then by a double-throw switch compare the readings of the joint with the rail. In paved streets, however, it is usually advisable to locate these bonds, which are practically broken links in the return circuit to the station. This can be done in the following way, at the rate of about four miles an hour, while the road is in operation.

It is necessary to have two voltmeters reading about 300 millivolts full scale, provided with keys so that they can be snapped out of circuit in case an open bond is bridged for contact to the rails. I have found nothing better than wire track brushes, which can be made serviceable for this purpose by taking off the top of the brush and over the ends of the wire brush securing a copper plate, which will make contacts to the ends of the wires; to this solder the drop wire. The flexible vertical motion on these brushes gives sufficient pressure for these contacts, four of them being required, two on each rail. A wooden platform truck with four wheels, such as is usually found in railway construction, answers this purpose the best. These brushes are then rigged up underneath this car, having 4 ft. between centers, two of them resting on each rail. Two pressure wires to each rail are carried back to the car, and the voltmeters are connected to them, one for each rail.

It is best to have a light car, for if a heavy car is used very often the weight of the car will cause the fish-plate to make contact and bridge the broken bond. When this truck is towed over the line it should be between the operating car and the power station, for the reason that, if a dead rail is run over, the current will be deflected from the dead rail to the live rail through the axles of the car, and will show on the relative readings of the two voltmeters a different current flow in the rail. A light truck will not tend to assist in equalizing the current flow on these two rails.

It will be noticed that when the brushes are over a solid rail, there will be a slight deflection given to the voltmeter hand; this deflection will suddenly jump up on passing over a bond, and it is necessary to run over the entire road to determine what bonds will be passed and what joints rebonded. This varies with the general character of the bonding and the current density in the rail.

A number of queer things will often be observed in these tests caused by broken bonds and effective cross-bonding. The current will sometimes be reversed where two broken bonds are found on one line of rail and the current from the car will flow through the cross-bonding back to the paralleling rails.

The best way of readily marking these poor bonds is to have an enclosed tank nearly filled with whitewash, and run two pipes to-

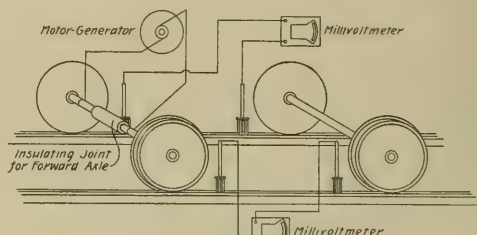


FIG. 2.

wards the forward end of the platform, providing the ends of these pipes with quick trip valves, and having a string to each valve. If the car is provided with an air brake, the air pressure from the brake reservoir can be piped to the top of this tank. When a bad bond is reached pull the cord on the trip valve and the whitewash will be squirted over the side of the track near the defective bond. This whitewash will last several weeks so as to allow plenty of time to replace the bond, and does not interfere in any way with the running of the car.

This test requires two observers, one on each rail, to make it properly, with a speed of from four to six miles per hour. Fig. 2 shows the general arrangements of the trailing bond test car. It must be made so that the bond is compared against the actual current density in the rail, which can be determined very closely from

the weight of the rail and the drop of the voltmeter, by using the following data: The resistance of one mile of continuous rail 1 sq. in. in section equals 0.45 ohm.; or the resistance of the rail is practically 10.4 times that of an equivalent section of pure copper at 20 degrees Cent.

### ANNUAL MEETING PITTSBURG CONSOLIDATED TRACTION CO.

The annual meeting of the Consolidated Traction Co., of Pittsburgh, was held last month, and the first annual statement ever made by the company was issued. The board of directors was increased from five to six members. W. Kesley Schoepf, general manager of the company, was chosen a director to fill the vacancy caused by the death of President Magee, and M. K. McMullin was added to the board in the new place created. The old directors elected were John A. Bell, T. H. Given, B. F. Jones and Joshua Rhodes. The board elected the latter president; Mr. Schoepf, vice-president and general manager; F. H. Steele, secretary; W. L. Elkins treasurer and Samuel E. Moore, comptroller.

The financial statement covering the last two years was given as follows: Gross earnings, \$2,919,444.56; previous year, \$2,632,533.59. Operating expenses, \$1,350,386.16; previous year, \$1,294,480.13. Net earnings from operation, \$1,569,058.40; previous year, \$1,338,053.46. Dividends on stocks owned, \$322,019.50; previous year, \$322,267. Total net earnings and income, \$1,891,077.90; previous year, \$1,660,320.46. Fixed charges, \$1,066,636.09; previous year, \$1,043,009.30. Surplus current year, \$824,441.81; previous year, \$617,311.16. Dividends on preferred stock, \$720,000; previous year, \$591,311. Net surplus, \$104,441.81; previous year, deficit of \$622.16.

The stockholders of the Pittsburgh Traction Co. and the Central Traction Co. elected the following directors: G. W. Elkins, John A. Bell, T. H. Given, B. F. Jones, M. K. McMullin, Joshua Rhodes and W. K. Schoepf. The Duquesne Traction Co. and the Fort Pitt Traction Co. elected the same men, with the exception of Mr. Bell and Mr. McMullin. These are underlying companies of the Consolidated.

### TICKET FRAUDS IN WASHINGTON, D. C.

The Washington Traction & Electric Co. has recently caused the arrest of several of its employees who, according to evidence secured, have succeeded in defrauding the company out of several thousand dollars, by obtaining possession of used tickets, which were supposed to have been destroyed, and turning these into the office in lieu of cash fares collected. The investigation carried on by Mr. H. W. Fuller, the new general manager, discloses the fact that the frauds have been practiced for many months, and he states that although the newspaper reports of the total losses sustained are greatly exaggerated, the conspirators have undoubtedly operated on an extensive scale.

The system by which the company has been robbed was very simple. The Washington companies sell six tickets for 25 cents, and a large proportion of the receipts come in in this way. The used tickets after they are turned in by the conductors, are counted, tied up in bundles of 100, and are then taken in a bag by a trusted clerk, and thrown into the furnace under the boilers at the power station. The clerk is instructed to wait and see that the tickets are on fire before leaving, and it has been his practice to do so. But the fireman at the power house discovered that by deadening his fires just before the tickets arrived, the bundles could be withdrawn after having been in the furnace for several minutes, and a portion of the tickets would be uninjured, except for the punch mark which is made when the ticket is collected as fare. For some time he has been rescuing tickets in this way and selling them to conductors at \$1 a hundred, the conductors turning the tickets in in place of cash fares at a profit of over 3 cents on each ticket.

The fraud was finally discovered by the presence of several slightly scorched tickets in each day's returns, and investigation showed that many of the conductors were turning in tickets bearing some other conductor's punch mark.

Mr. Fuller at once proceeded to find the cause for this with the result that the widespread conspiracy was unearthed.

### PAVING IN BOSTON.

By F. S. Gore, Treasurer Norfolk (Mass.) Western Street Railway Co.

In 1860 cobble stone, sea washed, was the principal paving in use in the city of Boston, though at that time there was a demand for a smoother paving. About this time Alfred T. Turner, superintendent of streets, introduced trap rock paving, a very hard stone, with one smooth side used as the face. This paving was considered at the time a success, and was used extensively until granite blocks became the standard paving of Boston.

That same year there was laid by the Cellular Iron Paving Co. a pavement known as "cellular iron paving," with the understanding that if it was not satisfactory the company was to remove it at its own expense. In 1862 a petition was sent to the superintendent asking to have this removed, as it had become so slippery that it was dangerous for horses, and it was ordered removed.

In 1869 wood paving was introduced, but with little success, and was finally abandoned.

Granite paving on a concrete foundation with the joints filled with pebbles and pitch or cement, is generally used at the present time where there is heavy team travel.

Asphalt paving has also been laid for a number of years, it being sanitary and practically noiseless, and it is superseding the other kinds of pavement to a considerable extent. The two kinds of asphalt principally used are the Trinidad, coming from the Isle of Trinidad, and Sicilian Rock, which is composed of a mixture of two kinds, one coming from Ragusa, Sicily, and the other from Vorwohle, Germany. Sicilian Rock asphalt had been in use for many years in foreign countries before it was introduced into America. The Trinidad is usually laid 2 in. deep, on a binder coat, 1½ in. deep, composed of small crushed stones mixed with paving cement, and this is laid on a concrete foundation 6 in. deep.

The Rock asphalt is laid 2 or 2½ in. deep, on top of concrete 6 in. deep, and requires no binder coat whatever. Sicilian Rock asphalt in Boston is laid under the following specifications:

"The present pavement or surface shall be removed and the subsoil then be excavated and removed to the depth of 8 in. below the top line of the proposed pavement. Soft or spongy places not affording a firm foundation shall be dug out, refilled with good earth, clean gravel or sand, and well rammed, so as to make such filling compact and solid, and the entire roadbed thoroughly rolled with a heavy roller.

"Upon the roadbed thus prepared shall be laid a foundation of hydraulic cement concrete 6, 5 or 4 in. in thickness, according to the class of traffic to which the pavement is to be subjected, this concrete to be made as follows: One measure of cement, equal to the best quality of freshly burned Rosendale cement, and two of clean, sharp sand, shall be well mixed dry, and then made into a mortar with the least possible amount of water. Broken stone or gravel, thoroughly cleansed from dirt and drenched with water, but containing no loose water in the heap, shall be immediately incorporated with the mortar in such quantities as will give a surplus of mortar when rammed. This proportion, when ascertained, shall be regulated by measure. Each batch of concrete shall be thoroughly mixed. It shall then be spread and at once compacted by ramming until free mortar appears upon the surface. The whole operation of mixing and laying each batch shall be performed as quickly as possible. The pieces of broken stone or gravel shall be of a size that will pass through a 2½-in. ring. The upper surface of the concrete shall be made exactly parallel with the surface of the asphalt pavement to be laid thereon, and shall be 2 in. below the grade of the top of the finished pavement.

"Upon this foundation, when sufficiently dry, the wearing surface, or pavement proper, shall be laid. This shall consist of a mixture of from three to four parts natural bituminous limestone rock mined at Ragusa, Sicily, with one part mined at Vorwohle. It shall be thoroughly mixed and properly ironed and rolled."

The style of rail has gradually changed from a center bearing or tram cast iron rail laid on wooden stringers, to the present 9-in. girder, laid with a 1-in. tie plate between the rails and the ties, which is now practically the standard construction in Boston.

The different kinds of tram rail, including the present girder, have been designed with the view of getting a rail in which the paving might be brought close to the top. With a T rail, on account of the wide bottom, this cannot be accomplished, as a rut



soon forms at the side of the rail, which makes it dangerous for travel in cities and large towns, although I believe that a heavy T rail, laid on ties on hydraulic cement concrete, with asphalt for a wearing surface, could be used successfully if the cars were kept off until the cement was well set.

Asphalt laid in tracks, unless extraordinary pains have been taken in the construction of the roadbed, should have a border of tooth-ing stones between the rails and the asphalt, as in most cases the rails spring so much when a car passes over them as to soon cause the concrete against the rail under the asphalt to crumble, with the result that the asphalt breaks or cracks. Where concrete is used in tracks, hydraulic cement, mixed in the proportion of 7 parts stone, 3 parts sand and 1 part portland cement should be used.

If granite blocks are used for paving, they should be 6 in. in depth, as the deeper blocks (on account of the ties in the track) soon cause the paving to be very uneven. In laying a concrete foundation in tracks for granite blocks all loose material between the ties should be carefully removed, as a small stone or other loose material on the ties will soon begin to pound, and uneven settling will follow. Then fill in with hydraulic cement concrete to within 8 in. of the top of rail. On this put 2 in. of sharp sand, and finally the 6-in. paving blocks. Fill in the joints with pebbles and pitch or cement. This forms one of the most durable pavings that can be laid.

Including the space between the rails and a distance of 18 in. outside of each rail, the various pavings cost in Boston per lineal foot of single track as follows:

Asphalt, with concrete from the bottom of the ties, \$3.50, or with 6 in. of concrete, about \$2.62; brick, on a concrete foundation from the bottom of the ties, about \$3.00, or with a 6 in. foundation, \$2.10; granite blocks, laid as recommended in the previous paragraph, \$3.14.

On a number of avenues of Boston the car tracks occupy a reserved space in the center of the street. In these cases T rails are laid on wooden ties without paving, the space between the rails and between the two tracks being filled up to the top of the rails with loam covered with grass sod, making a very pleasing appearance. The space on either side of the reserved strip is paved with asphalt. Where complicated special work is laid, granite blocks are used for paving.

### FRANCHISE TROUBLES IN БЕЛОIT.

The Beloit, Delavan Lake & Janesville Electric Ry., which it is proposed to build between these three places, has stirred up considerable strife over the franchise question in Beloit. The first franchise had progressed to its second reading in the common council when the judiciary committee presented a new ordinance, to which Mr. H. H. Clough, of Elyria, who stands at the head of the new railway company, objected seriously on behalf of the promoters of the road.

The whole trouble in Beloit at present is that the matter has resolved itself into a fight between the two sides of the river. Neither side is willing to give in and both are making a strong fight to have the line on their side of the town.

Unless a satisfactory franchise is agreed upon, Mr. Clough suggests there is a fair prospect of the road going around, instead of through, Beloit. The company is prepared to spend \$600,000 on this electric line, which will extend from Rockford to Janesville, and work will be commenced during the month of May, so that the line can be opened in October or November of this year. All that is holding back the work at present is the franchise question in Beloit.

### TEXAS OIL FIELDS.

The oil fields recently developed in Jefferson County, Tex., have led to a boom in oil lands which is also resulting in marked prosperity for other interests. The first "gusher" was struck Jan. 10, 1901, three miles south of the town of Beaumont; this is 84 miles east of Houston and 18 miles from Port Arthur, on the Gulf. Mr. H. F. MacGregor, general manager of the Houston Electric Street Ry., advises us that his company is now burning Beaumont oil in the power house and will save \$6,500 per annum in the fuel bill. The price paid for oil is 50 cents per barrel.

## COMBINED TROLLEY AND CONDUIT TRAMWAY SYSTEM.

Abstract of a paper read before the Institution of Electrical Engineers by Mr. A. N. Connette.

In many cities where the overhead trolley is, or will be, admitted on surface tramways there often exists a street or a central zone where it is, or will be, expressly prohibited. Again, other cities prohibit absolutely the trolley within their limits, but penetrating lines from the suburbs come to the limits with the trolley, and from there a change of cars must be made to enter the city, or the cars must be equipped so as to be able to use another system of traction. The general engineering problem in these two cases is about the same. Broadly speaking, it is that the electric motors, with which the car is equipped, must be furnished with current from a source other than the overhead wire along a part of its route. There is no one well-defined system or method of solving the difficulty upon which engineers are agreed as being the best. It is natural that this should be so, local conditions being such an important factor that each individual case must be carefully studied by itself, so that what would be a correct solution in one place might not be justified in another. There are three means of solving the problems: (1) Accumulators; (2) surface contact; (3) open slot conduit.

The author does not discuss the first two systems, but thinks there should be no hesitation about adopting the third where financial and constructional conditions make it possible, for this system has proved itself to be workable. It has passed entirely beyond the experimental and uncertain period, and can now be adopted without hesitation as an electric tramway system for the propulsion of cars. It can fail completely, but even partial failure will be the fault either of design or of construction, or of both.

The problem of adapting the plow and track mechanism, to change from the overhead line to the conduit system or vice versa, has been satisfactorily and carefully worked out on several different general principles.

The subject will now be considered in the following order:

1. The general type of conduit to be adopted.
2. The mechanical and electrical bases on which to construct conduit.
3. The special apparatus necessary for a mixed conduit and trolley line.

The first question to be solved in a conduit construction is the conductor system, to which is intimately connected the manner of making contact. With the limited clearances in a conduit, there can be no other practical method than the one of installing rigid conductor bars, to which the original Budapest conduit owes its success.

The next question is whether the conduit shall be side slot or center slot construction. In the author's opinion the center slot is the better construction from an operating standpoint. The inherent difficulty with the side slot is the switch at the junction of two slots. With the center slot a comparatively light movable tongue can be hung or pivoted to the fixed tongue, its use being simple to guide the plow. With the side slot the tongue is much stiffer and heavier, because it must also guide the wheels of the car and support them in one position; that is, the entire tongue is movable, and its upper surface from point to heel must be level with the wheel rail.

In the present state of the art there can be no question about adopting an ironclad porcelain insulator, or at least a material which has the same general characteristics. The first line equipped in New York City used a built-up insulator, a bolt being covered with an insulating compound; it failed, and the type of insulator was adopted which had proved so successful at Washington. (This was described in the "Review" for January, 1898.)

In Brussels the type of insulator used is a bolt surrounded by a rubber compound. This is subjected to a severe piercing test with a Rumkoff coil before being accepted. These insulators have been fairly successful, but they are expensive, and they may deteriorate by exposure to the atmosphere. The ironclad porcelain insulator is strong, durable and cheap. There can be no hesitation about its use. The insulators should be vertical, so that they may not offer the chance for the accumulation of dirt, which can easily happen with one horizontally placed.

Assuming a vertical ironclad porcelain insulator, the method of



attaching it to the conduit construction becomes important, the depth of the tube being somewhat dependent upon this. For the sake of simplicity they should be fastened to the metallic structure, which has the further advantage of keeping the conductor-bars at the same distance from the wheel-rails, except in the special case of a center-slot conduit where the yoke construction does not permit the carrying of the wheel rails. The extreme positions of the insulators are, first, with the upper surface of the insulator as near the street surface as it can be for mechanical protection, and

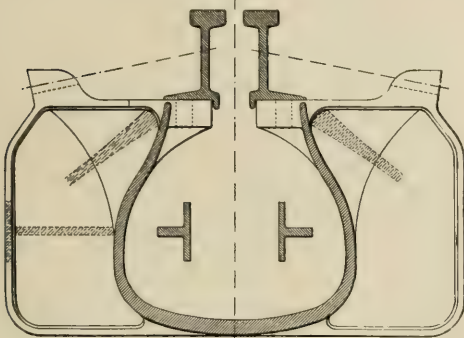


FIG. 1.

secondly, with the upper surface of the cast-iron insulator cover bolted directly to the bottom flange of the slot-rail.

If the insulators are carried close to the street level they must be protected by metallic covers, which in Europe are considered objectionable, and in some cases they are absolutely forbidden by the authorities, as in Paris. Therefore, the second method is the only one that can be used in such cases. Perhaps it should be said that the insulators are protected by metallic covers in the second case; but these are paved over, so that the street surface is in no way altered in appearance by their use.

The limiting conduit depth is often a vitally important matter on account of the crossing of immovable sub-surface constructions. The conductor-bar carrying height is arrived at by adding the depth of yoke-seat and the air-gap to the height of slot-rail. It is possible that the height so arrived at will not give the necessary distance for a vertically hung insulator and its mechanical protection. In this case the insulator determines the conductor-bar carrying height. When this distance is determined, the height of bar itself, with the necessary clearance to the bottom of the tube, is added. The distance so determined gives the conduit depth. The clearance should be from 9 in. to 10 in. to allow considerable room for water and dirt accumulation, although for short dis-

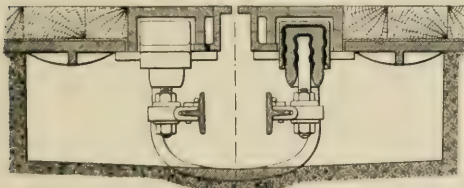


FIG. 2.

tances, where unavoidable, a depth of 4 in. has been successfully used. Such shallow lengths need cleaning often.

A shallow conduit was designed for use on the Pont de l'Alma, in Paris. A careful examination showed that the construction given in Fig. 1 was practicable by slightly cutting the masonry arches, which was adopted. The conduit construction in this case has a total depth of about 22 in. with a 6-in. slot rail and insulators bolted to their bottom flanges. The conduit shown is in actual operation, and it can be safely recommended for special

cases where the depth available is restricted. Fig. 2 shows a section through the insulator.

It may not be amiss to say a few words about the switches, because in practice they are responsible for most of the interruptions in service. A misplaced switch has the result of guiding the car in one direction and the plow in another. The latter can become twisted in the conduit in a variety of ways, but with the too sure result of interrupting the traffic for a time, which, in the author's experience, may vary from 15 minutes to two hours. This bare statement is sufficient to demonstrate the necessity of so designing the switches as to reduce to the strictest minimum the possibility of such accidents.

There are two distinct cases to be considered. The first is where the track is alone switched, the slot being continuous. Fig. 3 is a sectional view of a counterweight mechanism which can be adjusted to close the switches automatically, so that the track should be always open for the passage of the cars using the conduit track. Fig. 4 is a section of the same mechanism for the case of a side-slot conduit. This precaution should always be taken, but it may fail. When this happens, it is usually due to something solid having fallen into the switch, and in consequence the tongues fail to return to their normal position. In the case of the center-slot construction, the danger of an accident can be avoided if the plows are hung on slides, which permit their traveling completely across the car. If the ends of these slides are left free of all obstruction from the truck or otherwise, the plow will drop off when the car has reached a certain distance on the wrong track. But the motorman generally perceives his error before that occurs, and simply stops and reverses the car, with the result of no interruption worthy of mention. Even in the worst case of losing the plow the car is simply "dead," and can be pushed in by the succeeding one. A trap should be placed conveniently at each such switch, so that the plow can be taken out with no loss of time. If the accidents are only of this nature, they are

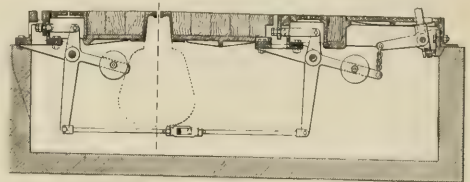


FIG. 3.

not worthy of any serious attention. But in the case of the ordinary side-slot conduit, this result cannot be attained. The tongue there in one position covers the slot. In case of a false position of the switch, an accident will happen which almost surely must result in a serious interruption of the car service. To avoid this difficulty, the author suggests that before the switches are reached, the slots should be deflected to the central position.

In the second case, with a slot-switch, the slot-tongue is a necessity. The author recommends for the side-slot conduit the same deflection of the slot to the central position. This serves the purpose of being able to avoid the side-slot slot-switch, the constructional difficulties of which are considerable. The danger of an accident with this switch is limited to the case where the point of the slot tongue is directly in the slot. A "head-on" collision can then take place. But if the tongue is not thrown in the same direction as the track tongues, the same slight interruption may happen as above explained—providing, of course, that the system of plow slides there mentioned is in use. There are no mechanical or electrical difficulties in deflecting the side slot conduit to the center slot of a slot switch, the results of actual operation in Paris having demonstrated this statement. The slot-switch operating mechanism is arranged so that with one movement of the handle the three tongues are thrown in unison. For a dense traffic, it is advisable to put a switchman at such slot-switch points, to reduce to a minimum the danger of accidents and of interruptions of service. The author feels confident that the accidents at switching points will be almost negligible if the construction above indicated is followed.

The first decision to be made for a line partly conduit and partly overhead is whether the plow shall be carried continually on the

car, or removed and replaced at each junction point of the two systems. The latter is the simpler method. A roomy manhole containing a man to do this work is all that is needed; but it needs no argument to prove that it is an undesirable and expensive method to adopt. One is then impelled to a method whereby the plow is always carried on the car as the trolley is, to effect which the plow must be raised or lowered at the junction points of the two systems. The most natural and the neatest solution is to raise the plow through the slot with no special arrangement in the latter.

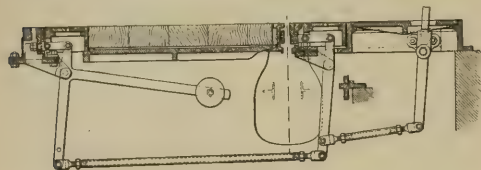


FIG. 4.

This has been successfully done in Berlin and Brussels. In the former city the plow is equipped with a wheel at its lower extremity, which runs up an inclined plane; and the contact shoes working on horizontal axes pass through the slot by being depressed to a vertical position. The wheel then runs in the groove of the wheel rail, and it is raised clear of the track by the turn on a crank given by the motorman. At the same time the conductor loosens the bow sliding trolley, and the operation is complete. The entire change can be made without stopping the car. This system involves the use of what may be called "flappers." These are hung on horizontal axes around which is a coil spring, one end of which is fastened to the fixed axis and the other to

difficult problems connected with the conduit system. The successful installation of two bare conductors in an open slot conduit is not as serious a matter as to take the current from these bars through the slot to the car motor. A plow must be strong enough mechanically to resist the shocks and wear and tear of ordinary usage, while not so strong but that it will yield before injuring the conductor-bar system in case of an accident. At the same time it must be electrically efficient under the most difficult conditions imaginable; bare collectors of current are connected to leads, which must be covered with insulation and mechanically protected by metallic wearing plates, the total width of which do not exceed  $\frac{1}{4}$  in., with a  $\frac{3}{4}$ -in. slot, this being the ordinary condition with a center-slot conduit.

The flapper form of plow construction is weak mechanically. The friction of, and shocks due to, uneven joints in the conductor bars tend to twist the flappers about their horizontal axes. At the points where the bars are interrupted, such as at slot switches or at crossings, the shocks of this nature are very considerable. In actual practice the flappers are often wrenched off at these places.

The author believes it to be indisputable that other forms of plow are much more efficient, but none of them have the advantage of being able to be withdrawn from or lowered into the conduit without a special trap construction at a fixed point.

In the light of present experience the best plow is one having soft cast-iron shoes, pressed lightly against the vertical faces of the conductor bars by semi-elliptic springs horizontally placed. The shoes preferably should be carried by horizontal links, which take all the shocks to which they may be subjected, leaving the springs free to do the work only of pressing the shoes outwardly. In this way the risk of deforming the springs is avoided. The links should be constructed so as to limit the outward course of the shoes. The conductor bars at switches and crossings are simply curved slightly outwardly. The shoes are connected to the

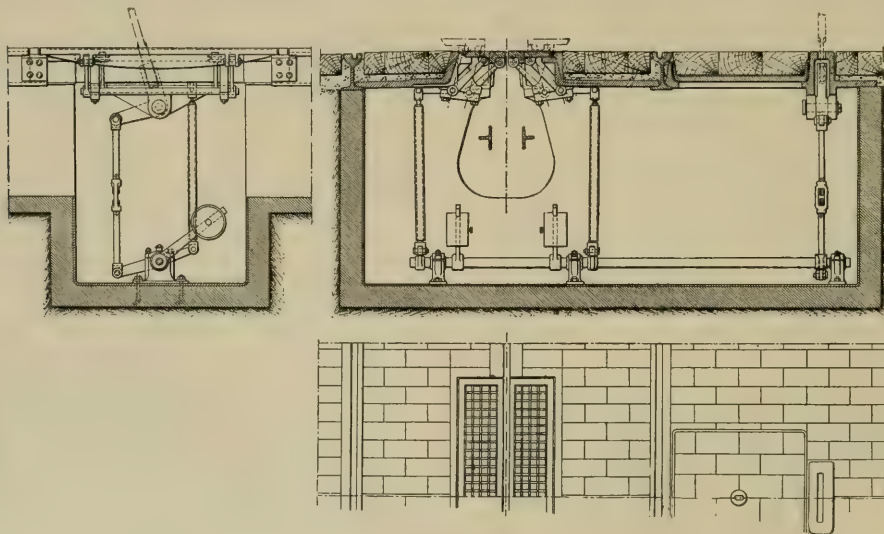


FIG. 5.

the flapper. The springs make the flappers press against the conductor bars. The contact may be made on the vertical or the upper face of the bars according to the way the road is designed. The flappers are not thick, in fact, the whole construction of the plow is very much cramped, for it must pass through the  $\frac{1}{4}$ -in. slot. The plow of this form is withdrawn easily, but it has to be specially weighted to make it descend, for it has only its own weight to overcome the tension of the flapper springs, so that they will take the vertical position necessary to pass through the slot.

There could be no good reason for not adopting one of these plow designs for a side-slot conduit with  $\frac{1}{4}$ -in. slot—for a center slot, with  $\frac{3}{4}$ -in. width, their use is out of the question—if no other complications were involved; but the plow is one of the most

leads by copper fuses. This plow construction is simple; in actual results it has proved itself to be efficient. It certainly is an improvement upon the "flapper" type.

The trap construction in its simplest form would be one in which the lids required to be lifted before the arrival of the car, and to be put back in place after its departure. This would be rightly considered a crude and laborious operation. Fig. 5 shows a form of trap which is operated after the car has reached its position. One throw of the lever opens the trap, which is so counter-weighted that the effort necessary for this is almost inappreciable. This trap construction has given excellent results in France, where forty of them are in operation. Where the flapper form of plow is used, the plow is lifted by means of an apparatus



similar to a brake-staff, which is placed on the platforms. The plow is connected to this staff by means of cables which are guided by conveniently located sheaves. On account of the width of slot of the side conduit, made necessary by the fact that it must be wide enough for the wheel flanges, the flapper form of plow has only been adopted for this construction of conduit. The plows are raised in guides attached to the side frames of the truck. In Brussels and Berlin the plows are not mounted on slides permitting a lateral motion across the car. The two slots of a double-track construction being located on the interior rails, it is necessary to carry two plows with a raising and lowering mechanism for each. If the requirements of the road demand cross-over switches from one track to another, a third conduit is necessary for a short distance at such points. The deviation of the slot to the center with the necessary plow carrier construction entirely obviates the difficulty of two plows and of a third conduit.

The use of the slides seems to the author to be a valuable feature of conduit electric railroads for the various reasons that have been given in the paper. Therefore the following explanation of a raising and lowering device for the plow, which will permit this sliding feature, is given in detail. Fig. 6 gives three views of such an apparatus. A are the side-bars, B the top-bar of the truck, and C the brake-rods, which must be placed outside the wheels as here shown. D is the plow shown in position on the side-slot conduit; it slides from this position to that of (1) on the center slot, or of (2) the position of the slot of the other track when crossing from the interior conduit on one track to the similarly placed conduit on the other track. The slide-ways are shown by the bars E. The bars F prevent the plow raising or tilting in the conduit, except in the central position (1), where the casting G, held in position by the lock H, performs the same function. The sliding bars are held in position by the steel castings I. The projecting central piece J, braced as shown, holds the plow in its raised position. The whole apparatus is supported by the channel beams K, which are bolted to the side-bars of the truck. In this way the vertical variation in height is limited to the small movement of the journal-box springs of the truck. The plow is raised in the following manner: The fixed screw L is turned by means of a removable crank placed at M; the block N makes the course from one end of the screw to the other. In the figure the block is in its position with the plow raised. The piece carries the two rollers O, over which heavy link chains run. The latter are stationarily fixed at one end P, and at the other end to the casting G. The piece G is raised by an amount which is twice that of the course of the block N. The latch R automatically locks the block N in place when it reaches the end of its course. This prevents the trepidation of the truck from lowering the plow when it is in its raised position for the overhead-trolley section of the road. The box S covers the double-pole switch which puts the car-leads in circuit, with the overhead or the conduit line as the case may be. This is done automatically with the raising or lowering of the plow, by means of the rod T, which is moved by the block N when this is near the end of its course in each direction.

The author is indebted to Mr. E. W. Mix, the chief engineer of the Societe des Etablissements Postel-Vinay of Paris, for his invaluable assistance in the design and manufacture of the apparatus above described. That it has been successful is largely due to his efforts.

It is a good plan to form the piece M so that it will only fit a controller handle, which can only be removed from the controller on the "off" position. In consequence, if the handle is used to raise or lower the plow, there can be no movement of the controller until the operation is finished. Generally there are two traps at the junction points of the two systems—one for each track. The conductor of the car can operate the trap, but it is preferable to have a man specially stationed for the purpose, if the car traffic is at all frequent. In practice the operation is as follows: When the car has stopped with the plow over or under the trap—a mark on the track gives to the motorman the exact position to stop—the motorman gives his controller handle to the trapman, who opens the trap, and lowers or raises the plow, closes the trap, and returns the handle to the motorman. At the same time the conductor lowers the trolley from or raises it to the trolley wire. The whole operation takes on the average to seconds when the men become accustomed to it. If these junction points coincide with regular stopping places to load or discharge passengers the loss of time due to this operation is inappreciable. The only

arcng at the conductor bars and at the automatic switch S, Fig. 6, is that due to the lighting circuit. This is too small to have any injurious effect upon the plow shoes, and the construction of the switch with a quick break is such as to remove any danger there also. If electric heaters should be used requiring rather large currents it might be necessary to cut them out of circuit during this operation. The car wiring for the mixed system is only slightly more complicated than for one system alone. The conduit circuit being completely insulated the ground wire must be removed from the controller. Two wires are run from the controller to two points on the double-pole switch S. These two points are thrown in by the switch with one pair of points connected to the two plow leads or with another pair connected to the trolley pole and the earth.

In the electrical apparatus the only special precautions to take due to the use of conduit is, first, to have the field coils insulated for 500 volts. With an overload line the difference of potential between the field and the carcass of the motor is that due to the drop in the fields. But with the conduit it can happen that one pole of the conduit circuit is grounded, and that the fields are directly connected with the other pole. This would give 500 volts difference of potential between the carcass of the motor and the field winding. All standard motors should stand this condition,

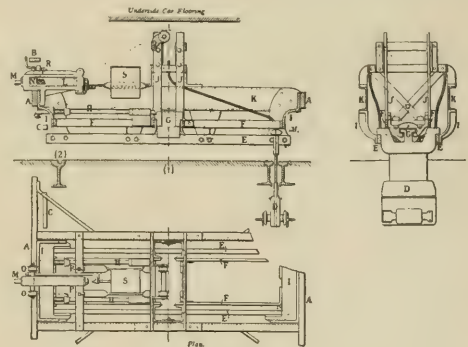


FIG. 6.

but it should not be omitted to be specified by the buyer. Second, when electric brakes are used, special insulation precautions are vitally necessary for the brake coils. A grounded conductor bar can subject these to 500 volts pressure during the entire time the car is on the conduit section. Not only is the annoyance due to burning up of the coils to be considered, but also that due to the short-circuiting of the line. An interruption of this kind is overcome by lowering the line voltage by means of a rheostat at the station, so that a current the amount of which is controllable at the switchboard may be sent through the fault. This excessive current will burn the plow fuses, thus clearing the line at the expense of leaving the faulty car "dead," to be hauled in by the succeeding one.

With a combined trolley and conduit line the conduit section should have a separate circuit. It may be possible to operate it successfully with a grounded return, but few engineers would care to propose it. It is much better to increase the operating factor of safety by having both sides of the circuit insulated. In case the conduit section or sections are reasonably close to the power station, this may be done with a separate dynamo located there for the conduit circuit, or by means of a motor generator. If the cost of the leads to the conductor rails from the station is excessive, the motor generator set may be stationed near the conduit section, and operated from the overhead circuit. The proper solution may be one of many different ones depending upon the local circumstances governing a specific case. As a result of actual tests, it has been found that the conductor bars of mild steel electrically connected with two bonds at each joint have a carrying capacity of about one-eleventh of copper bars of the same cross section. These bars can be largely increased in electrical carrying capacity by attaching to them bare copper cables for this purpose. It can



be readily seen what an economy this method affords over that of laying insulated cables in ducts. In Paris the cables have a cross section of 250 square millimeters, or about 500,000 circular mils. The cables are electrically connected to the bars at very short distances apart, to avoid electrolytic action between the two metals.

#### COST OF CONDUITS.

The question of the cost of conduits must be treated in a general way, local circumstances being such a large factor in the determination of cost that no other method is possible. The side-slot conduit can be built for about £500 less per mile of single track than the center slot. In the special work there is an economy in the slide-slot also as ordinarily built, as there are fewer frogs with three rails than with four. But if the slot is deflected to the center, as has been recommended in the paper, the economy cannot be realized; on the contrary, the cost will be somewhat greater, due to the cast-steel deflecting pieces and the bent slot-rails. It is generally stated that a conduit road costs twice as much as an overhead trolley road. This statement may be misleading, owing to the fact that an overhead trolley road may be very variable in its cost, depending upon pavement requirements, overhead construction adopted, and many other local conditions, such as the regulations for the return current by the rails. But the construction of the conduit part of a road is quite independent of these factors; for an overhead trolley road which would cost £5,000 per mile of single track, it is quite probable that the same road with the conduit construction would cost £11,000 for the same length—that is, the conduit properly speaking would cost £6,000 in excess of an overhead trolley road. If the overhead trolley line should have a first cost of £10,000 per mile of single track, there is no reason why the use of a conduit on such a line would double the cost as in the first instance. Roughly speaking, the cost of a conduit in this latter case would be £16,000. To arrive at an approximate comparison of the cost of the two constructions, it is fair to assume that the cost of paving and of the wheel rails is the same in both cases. For the conduit there should be added per mile of single track approximately the following material and labor: One hundred and five tons of slot rail, 40 tons of conductor rails, 210 tons of cast iron, £120 excess for bolts, etc., porcelain insulators £35, 1,400 cubic yards excess excavation, 1,200 cubic yards of excess concrete, £600 excess labor for track-laying, £400 sewer connections. Crossings, turnouts and special track work in general, cost 200 per cent more on an average for the conduit than for ordinary track. A cost which is wholly indeterminate is that of removing sub-surface obstructions. This, as has been explained, can often be reduced by varying the conduit depth to suit special cases.

Considering alone the items above enumerated they will amount to between £5,500 and £6,000. Deducting the cost of an average overhead construction, it can roughly be said that a conduit road will cost from £5,000 to £5,500 more per mile of single track than a trolley road under the same conditions, to which should be added the increased cost of special track work and the removal of underground obstacles. Under ordinary conditions the difference in cost will vary between the limits of £7,000 and £9,000.

The actual cost per single-track mile of the conduit roads installed by the author in 1896 for the Metropolitan Railway Co., of Washington, D. C., was £9,945. Of this sum £1,645 was for paving, in the proportion of one-third stone, using old sets, and two-thirds asphalt, leaving the cost per mile without paving £8,300.

The metallic structure cost less at that date than it would now. The temporary track is a very low item, the authorities having permitted a flat strap-rail to be laid on the pavement (mostly asphalt) by means of flat tie-bars with special seats at their extremities. It should be stated that this city is an exceptionally favorable one for the construction of conduit road, the streets being wide and with little traffic upon them, and the supervision being that of the thoroughly trained engineers of the United States Army.

The total cost per single-track mile of the open slot conduit system of the Second Avenue Railroad Co., of New York, compiled from the diary of W. C. Gotshall, engineer in charge of construction, was £11,841. In comparing this cost with that of the Washington conduit, it should be borne in mind that the items of cost of special track work, feeder ducts, paving, bonds, sewer connections, temporary track, are not included in this estimate, while they are in the Washington costs.

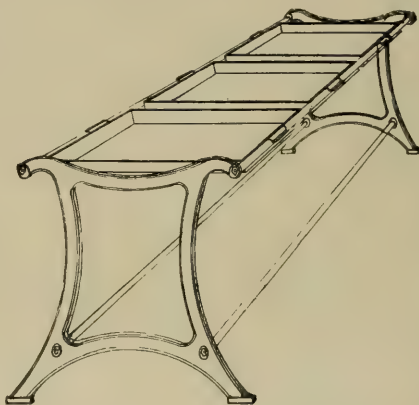
The author estimates the cost per single-track mile in England under fair average conditions to be £16,493, including wood paving, which is estimated at £3,305.

In concluding the author emphasizes the point that such a transmission system, being wholly an insulated one, can be calculated for the most economical drop of potential, which is not the case of an overhead line with rail return. Considerable saving, either in copper or boosters or both, can so be effected, which should be put to the credit of the conduit system in any estimate of the cost of such a system.

#### RACK FOR OIL SIGNAL LAMPS.

Managers using oil signal lamps on their cars to prevent possible rear-end collisions when the interior lights go out will be interested in the accompanying illustration of a lamp rack used at Baltimore for convenience in handling the oil lamps and for decreasing the risk of fire.

The stand or rack consists of two cast-iron end frames joined by four wrought-iron rods. The lamps are placed in tin trays,



16 in. wide, 28 in. long, and 3 in. deep, which are hung on the rods by curved handles, a rack as shown in the sketch having capacity for three trays on the two upper rods and a like number on the two lower ones. Each tray will carry 15 lamps.

The rack is kept near the barn door away from inflammable material, and at the end of the night runs, the lamps are taken from the cars and placed in the trays. The lamp cleaner then takes one tray to the oil house, where it is hung on a pair of iron brackets, while he cleans and refills the lamps. He then returns the tray and lamps to the rack, and goes through the same procedure with each tray in succession until all the lamps have been attended to. The rack is 31½ in. high, 34 in. long, and the end pieces are 52 in. wide at the base.

#### SUIT TO RECOVER \$600,000.

A suit has been instituted by Frank De Haas Robinson to obtain an accounting in a transfer of street railway stock. His petition states that he was the owner of 19,175 shares of stock of the Ft. Wayne Consolidated Railway Co. and of \$350,000 of stock of the Cleveland City Cable Ry. In view of his indebtedness to a number of banks it was agreed by his creditors to appoint a committee to take charge of Mr. Robinson's interest in Fort Wayne, raise sufficient money to retire the floating indebtedness of the road, foreclose the mortgage, and bid the road in. The committee was then to organize a new company, it being agreed that a certain portion of the stock of the new company was to be held in a pool and sold from time to time, the proceeds applied to the indebtedness of Mr. Robinson. The Fort Wayne roads were duly sold and purchased by the committee Sept. 9, 1899. It is then alleged that the balance of the agreement was not carried out.

## SUCCESSFUL RAILWAY SWINDLERS CAUGHT.

Gilbert J. Moffett, who for ten years has successfully practiced numerous swindling operations on steam and electric roads and accident insurance companies, was arrested and convicted a few weeks ago for using the mails for fraudulent purposes, and was sentenced to one year's imprisonment. He will spend a year at Fort Madison, Ia.

Moffett's criminal career has been brought to a close, for the present at least, through the efforts of Mr. Franklin J. Moore, of Philadelphia, assistant United States manager of the General Accident Assurance Corporation, Ltd., of Perth, Scotland, who caused his arrest and conviction at Council Bluffs, Ia.

Moffett's plan has been to pretend to get hurt on a train and then compromise with the railway company, or to take out an accident policy, claim to be hurt and collect on the policy. He is a shrewd man, and in the last ten years has swindled 21 insurance companies and many railroads. An account of one of Moffett's methods of getting hurt was published in the "Review" of August, 1898.

While holding the office of manager of an accident insurance office in St. Paul, Minn., Moffett met a man who had been swindling accident insurance companies and street railway companies by



GILBERT J. MOFFETT.

pretending to be hurt in accidents. He was so impressed with the man's scheme that he quit the insurance business and formed a partnership with him. Their first victim was the St. Paul & Duluth Ry. Moffett got a cane with a screwdriver in the end. While the train was running from Duluth to St. Paul he loosened a screw in the floor of the aisle of the car and fell over it. He pretended to be seriously injured, and when the train reached St. Paul his partner was at the depot to meet him. They asked for \$1,500, but the road compromised for \$600.

This plan proved so successful that it was soon tried upon other roads. The partners went to Chicago, and Moffett bought a ticket over the Rock Island to Englewood. He raised a screw in the car floor and his partner fell over it and injured his side while entering the car. The doctor who examined him said he had some broken ribs, and the claim agent for the Rock Island settled with him for \$200. Next Moffett went to St. Louis over the Chicago & Alton, and eight miles from St. Louis the train collided with a freight train and, of course, Moffett was among the injured, and the road paid him \$25. He held a Pacific Mutual accident policy and the company paid him \$600. Moffett and his partner got hurt a great many times in St. Louis and collected from street railways, railroad and accident companies.

Both of these men were aided in these swindles by the fact that each had an ununited fracture of the ribs and thus could always get doctors who would swear that they found broken ribs. It is remarkable the many different schemes Moffett had of getting hurt, so he could collect money from railroads and insurance companies. If he heard of a runaway or a train wreck, he would at once go to bed, summon a doctor and pretend to have been injured in the wreck or runaway. He had a complete list of all the railway claim agents and insurance adjusters in the country, and he lost no time notifying them when he chose to get hurt. He always made it a point to get the best doctors, as he stated in a confession made to Mr. Moore, after his conviction, that they were the easiest

deceived, and insurance companies were always willing to accept their statements, without questioning them.

Moffett has recently had several claims against the General Accident Assurance Corporation. June 24, 1900, he said he had fallen from a bicycle in Denver, and collected \$175 from the company.

He next took out a policy in the name of John A. Smith, went to Lincoln, Neb., where he claimed to have been hurt, and collected \$250. January of this year he feigned an accident which led to his arrest and conviction. While in Omaha, he learned of a railroad collision in Council Bluffs, Ia. He went there, rented a room, bandaged up his wrist and sent for a doctor. He said that he was hurt in the wreck and that several ribs in his right side were broken. He wrote to the Rock Island Ry. claim agent at Des Moines, saying he had been hurt in the wreck. The company paid him \$50. He held a policy in Mr. Moore's company under the name of James D. Karah. He notified him that he had been hurt, and sent a statement signed by Dr. Donald Macrae, formerly mayor of Council Bluffs, setting forth that he had some ribs broken. Another physician also examined him and reported that he was hurt.

Moffett gave the name of R. D. Clement, of Chicago, as an eye witness to the accident. Mr. Moore's letter to this party elicited no reply and the letter came back. On looking over Moffett's letter Mr. Moore noticed some peculiarities in the handwriting which agreed with the writing of a party who had collected several claims in Western cities. The handwriting of Karah and Moffett was identical. A detective was engaged to watch Moffett and in the meantime Mr. Moore went to Chicago to find the witness. He was much surprised to find this man was his old partner who had married, settled down and abandoned the swindling business. Mr. Moore then hurried to Council Bluffs and laid the case before the federal grand jury who indicted Moffett for using the mails for fraudulent purposes. He was arrested and after hearing the evidence against him pleaded guilty. The accompanying pictures show him both with and without a beard. For these we are indebted to Mr. Moore, who has detailed information in regard to 70 claims which Moffett has successfully collected from railway and insurance companies; but an adequate estimate of all the swindles he has perpetrated can probably never be made.

Moffett was very proud of having swindled the Lake Shore and told Mr. Moore that while living in Chicago he read of an accident which occurred in the Rock Island station caused by the air brakes of an incoming Lake Shore passenger train failing to work, so that the train struck the bumper. As many of the passengers had been thrown off their feet and the company had been unable to get their names before they left the station Moffett decided that he was in that train. He said: "I cut my hair off close and dyed it gray, shaved my beard and mustache, put on a pair of eye glasses and under the name of Brown secured indemnity for alleged injury." Moffett also assumed the name of the general passenger agent of the Lake Shore, A. J. Smith, and collected a number of claims. Other names assumed by him were: J. A. Smith, J. D. Karah, A. C. Bell, R. D. Clemens, George Miller, Will J. Weldon, George J. Spencer, J. R. Henry.

Another alleged accident swindler has just been placed under arrest through the instrumentality of Mr. Moore. The name of this offender is Joel E. Emerson and his operations are very similar to those pursued by Moffett. Emerson's scheme is said to be a plan whereby he claims sprains to his right ankle through a fall from a street car or a steam car.

On Feb. 19, 1901, Emerson put in a claim for \$157.14 with the General Accident Assurance Corporation of Scotland, and it is on this claim that his arrest has taken place, though six other charges will be used in attempting to secure a conviction.

This claim was not paid from the fact that agents of the company believed that something was wrong, and Mr. Moore was placed on the case. He followed it out, collecting evidence in various states, until he assisted in his arrest in Nashua, N. H., on April 17th.

It is stated that Emerson's ankle was injured in a logging camp many years ago and that it takes a very light jar to produce a condition that deceives even the most watchful physician. Emerson, it is claimed, has played this defect to defraud very many companies. He has done the most of his business through the mails and it is from this fact that the United States authorities are called into the case.

Emerson is about 50 years of age and has had a long career of crime. He has been an agent for insurance companies, and in



1898 was arrested and fined for representing a company that is not allowed to do business in Vermont. He has also served 15 years in the state prison at Windsor, Vt., for robbing a stranger of \$90 and a ticket to the Black Hills. Since getting out of prison he has spent most of his time in Vermont. After his arrest he was admitted to bail to await the action of the grand jury.

### VALUE OF TERMINAL FACILITIES.

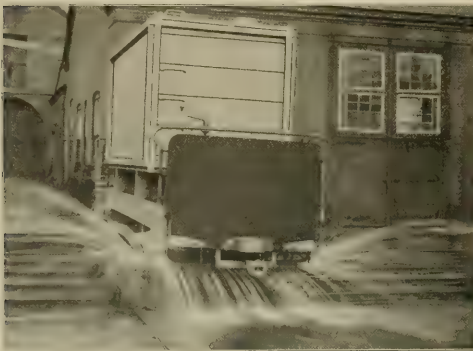
In an equity suit of the Pittsburg & Birmingham Traction Co. against the Second Avenue Traction and the United Traction Cos., testimony as to the value of the terminal loop through the downtown district of the city used by the defendants was given by a number of prominent street railway men. Pres. H. W. Moore, of the Pittsburg & Birmingham line, testified that he thought that the Second Avenue system would be practically useless without the use of the terminal because passengers would not patronize it if they had to transfer at the entrance to the loop. He estimated the value of the loop to the Pittsburg & Birmingham at \$150,000 annually.

Thomas A. Noble, an attorney, thought that 2½ cents per passenger would be a fair price for the privilege of using the loop, and I. A. McCormack, of Cleveland, estimated that 3 cents per passenger should be charged. John G. Holmes, of Pittsburg, thought that 2 cents per passenger would be the right price for the use of the loop and stated that if passengers had to transfer to the loop it would considerably reduce the travel. Albion E. Lang, president of the Toledo Traction Co., also testified that he had been over the line and considered 3 cents a passenger a fair price for the right. A. M. Neep, formerly secretary of the Allegheny Traction Co., George I. Whitney, Thos. S. Bigelow and other railway men agreed that the value of the right to the use of the terminal to be from 2 to 3 cents per passenger.

### SPRINKLING CAR FOR AUSTRALIA.

There has just been completed by the Taunton Locomotive Manufacturing Co., of Taunton, Mass., an interesting sprinkling car that is to be used on the Perth Tramways, of South Australia. The sprinkler consists of a strongly built cypress tank with walls 3 in. thick, carried on a body or framework of hard pine, which is mounted on a Brill No. 7 truck. The tank will hold 2,500 gallons of water.

The sprinkling pipes and water connections are all very large, none less than 4 in. in diameter, so that the full head of water in the tank is available and the water is distributed over a broad area.

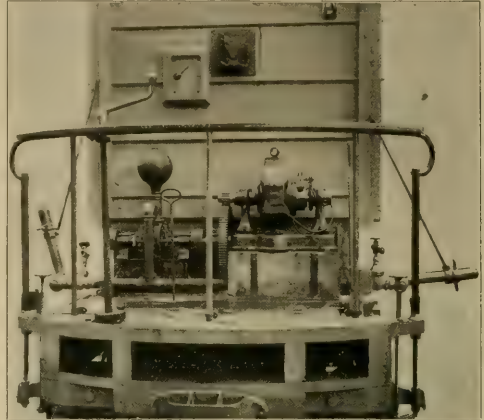


TAUNTON SPRINKLING CAR.

When working under gravity alone, the sprinkler will throw a volume of water covering a space of 8 ft. on each side of the track, but for broad boulevard work an auxiliary pump and motor are carried on the platform at one end of the car. This auxiliary outfit consists of a No. 2 Gould rotary pump, and a specially wound, slow-speed Holtzer-Cabot motor of 2½ h. p. Quick acting valves

with convenient levers are so arranged that the flow of water from the pump can be started and stopped instantly without injury to any of the apparatus. The shape of the discharge nozzle secures even distribution over a 40-ft. street, and the angle of the discharge pipe can be varied to any extent through 90 degrees.

This sprinkler was constructed for heavy work, and no attempt was made to secure a handsome appearance. The makers state that



MOTOR AND PUMP ON PLATFORM.

the tank might have been inclosed in a house with blinds, which would have improved the appearance of the car, though it would not in any way add to its value as a sprinkling machine.

### STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

Mr. W. H. Ham, of Washington, D. C., president of the Street Railway Accountants' Association of America, spent two days in New York last month making arrangements for the coming convention to be held in October. Mr. Ham informs the "Review" that the association's affairs are in excellent condition and every indication points to a most interesting and valuable meeting in the fall. The program will include one or two important committee reports, and particularly one on a system of keeping material and supply records. It is also probable that the question of "Taxes as an operating expense" will be re-opened and possibly this item will again be classified under operating expenses. It will be remembered that the committee on standardizing street railway accounts last year was greatly in favor of calling taxes an operating account, but in deference to the wish of the National Convention of Railroad Commissioners, the item was finally placed under "Fixed Charges." There is a strong desire among the street railway accountants, however, to have it again classified under "Operating Expenses."

The Accountants' Association has recently received a cordial invitation from the National Association of Railroad Commissioners to send a delegation to the next convention of the commissioners, to be held in San Francisco, June 4, 1901. The invitation has been accepted and a committee consisting of Messrs. Smith, of Chicago; McKay, of Milwaukee; and Ham, of Washington, will attend the San Francisco meeting in the interests of the street railway accountants. The National Convention has already endorsed the Accountants' standard system of accounts and has recommended that it be adopted by the various state commissions. The states of New York and Connecticut have followed this recommendation and it is expected other states will take favorable action soon.

It is reported that certain stockholders of the Chevy Chase (Md.) & Kensington Electric Railway Co. have applied for the appointment of receivers. The plaintiffs own \$13,000 of stock.



## OBSERVATION CAR IN SAN FRANCISCO.

An innovation in the way of trolley cars was started March 31st by the Market Street Railway Co., of San Francisco, which put in service a specially designed observation car, which makes three continuous trips per day of 20 miles in length, over the company's

makes the round trip, which is divided into five courses, in three hours and a half. The first course is from the starting point to the company's power house, where a stop of 10 minutes is made to allow the excursionists to inspect the plant; the second course is to the Affiliated Colleges, passing Mission Dolores and Golden Gate Park; the third course is to the ocean beach, where a stop



FIG. 1—OBSERVATION CAR "CITY OF ATLANTA."

lines. We are indebted to Mr. E. P. Vining, general manager of the company, for the following description of this car.

The new car has been named the City of Atlanta, and it is much larger than the ordinary trolley car. It leaves the starting point on Market St. at 9:30 a. m., 2:00 p. m. and 7:30 p. m. daily (except in stormy, rainy or unpleasant weather, when it is not run), and

of one hour is made, allowing the passengers to visit the Cliff House and other local attractions; the fourth course is on the return trip to Filmore St. hill, which is the steepest in San Francisco covered by an electric line; the fifth course is the return to the starting point on Market St. The fare for the round trip is 25 cents, and no transfers are received or issued. The car makes

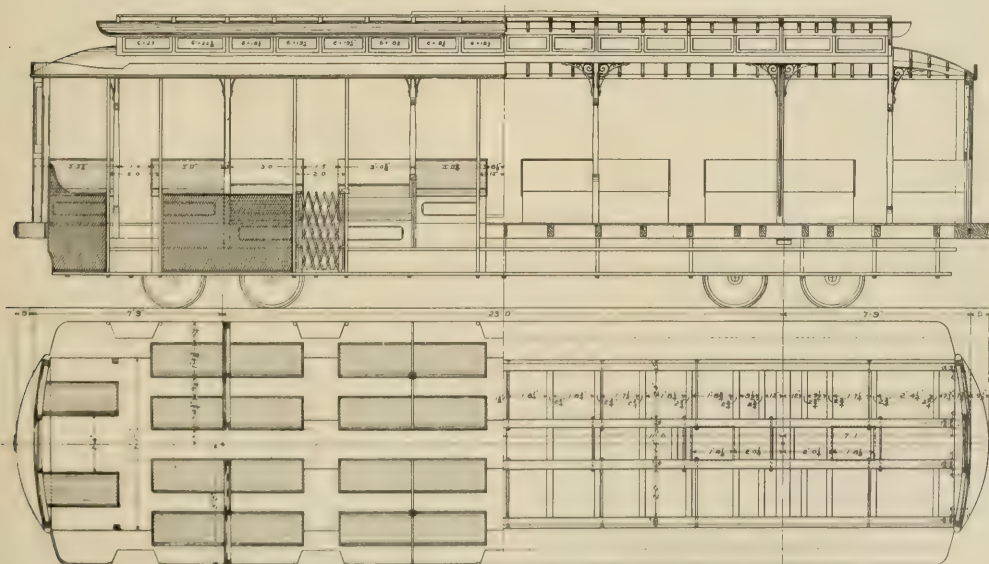


FIG. 2 PLAN AND SIDE ELEVATION OF OBSERVATION CAR.

no stops en route except those scheduled. This trip gives the passengers an unequalled opportunity for a general view of the city of San Francisco.

The car, as will be seen from the illustration, Fig. 1, is built so as to give all the passengers an unobstructed view, and it has proved a popular attraction from the start. The morning trip has averaged 50 passengers and the afternoon trip has invariably been made with the car full. The evening trip, up to the present time, has been somewhat less well patronized than the other two owing

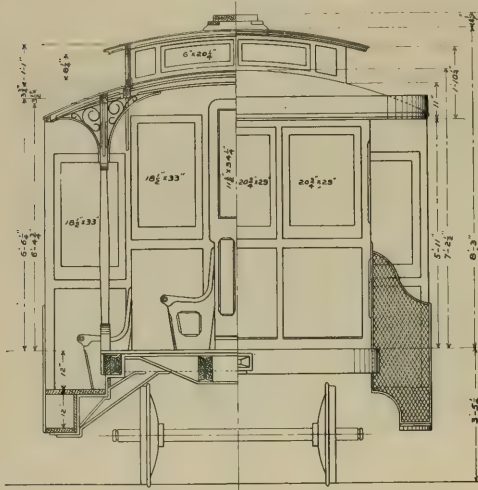


FIG. 3—HALF SECTION AND HALF END ELEVATION.

to the season not being well advanced, but with the warmer weather this trip is greatly increasing in popularity.

Figs. 2 and 3 show respectively the plan and side elevation and the end elevation of this car, which is of special design, for which a patent has been applied by the company. It is believed this is the first passenger car built with four rows of longitudinal seats, and this arrangement gives a seating capacity for 72 passengers in a car 40 ft. long and 10 ft. wide. As shown in Fig. 2 the inside rows of seats are elevated considerably above the outside rows, leaving the view of the inside passengers entirely unobstructed. The dimensions and proportions of the body of the car will be found by reference to the illustrations.

## STANDARDIZING STREET RAILWAY EQUIPMENT.

The committee on Standardizing of Street Railway Equipment, appointed at the recent meeting of the executive committee of the American Street Railway Association, has begun active work with a view to presenting a comprehensive report on the subject at the annual meeting of the association in October next. Mr. T. E. Crossman has been appointed secretary to the committee, and he, in conjunction with the members of the committee, will visit some of the leading manufacturers of street railway equipment to ascertain their views on the subject of standards.

The members of the committee are John R. Graham, Lynn & Boston R. R., Boston; N. H. Heft, Meriden Electric R. R., Meriden, Conn.; Frank G. Jones, Memphis Street Ry., Memphis, Tenn.; Willard J. Hield, Twin City Rapid Transit Co., Minneapolis; Conway F. Holmes, Metropolitan Street Ry., Kansas City. They request that all who are interested in the subject will correspond with the secretary of the committee, whose address is 1829 Park Row Building, New York, prior to May 20th, at which time a meeting of the committee will be held in Buffalo.

The Toledo, Monroe & Detroit Electric Railway Co. began operations between Toledo and Monroe, Mich., April 10th.

## ELBERFELD-BARMEN SUSPENSION RAILWAY.

The suspension railway across the valley of the River Wupper, from Elberfeld to Barmen, Germany, was opened March 1st for passenger traffic, and the result is said to be highly satisfactory. Although the crowds were immense and all the cars filled to their utmost capacity, the trains ran smoothly, and no accidents occurred. The cars did not swing at all, even where the curves were sharpest. Ingress and egress to the cars is effected very rapidly. The surface railway makes the trip in 25 minutes, while the suspension railway accomplishes it in half the time, and it is contemplated to still further increase the speed. The fare is 10 pfennigs (2.38 cents).

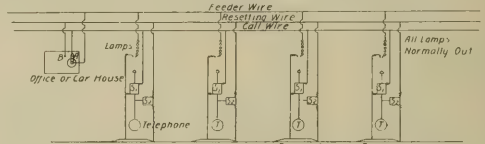
## CALLING CONDUCTORS TO THE TELEPHONE.

Where a private telephone system is used for dispatching cars on an interurban road, it is often highly desirable that some way be provided whereby the dispatcher can signal a car out on the road and open communication with the train crew.

Mr. D. Valentine, chief engineer for the Massachusetts Electric Companies at Brockton, Mass., has devised a system that accomplishes this purpose, the essential feature being a series of semaphores, one of which is placed near every telephone instrument along the line, or if preferable only at the turnout instruments. Normally these signals are set so an approaching motorman sees only the edge and not the face of the disk.

The accompanying diagram illustrates the system. When the dispatcher desires the conductor on any particular car to go to the telephone, he closes the switch at A, thereby exposing at each instrument on the line of a red semaphore with the word "phone" painted on it. As the conductors reach these signals they immediately call the dispatcher on the telephone instrument and find out who it is that is wanted. The signals are all left in the "calling" position until the particular conductor whom it is desired to reach has arrived at an instrument and responded. This may possibly cause one or two conductors that are not wanted to call before the right one answers, but the delay is very slight and by keeping careful track of his cars the dispatcher need not set the signals until he knows the desired car is nearing an instrument.

When the man wanted has been reached, the dispatcher throws the switch to B, when all signals will at once return to clear without further attention. As an adjunct to the semaphore disk, a



WIRING DIAGRAM, VALENTINE TELEPHONE SYSTEM.

bank of lamps is placed over each signal, and these light up when the disk turns to the calling position. No batteries are necessary, as the signals are operated by current taken from the railway circuit. The wires for the calling signals are entirely independent of the telephone circuit.

The semaphore used is exactly similar to the one used in the Valentine block signalling system, which was described in the "Review" for April, page 252. By closing the switch at A, current flows through the calling wire, actuating all the solenoids S1, and causing the semaphore plungers within these coils to rise. As the plungers rise they make a quarter turn, this twist motion being given by a small peg in the interior of the solenoid, which runs in a quarter helical groove on the face of the plunger. When in its highest position the head of the plunger closes the switch in the lamp circuit, as shown, causing the lamps to remain lighted as long as the signal is set at the "calling" position. The semaphore plunger is held in its raised position by the plunger of S2. By closing the circuit to the resetting wire, the solenoids S2 are actuated, releasing the semaphores, which drop of their own weight, turning at the same time back to "clear."

## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### TURNING OF BICYCLIST ONTO TRACK WITHOUT NOTICING CAR.

*Medcalf v. St. Paul City Railway Co. (Minn.), 84 N. W. Rep. 633. Dec. 17, 1900.*

For a bicyclist riding 40 or 50 feet behind a street car that suddenly slows down on account of a wagon ahead of it to attempt to pass the car by turning onto the adjoining track, without noticing a car approaching on that track, which, by the exercise of the most ordinary care and prudence, he could not fail to see, and with which he collides, the supreme court of Minnesota holds is such contributory negligence as to warrant the direction of a verdict for the company, notwithstanding negligence in the speed of the car.

### WHERE CHILD RUNS IN FRONT OF APPROACHING CAR.

*Campbell v. New Orleans City Railroad Co. (La.), 28 So. Rep. 985. June 4, 1900. Rehearing denied Nov. 19, 1900.*

The supreme court of Louisiana holds that if an accident happens to a child by its running upon a track in front of an approaching electric car, no liability attaches to the motorman or his employer if the circumstances were such as were not calculated to cause the motoneer, in the exercise of proper prudence and caution, to suspect that it would do so, and he takes immediate action to save the situation the moment its intended course is shown.

### DUTY OF DRIVER ON TRACKS TO TRY TO PREVENT COLLISION.

*McCann v. New York & Queens County Railway Co. (N. Y. Sup.), 67 N. Y. Supp. 748. Dec. 31, 1900.*

To instruct a jury that a driver of a carriage, whose back was to an approaching car, was under no legal obligation to look around to see if it was coming, the first appellate division of the supreme court of New York holds was reversible error, it being his duty, while driving upon street railway tracks, if he knew that a car was approaching, and was liable to or was about to collide with the carriage which he was driving, to do whatever he could to prevent that collision, and if he did not do that, and by reason thereof he sustained an injury, the street railway company could not be held liable for it.

### \$1,054 FOR GUARD BAR FALLING ON MAN'S HEAD.

*Smith v. Nassau Electric Railroad Co. (N. Y. Sup.), 67 N. Y. Supp. 1044. Jan. 11, 1901.*

A guard bar of wood, four inches wide, an inch thick, and about sixteen feet long, fell upon the head of the plaintiff as he was boarding an open car. He became senseless and ill, and suffered great pain and dizziness, attended with nausea and vomiting. Throughout the summer he suffered from pain in the head, and could not go out in the sun except with the penalty of violent pain and dizziness. He was a farmer, and was forced to carry a sunshade into the fields when he superintended his men, and could not work himself. The following summer he suffered like pain and discomfort and inability, but in a lesser degree, he testified. Others testified that his mental processes were not as quick and active as they were previous to the accident. Under these circumstances the second appellate division of the supreme court of New York holds that a verdict in his favor for \$1,054 was not excessive.

### SNOW BLOCKADES EXCUSE FAILURE TO RUN CARS WITH AGREED FREQUENCY.

*Buffalo & Lancaster Land Co. v. Bellevue Land & Improvement Co. (N. Y.), 59 N. E. Rep. 5. Jan. 8, 1901.*

A contract to construct an electric street railroad and run passenger cars thereon as often as once every half hour from 7 a. m. to 8 p. m. each day, as such street railroads are usually run, the

court of appeals of New York holds, fairly construed, does not absolutely bind the company making the contract to run a car every half hour each day under all circumstances and conditions, whether possible or not. Nor does it consider that there is a substantial breach of the contract where, say during a considerable part of the time between Dec. 1 and April 1, heavy snowfalls and drifted snow render it practically impossible to run cars over the road every half hour, but the snow is removed with the appliances and assistance usually and ordinarily employed for that purpose by street railroads, and, when so removed, the cars are run with the agreed frequency.

### PARENT'S NEGLIGENCE—MOTORMAN'S EXCITEMENT—ADOPTION OF APPLIANCES.

*Warren v. Manchester Street Railway (N. H.), 47 Atl. 735. July 27, 1900.*

A parent's negligence, the supreme court of New Hampshire holds, is not imputable to his child.

A motorman's excitement, which causes him to err in judgment in his efforts to stop his car to avoid an accident, as for example causes him to use the brake when he ought to use the reverse, the court holds, will not alone excuse him from the charge of negligence, but is one of the circumstances to be considered by the jury in determining whether he was guilty of negligence or not.

Again, the court holds that a street railway company's duty to equip its cars with safety appliances is not limited by their convenience, but includes the adoption of such appliances as men of average prudence would use under the same circumstances.

### INSTRUCTION TO JURY ABOUT TESTIMONY AS TO PAYMENT OF FARE.

*Reem v. St. Paul City Railway Co. (Minn.), 84 N. W. Rep. 652. Dec. 21, 1900.*

This was a personal injury case which involved the question of whether the plaintiff had paid his fare and was a passenger upon the defendant's car. At the trial the court instructed the jury: "Now, gentlemen, it is proper for you to consider all the testimony bearing upon the question as to whether this plaintiff paid his fare or not. Of course, it matters not whether he paid his fare with a nickel or with pennies, or in any other way. If in fact he did pay his fare, then he became a passenger upon the car. But, of course, it is proper for you to carefully remember the proof he offers in regard to the payment of the fare, and what other witnesses have testified in regard to the payment of the fare; for, even while he may be mistaken in regard to the manner in which he paid his fare, still if in fact he did pay his fare he thereby became a passenger. But if he was mistaken—has given incorrect testimony in your presence—in regard to the manner of paying his fare, that is proper for you to consider upon the credibility which is to be given to his testimony and the testimony of the other witnesses in this regard." This, the supreme court of Minnesota holds, was a correct statement of the law.

### SUFFICIENT DILIGENCE TO MAINTAIN TRACK IN SAFE CONDITION.

*Casper v. Dry Dock, East Broadway & Battery Railroad Co. (N. Y. Sup.), 67 N. Y. Supp. 805. Dec. 31, 1900.*

Assuming in this case that there was evidence to go to the jury that at about 12 o'clock in the day a rail had become loosened, so that the plaintiff's foot was caught between the rail and the pavement, and that proof of this fact, unexplained, justified an inference of negligence, the first appellate division of the supreme court of New York holds that this presumption was rebutted, so that it was proper to direct a verdict for the defendant where the evidence showed that employees were constantly inspecting the road, and repairs were promptly made; that several trips had been made over it that day, before the accident, to ascertain if anything was out of order; that at about 11 o'clock an inspector had observed that there



were two holes that needed spikes, and had immediately reported same by a note which he sent by a conductor, and that the repair was made shortly after 1 o'clock, or within about an hour after the accident.

#### SECOND CONSOLIDATION VALID AND CARRIED POWER TO EXTEND TRACKS.

In re Trenton Street Railway Co. (N. J. Ch.), 47 Atl. Rep. 819. Dec. 20, 1900.

The court of chancery of New Jersey holds that where, by a consolidation of several roads, a corporation de facto or in fact was formed, and this latter formed a part of a second consolidation with still other roads, the second consolidation agreement would be valid notwithstanding one of the roads in the first consolidation might have been incapable of consolidating with another street railway, and that the corporation formed by the second consolidation would have the power of each of the constituent members of both consolidations, including the power to extend tracks.

The act of 1891, which put all street railroads within the class of roads included within the general act of 1888 which authorized the consolidation of horse roads, the court holds was a perfect act, and that the reference to the provisions of the act of 1888 was sufficient, without a re-enactment of nearly the whole body of that statute.

#### DUTY AT CURVE TO PASSENGER ON PLATFORM— CONDUCTOR'S TIME CARD NOT ADMISSIBLE.

Lucas v. Metropolitan Street Railway Co. (N. Y. Sup.), 67 N. Y. Supp. 833. Dec. 31, 1900.

The defendant, having permitted the plaintiff to go upon its car and taken his fare, the first appellate division of the supreme court of New York holds, obligated itself to exercise extraordinary care to transport him to the point of his destination without injury. It could not expose him to unreasonable danger, even though he stood upon the platform of the car. When it was about to run its car around a curve at such a rate of speed as would be sufficient to wrench his hands from the hand rail of which he had hold, and throw him to the street, it owed him the duty of informing him of that fact, or indicating to him in some way that he must exercise at that point increased care for his own safety. Failure to perform this duty, the passenger being free from negligence, the court holds, rendered the company liable for damages for his injury.

Refusal of the trial court to admit the time card of the conductor of the car, showing the exact time when the accident occurred, it is held, was not error, the appellate division being of the opinion that the time card was properly excluded. It says that it was, at most, a memorandum made by the conductor, a servant of the defendant, of which the plaintiff had no knowledge, and which could not possibly bind him in any way. It might be referred to by the conductor for the purpose of refreshing his recollection, but it could not be introduced in evidence for the purpose of corroborating the testimony of the conductor or to establish the fact as to the time when the accident did actually occur.

#### NEGLIGENCE NOT SHOWN BY USE OF SHORT CAR WITHOUT GATES, NOR BY JOLT AT SIDING.

Byron v. Lynn & Boston Railroad Co. (Mass.), 58 N. E. Rep. 1015. Jan. 2, 1901.

A passenger was thrown to the ground by a swaying or jolt or lurch of a car as it returned to the main track from a siding. But upon a full consideration of the evidence, the supreme judicial court of Massachusetts is of opinion that it would not justify a finding that the company was negligent. The car, it says, was a short one, running upon a single track, and had not gates upon the platforms. But such cars are common. There is no statute (in that state) which forbids their use, or requires them to be equipped with gates. So the court holds that the use of such a car was not negligence. And then it says that such motions of street cars are of common and frequent occurrence, and are to be expected, to a greater or lesser degree, whenever the car passes from one track

to another, and so are of the class of usual and unavoidable incidents in the use of cars upon the street. Unless they are unusual in degree, and caused by some defect in the car or the track, or by some unusual or dangerous rate of speed, they furnish no evidence, it holds, of negligence on the part of the carrier or of its servants. In this case, it goes on to say, there was no evidence that the jolt was due to any defect in the car or in the track, or that the car was proceeding at an extraordinary speed. The witnesses who gave an estimate of the speed placed it at from  $3\frac{1}{2}$  to 4 miles an hour, and there was no one who testified that the rate was either unusual or dangerous. The jar felt by the different witnesses was not so great as to be unusual, or as to justify a finding that it was due to negligence. Hence, exceptions to a judgment in favor of the company are overruled.

#### PROOF OF CARE ON PART OF FOOT TRAVELER RE- QUIRED.

Mathes v. Lowell, Lawrence & Haverhill Street Railway (Mass.), 59 N. E. Rep. 77. Jan. 4, 1901.

A foot traveler whose course is across the tracks of a street railway, the supreme judicial court of Massachusetts holds, must exercise care to avoid being hurt by the cars, and if he is struck by a car and injured or killed, there can be no recovery, in a suit against the railway company for damages, unless the plaintiff shows by affirmative evidence that the traveler was in the exercise of due diligence to avoid injury. And, further, when the whole evidence has no tendency to show care on the part of the traveler, but, on the contrary, shows that he was careless, it is the duty of the court to direct a verdict for the defendant.

#### EXCHANGE OF PLACES BY CONDUCTOR WITH MO- TORMAN.

Gamble v. Akron, Bedford & Cleveland Railroad Co. (Ohio), 59 N. E. Rep. 99. Nov. 27, 1900.

Where a conductor on an electric car, who was also a competent motorman, temporarily exchanged places with the motorman, there being at the time no apparent danger of accident, to enable the latter to eat his dinner, and while the conductor was running the car a collision occurred with a snowplow running around a curve in the opposite direction, solely through the fault of the company's train dispatcher, fatally injuring the conductor, the conductor, the supreme court of Ohio holds, was not chargeable with contributory negligence merely by being in the place of the motorman and standing at his post while endeavoring to avert the impending collision. It holds that where one of the company's rules merely defined the regular position of the conductor when not collecting fares, and did not prohibit him from temporarily occupying any other position, while by two general rules he had full charge of the car while in service, that this implied that he might be anywhere in the car while in the performance of duty. In an emergency—such as, for example, an accident to or sudden illness of the motorman—he might be in the vestibule in the place of the motorman, and, if competent to do so, might act as motorman. So it does not think that there was in this case any violation of either the letter or spirit of rules of the character referred to, when construed together, when the conductor temporarily exchanged places with the motorman in order that the latter might eat his dinner. Moreover, the court declares that it is not willing to accept it as the law that a motor engineer, as this conductor was for the time being, is guilty of contributory negligence merely because he remains in his dangerous position and continues his efforts to avert calamity from the passengers behind him.

#### LIABILITY FOR INJURY OF PASSENGER ATTEMPTING TO LEAVE CAR AFTER COLLISION.

Wanzer v. Chippewa Valley Electric Railroad Co. (Wis.), 84 N. W. Rep. 423. Dec. 7, 1900.

sustained by a passenger for hire on an electric car, by reason of its running into a load of hay at 10 minutes after 8 o'clock on a June evening. One of the questions submitted to the jury elicited the answer that a prudent person engaged in the business of the company, who exercised the utmost care and forethought for the safety of passengers, would not have foreseen, in the light of the

attending circumstances, that an injury to the plaintiff would be the natural and probable result of operating the car as it was operated. Now, the supreme court of Wisconsin holds that this answer, upon which the company relied, presented an insurmountable objection to holding that the judgment which was rendered for the company was supported by the findings of the jury, because the answer did not embody the standard of care required of the company. There were, it says, several persons in the car besides the plaintiff. The company owed the same duty of care and forethought for the safety of all of them. If by the exercise of such care and forethought its employees, or any of them, in charge of the car, would have foreseen, in the light of the attending circumstances, that an injury to any of such passengers would be the natural and probable result of operating the car as it was operated, and failed to do what they could to prevent such injury, then the company would be guilty of actionable negligence, whereas the question submitted and answered limited the company's care and forethought to the plaintiff alone. Furthermore, the court holds that the darkness of the night, caused by the coming of a storm and the trees along the street, and the liability of teams to be upon the track, made it a proper question for the jury to determine whether, under the circumstances, the speed of the car was negligently high. The court assumes that the reversal of the car and the consequent blowing out of the circuit breaker, was not of itself actionable negligence. But the flash, explosion, and collision it thinks were well calculated to shock a nervous person of a class such as are liable and expected to ride upon street cars, as well as to travel upon the public highways. And it holds that this passenger would not be precluded from a recovery by the mere fact that she unwisely attempted to escape from the car, after the collision, instead of remaining quietly in the car. However, to say that the company was required to exercise "the utmost care and forethought for the safety of passengers," and the like, the court holds misleading, if not erroneous.

#### GOING NEAR TRACK TO UNLOAD WAGON WITHOUT WATCHING FOR CARS.

*Davies v. People's Railway Co. (Mo.)*, 59 S. W. Rep. 982. Dec. 11, 1900.

At a point where building materials had been deposited on the street leaving just enough space between them and a street car track for the unloading of wagons, a man who had gone very close to the track while assisting in unloading heavy iron beams from a wagon was struck by a car. His averment was that he was struck by the car wholly and entirely through the fault, carelessness, and gross negligence of the agents, servants, and employees of the company who were operating the same, who failed to check the speed of the car or to ring the bell, or to in any manner warn him of the approach of the car, although he was standing with his back to it, and in plain view of the persons engaged in its operation. The supreme court of Missouri, division No. 1, holds that a peremptory instruction should have been given for the company. Certainly, it says, it must go by the saying that the voluntary assuming of a position upon or so near to the tracks of a street railway, over which cars are run every few minutes, that they cannot pass without inflicting an injury to the party so positioned, unless the intervention of some independent agency occurs to prevent it, is an act of the grossest negligence. If in taking the position assumed by this party, and at the same time engaging in an undertaking, as he said he was, that prevented his seeing or hearing the approach of the cars that he knew were due and liable to pass along at any moment, did not constitute an act of negligence that must be said to have contributed to the injury resulting to him on account of being run against by a car pursuing its usual course upon the track, it would be idle to search the field of practical experience for an illustration of what is termed in law an act of contributory negligence. He had no right to assume a place of danger upon the track, deliberately engage in an undertaking in such a manner as to deprive him of the senses of sight and hearing,—the common avenues through which the approach of danger is communicated,—and trust that the company's agents, in the course of their employment, would be more considerate and watchful for his safety than he himself had been. There was neither allegation nor proof that the injury was wantonly or willfully inflicted by the agents of the

company in charge of its car, and, if the party injured was not entitled to recover for his injuries on account of his contributory negligence, as he himself showed, there was nothing, the court holds, left for the jury, and no possible good could come from a further prosecution of the inquiry as to the extent of the company's negligence in the case, the doctrine of comparative negligence having no recognition in this court.

#### RIGHTS AND DUTIES OF CITY STREET SWEEPER ON TRACK.

*Dipalo v. Third Avenue Railroad Co. (N. Y. Sup.)*, 67 N. Y. Supp. 421. Dec. 7, 1900.

A street sweeper in the employ of the city, while bending over, sweeping between the rails of a street railway track, and facing to the south, was struck, as he alleged, by a north-bound car. The trial justice, in his instructions to the jury, charged that, as a street sweeper, the man had a right to be where he was; that he was bound to use ordinary care, and that the company was also bound to use ordinary care in not running him down. The ordinary care which this charge required of the sweeper, the first appellate division of the supreme court of New York holds, referred to the conditions under which he was at the time working; and that measure of care, namely, ordinary care, was only another way of stating that it was his duty to exercise reasonable care to avoid injury. The charge in this respect, it holds, was sufficiently explicit, without amplification, and stated the proper rule, so that it was not error to refuse a request for an instruction "that the plaintiff was bound to use care commensurate with the dangers and risks of the situation." Nor does it consider that it was error to refuse a request to charge that "the plaintiff was bound to look and listen for the approach of cars, and to exercise reasonable care to avoid them and get out of their way." That was, in substance, it says, a request to charge the jury the general rule of law applying to pedestrians approaching railway tracks. That rule, in its broad statement, does not apply to persons whose duties in the public service require them to work in or upon car tracks upon a public street. In this case, a car passed the sweeper, and he immediately resumed his work upon the track, and had the right to assume that some notice of the approach of another car would be given him. But, even if he had not, it was for the jury to say whether, under the circumstances, he was bound to look and listen. The request made of the justice was that he should charge, as a matter of law, that the plaintiff was bound to look and listen for the approach of cars, and to exercise reasonable care to avoid them. As the request with reference to reasonable care was coupled with that request for a positive instruction, as matter of law, as to the duty of the plaintiff to look and listen under the conditions proven, the whole request was unavailing. Judgment for plaintiff affirmed.

#### SICKNESS DOES NOT ENTITLE PASSENGER TO RIDE ON PLATFORM IN VIOLATION OF RULE.

*Montgomery v. Buffalo Railway Co. (N. Y.)*, 58 N. E. Rep. 770. Dec. 4, 1900.

A passenger with a transfer ticket boarded a street car, placed himself upon the rear platform, and tendered his ticket to the conductor. The latter called his attention to one of the company's rules, which provided that conductors should "not allow passengers to sit or stand on, or to crowd, the rear platform, but will politely request them to take seats, or to stand inside the car," and directed him to go inside the car. This the passenger declined to do, stating that he had a sick headache, was nauseated, and that he expected to be affected actively by the nausea at any moment. The conductor, however, insisted upon compliance with the rule, and, the passenger refusing compliance, the car was stopped and the passenger was ejected therefrom, though with no excessive force or physical injury. Now, the company not only had the right, but it was bound, the court of appeals of New York holds, to make rules and regulations to insure the safe, effective and comfortable operation of its corporate business; and whether any particular rule is lawful and reasonable is a question of law for the court. This particular rule being admitted to be reasonable, the court withholds its assent from the proposition that the right of enforcement might depend upon particular



circumstances. It maintains that, if the rule was a reasonable one, the passenger was bound to submit to it, and that it was the duty of the conductor to enforce it. Therefore, in ejecting him from the car upon his refusal to submit, the conductor was acting lawfully in the discharge of his duty. The passenger, by his conduct, had forfeited his right to be carried any further. A railway company is not obliged to carry persons, unless they are willing to submit to, and to be bound by, the reasonable rules and regulations which it has established. This passenger, if in the physical condition described by him upon the day in question, was not obliged to travel upon the street car; but if he chose to do so, he was bound to submit to its regulations. He had no sufficient reason in law for complaining because the conductor performed his duty, and compelled him to leave the car.

#### TROLLEY ROAD ON COUNTRY HIGHWAY NOT AN ADDITIONAL SERVITUDE.

Ehret v. Camden & Trenton Railroad Co. (N. J. Ch.), 47 Atl. Rep. 562. Nov. 27, 1900.

A trolley railway upon a country highway, the court of chancery of New Jersey holds, is not an additional servitude upon the land of the abutting owner, who owns to the middle of the road. It says that it fails to perceive any difference in the easement which the public has in a country road, on the one hand, or a city street, on the other, which would make a trolley railway operated under the act of 1893 an additional servitude in the one instance, and not in the other, and the law, it says, is settled that a trolley road in a city does not entitle to compensation. There being no intimation that the cars or motive power or speed or tracks are to be different from other roads known under the name of "trolley railways," it says it must be assumed that the road is to be used as an ordinary street railroad, the motive power of which is electricity. The features of such a road are that its tracks are laid so as not to interfere with the use of the surface of the road by other vehicles; that its cars are of such size, and run at such a speed, as not to interfere with other traffic; that such stops are made as will accommodate those living along the line of the road. So used, the court declares that it does not perceive the least difference in the adaptability of such a road to the uses of a highway, whether it be a country road or a municipal street. Its design is to serve the primary purposes of a highway, namely, to enable people to pass from one place to another. If a distinction is to be drawn between the highways and streets, upon what line shall they be distinguished? If density of population along the highway is to be the criterion, how closely must the houses stand? Must they be within 50 feet, 50 yards, or 500 yards, to destroy the right of an abutting owner to damages? If the test is to be a corporate test, and all roads lying within townships to be within one class, and all roads within other municipalities within the other class, what is the substantial basis of difference? The court can perceive none. Then, again, a rural community in a short time may become an urban community, and thus the abutter upon a highway, who now has a right to damages for the location in front of his premises of a street railway, the next year may be stripped of that right by the fact that neighbors have built in his vicinage, or because the lines of a borough have been extended so as to include his property. In conclusion, the court says that, as it must assume that the structure to be constructed on the highway in question is to serve the public within the township in exactly the same manner as within a municipal corporation, it cannot perceive why the road does not serve the people of a township in the same way as the people of a city.

#### COLLISION AT CROSSING—SPEED—DEFECTIVE APPLIANCES—LOOKING AND LISTENING.

Roberts v. Spokane Street Railway Co. (Wash.), 63 Pac. Rep. 506. Nov. 28, 1900.

Safety in the rate of speed, the supreme court of Washington says, is nearly always relative. Here, a boy between 10 and 11 years of age, who was riding a bicycle behind a west-bound car, turned to cross the adjoining track somewhat diagonally, at a cross street, and was struck by an east-bound car that was running at a speed of about  $2\frac{1}{2}$  miles an hour. The motorman testified that

as soon as he saw the boy he made an effort to throw the current out of the car with the controller, and the handle broke,—pulled out of the socket,—because wired down. Then he made an effort for the reverse lever, and it came in contact with the disabled controller handle. He then threw the overhead switch, and disconnected the current from the trolley wire to the motors. Had the controller been in good condition, he could have stopped the car very nearly instantly, considering the place and rate of speed. As it was, the car, after the collision, stopped within 14 feet. Now, under all the circumstances, it could not be determined, as a matter of law, the court holds, that the rate of speed was not excessive, and the question of negligence therein was properly left to the jury.

The railway company was negligent in the operation of the car, the court further holds, because the controller handle was defective, and the car could not be stopped with the same facility as if the appliance had been sound. As to the question of negligence in one car passing another at a street crossing, it says that also was one of fact, in the light of all the evidence in the case.

Nor does the court consider that it was negligence per se, or in and of itself, for the boy to pass from behind the west-bound car for the purpose of crossing the other track. Neither does it deem it negligence per se if it is not shown that one looked and listened in crossing a street railway. Failure to look and listen before crossing the tracks of an electric railway in a public street, where the cars have not exclusive right of way, it holds, is not negligence, as a matter of law.

Judgment for the plaintiff affirmed.

#### NOT LIABLE FOR INJURY TO NEWSBOY KNOCKED OFF CAR IN PASSING TEAM.

Padgitt v. Moll and the Citizens' Railway Co. (Mo.), 60 S. W. Rep. 121. Dec. 18, 1900.

This action was supported by testimony which tended to show that a newsboy, ten years old, who for some time had been in the habit of jumping on the street cars as they passed along, offering his newspapers for sale, and jumping off when he had gone through a car, jumped on the running board at the front end of a grip car, offered his papers to a passenger on the front seat, and then passed on towards the rear of the grip car, behind the gripman, walking on the running board, offering his papers for sale to the passengers as he came to them, and while so doing, and holding to the stanchion, the moving car carried him against the tongue or horses of a delivery wagon backed up to the curb, which he had not seen, and which knocked him off the running board, so that he fell under the trailer, having a leg so crushed as to require amputation. At the time of the accident the car was moving at a moderate rate, the gripman was at his post looking ahead, and the conductor was on the rear platform.

Mr. Justice Valliant prepared an opinion in the case, for division No. 1 of the supreme court of Missouri, in which he said that the circuit court did not err in refusing to instruct the jury that the railway company owed the newsboy the duty of observing for his welfare the same high degree of care that it owed in respect to a passenger. The relation of the boy and the company to each other was not analogous to that of the parties in certain cases which serve to illustrate the principle that when a carrier of passengers for hire knowingly receives in its car or other conveyance a person who comes in for the purpose of being transported, and the carrier enters upon the act of carrying him, the person while being so carried is a passenger, regardless of whether he has paid or is expected to pay his fare, which principle will include mail agents and newspaper vendors on steam railroads traveling from one end of a route to the other. But, he went on to say, a newsboy jumping on and off a moving street car to sell his newspapers; not hailing to stop the car to receive him, nor signaling to stop to allow him to alight; not asking nor receiving permission, either express or tacit; not asking nor waiting for leave or license, but jumping on and off under circumstances that clearly indicate no purpose to pay fare, and no aim to be transported, but only to avail himself of the presence of persons on the car likely to buy his papers,—is in no sense a passenger, and the carrier is not under obligation to observe towards him the same degree of care that the law requires to be observed towards a person in the hands of the carrier to be transported. But the



law does require of the carrier, under such circumstances, the exercise of ordinary care, as the jury was instructed.

In this, the full bench of the supreme court of Missouri, to which the case was transferred, concurs. And it holds that there was no evidence in this case to show negligence on the part of the railway company, and that for that reason the judgment rendered in its favor should be affirmed.

### LONDON LETTER.

In a recent letter I mentioned the report that Mr. C. T. Yerkes was endeavoring to obtain a controlling interest in the Metropolitan Railway—the old London "Underground Railway." From the daily papers I see that Mr. H. C. Davis, who has for some time been working in London on the behalf of Mr. Yerkes, is now on his way back to the United States, having obtained the said interests and also carrying with him the Parliamentary charter for the Charing Cross and Hampstead tube.

Mr. J. Clifton Robinson has at last succeeded in overcoming the obstructive tactics of the government officials in authority at Kew Observatory and within a few weeks the whole system of the London United Tramway Co. (the largest overhead traction system in Europe) will be in operation. The cars are already running over a considerable portion of the line and the patronage during the first few weeks shows promise of a very great financial success; the line running in conjunction with the existing "tuppenny tube" gives the Londoners every facility for reaching Kew Gardens and Richmond in a short space of time and at a smaller cost than was previously possible.

It appears that in spite of all delays the Glasgow Corporation tramways will be opened in time for the coming exhibition, the inauguration ceremony is fixed for the 24th inst., and the two 5,000 h. p. Allis engines have already made most satisfactory trial runs.

The claims for personal injuries which have been put forward against the Liverpool Corporation tramways by the people injured in the accident which I mentioned last month, have reached so big a figure that the Ocean Accident & Guarantee Corporation which is insuring the Liverpool Corporation against such claims, has been mulcted of the full amount covered by the policy. I understand that it is now negotiating with the holders of the policy for more advantageous terms.

During the past year great strides have been made with electric traction in France. In this time the mileage has been practically doubled, standing now at 920 miles, while the power capacity of the generating stations equals 64,000 k. w., being very nearly three times what it was a year ago. The number of motor cars has increased in proportion to the length of track. The overhead trolley is by far the most popular system, being used on 76 lines as against 33 for all the other methods combined. Just now Paris affords an interesting object lesson; having as it has examples of every known way in which current can be used for street railway work; within this comparatively small area one may see in regular operation cars run by the overhead trolley system, both alone and with accumulators, with conduits, surface contact lines, third rail systems and accumulators. In five cases three-phase high-tension transmission is used, but the majority of the lines are worked by a 500-volt continuous current supply. There are four mountain railways worked by electricity in the country, but one of these is really a balanced cable line driven by a three-phase motor. In a comparatively large number of cases water power has been available. The use of producer gas engines in place of steam is worthy of remark. With regard to the type of steam engines used it is difficult to obtain reliable information, but the principal American makes appear to hold their own in popularity.

With reference to the proposed conversion of the London underground railways, it is unfortunate that the two companies concerned, the Metropolitan and the District Railway, are unable to come to an agreement with regard to the system which they will adopt. The former has decided to use that of Messrs. Ganz, of Budapest, while the latter prefers a modification of the multiple unit principle. I have been given to understand that the lighting of the whole of the tunnel is to be made a special feature of the undertaking, the idea being to whitewash the tunnel throughout and light it from a separate source of supply, so that in the event

of a breakdown at the power station the unfortunate passengers will not be forced to find their way out in darkness and with risk to their lives as is at present the case on other London systems.

In a recent number of *L'Electricien* Mr. F. Drouin in an interesting article, describes the new hill-climbing locomotives which have been lately supplied to the Compagnie la de l'Ouest Lyonnais by Brown, Boveri & Co. and Societe Suisse to work the exceptionally steep gradients between Lyons and the St. Just plateau. The gage of this line is one meter and a gradient of 6 per cent has to be mounted without any special devices, but in extreme cases where gradients of as much as 19 per cent are found, a rack is provided. The weight of the locomotive is 12 tons and that of the train 28 tons, while the average speed is about 5½ miles per hour. The electrical equipment for the rack gear and the rail driving wheels is entirely distinct. The former is driven by a 150-h. p. shunt wound motor of the four-pole type connected through a double reduction gear. There is a variable resistance in the field which enables the motor to act as a brake. For the latter there is an ordinary 500 volt series wound traction motor with an output of 25 h. p. at a speed of 300 r. p. m., driving through a single reduction gear. An automatic brake is fitted to each locomotive, which is so arranged that it comes on immediately, if for any reason the electrical supply fails.

The following tenders for 38 electric cars and works in connection therewith have been accepted by the Bournemouth Corporation the differences in price and the international nature of the computation are again very marked:

Branright & Co. ....	£ 35,025
Siemens Bros. & Co. (Woolwich) .....	£ 30,970
Robert Blackwell & Co., London .....	£ 30,374
Hungarian Railway Carriage Co. ....	£ 30,030
Hurd, Nelson & Co. (Scotland) .....	£ 29,472
British Thomson-Houston Co. ....	£ 29,364
Brush Co. (London) .....	£ 28,381
British Westinghouse Co. (accepted) ..	£ 28,020

With regard to the dynamos from a very large number of tenders, that of the British Thomson-Houston Co., £14,733, was accepted, although it was by no means the lowest tender.

An experimental car has recently been constructed by Diatto Bros., of Turin, for the line between Bologna and St. Felice sul Parano (a distance of 26½ miles). It is driven by two Ganz four-pole motors, these are series wound and are fitted with carbon brushes. The total weight, including suspension and gearing, is 1¼ tons. The load on the motor axles is 12.99 tons when the car is full and that on the non-motor axles is 11.61 tons, so that the tractive weight is amply sufficient to ensure the starting of the car at any point on the line. Each motor at the normal speed of 750 r. p. m., at an electrical pressure of 500 v. was found to give a tractive force of 882 lb. at the periphery of the wheels, which could safely be increased to 1764 lb. The energy was supplied to the motors by accumulators of the Percotto type, which appear to work admirably, but owing to the fact that no details of the expenditure made upon the experimental runs, it is unfortunate that no idea can be found of the prospects of financial success of the undertaking.

VAUGHAN.

### PROPOSED MICHIGAN INTERURBAN.

A new interurban road is being promoted to run from Muskegon to Pentwater, which will pass through North Muskegon, Dalton, Fruitland, Whitehall, Montague, Claybanks, Holstein, Shelby, Hart and Pentwater. The road will tap the famous peach district of Oceana County and will also serve the White Lake summer resorts.

Mr. George J. Conrad, of Cleveland, O., has been busy for some time securing a number of township and village franchises along the route. All franchises which are being obtained specify that the road is to be completed and in running order within 18 months, and that the fare charged shall not be more than 1½ cents per mile.

The promoters are planning largely on the freight business of the districts tapped to make the road a paying investment. There are immense amounts of fruit, especially peaches, grown in the Oceana district, and in many instances growers are now hampered by their distance from the steam routes and by the high freight charges.





the previous marking. These instructions apply where a continuous line the length of the car is made. If the longitudinal lines are desired to end with a little ornament at each rib; it will not be so essential to depress the lines at the angular points unless the panels are very long.

Scrolls and ornaments, as well as letters and numbers, are laid out by pouncing, and as a uniform standard should be adopted, the eye alone should never be depended upon for accuracy in laying out. Ornaments, letters, etc., are carefully designed on manilla paper, and pricked through with a large needle or wheel to admit the passage of the whiting or other powder when rubbed over with the pumice bag.

If the lettering and ornamentation are to be done in color, flat color is used. If in foil, go over the work with japan gold-size, being careful not to lay on too much size before laying on the foil.

If the size is heavy reduce with a little varnish and possibly a little turpentine. The foil is applied from the book. The book is held in both hands with the thumbs toward the work, and the back or hinge of the book toward the operator. The paper is turned back far enough to expose sufficient foil to cover the width of the stripe or letter and the book is pressed against the size. The paper is rolled back to expose more foil after each pressure. After each sizing has been covered with the foil, remove all superfluous foil by rubbing lightly with a rabbit's foot or a ball of cotton. This work is now ready for edging with fine lines of color. If this edging is dispensed with all straight lines are made smooth and true by placing a ruler close to lines and shearing the ragged edges by passing a flat piece of steel having a chiseled point along the edge of the ruler.

#### VARNISHING.

We have now reached the varnishing process. Varnishes should be kept at as uniform a temperature as it is possible to maintain. And it is very desirable to purchase in early autumn enough varnish to last through the winter, as the chilling of varnish is to be avoided.

Before proceeding to varnish, the shop should be freed from dust, the floor sprinkled, and the temperature should not be less than 70°. If likely to be annoyed by anyone opening and shutting doors, bolt them, as varnish is easily affected by draughts. A soft sponge, dampened with clear water, is passed over the foil to remove any remaining particles of this metal, and the car should be carefully dusted.

Varnish brushes and receptacles must be kept scrupulously clean, and if in the winter, the varnish can should be kept near the fire for an hour or more previous to using the contents.

Varnishing may well be styled a fine art, an art that is difficult to impart by precept; for in addition to dexterous manipulation, a certain fearlessness is required. Varnishers who appear most careless in applying varnish are often the most successful.

It may be stated in general that varnish may be freely applied to three or four panels, and then return with the brush comparatively dry and smooth up in the direction of the grain of the wood. It is also well to keep an eye out for any indications of sagging. This, if taken in time, may be straightened out. The inch brush is kept always in hand for all narrow places, edges, etc. Rubbing varnish is used for the first coat and finishing varnish for additional coats. Rubbing varnish should be allowed about two days to dry. When dry, the surface may be rubbed with No. 1 steel-wool to dull the surface, as well as to cut off all pimples.

We now proceed as before, putting on one or two coats of finishing varnish as desired, although if more than one coat of finishing is given, an interval of four or five days should be allowed between coats.

Having gone over the bumpers, chains, steps, etc., with a quick drying, cheap gloss black, the exterior is completed with the exception of the sash, which are done on both sides at the same time. Scaled or rough places are carefully scraped and sandpapered, and discolorations brushed with a solution of oxalic acid. After the acid has neutralized the stains, it should be sponged off with clean water. When dry, sandpaper again, stain spots if necessary, and varnish.

One coat of varnish is usually sufficient for the interior of cars, and it is well to take an impression of designs on head-linings so as to be prepared to reproduce them in case of emergency.

Last year the writer instituted an innovation in refinishing slatted seats in open cars. The seats of these cars are usually of alternating strips of ash and cherry, and the cherry slats are nearly always in good, smooth condition when the ash is bruised, scratched and discolored. The question that faced us was, What would be the best and cheapest way of treating these seats? Scraping down to the wood is slow and expensive, and when done, the real work of improving is not yet begun. So the following process was suggested and put in practice and has been so satisfactory that no one here thinks of departing from it:

After the seats have been cleaned, sandpapered and dusted, a coat of flat, deep cream color, made by adding raw sienna to white lead, is applied to all the light colored wood in the backs of seats. When dry, this is grained in distemper color in imitation of ash. For the seat proper, a little burnt sienna is added to the cream color, which makes a fair salmon color. This is put on all of the seat, as one solid color for this is deemed best. When dry, this is given a coat of cherry stain, which is made with burnt sienna, and a slight addition of vandyke brown. This stain may be in distemper, oil or varnish.

By following this plan, the seats are made to look as well as new ones, and at less expense than if scraped. As we are now retouching and revarnishing our cars for the coming season, we find occasional parts of seats, such as the frames of the backs which were treated as above last year, to show some hard usage. It is only necessary to reground and regrain such parts before varnishing the whole.

The ash graining color is made of two-thirds raw sienna and one-third raw umber ground to a thick paste in water. Nearly all distemper grainers advise the use of stale beer to thin the above; but I find good cider vinegar, reduced with a little water (about one-fourth), equally good, and this has the advantage of not requiring the painter to visit saloons.

The tools used for this work are a 1½-in. chiseled bristle brush to apply the color, a sponge, and a badger-hair blender. With some observation of the texture and color of the natural wood, and a little practice with these tools, a fair imitation should result. It might be well to caution the novice against any attempt at elaborate curls and gnarls, as plain, straight work is more satisfactory.

Before closing, I want to say a few words in regard to a statement made by Mr. Brydges in his paper before the American Street Railway Association, published in the "Review" for November, 1900, page 648. In this he says: "In place of applying four or five coats of rough-stuff to produce a surface, we apply one coat of glaze, or scrape-in coat, as I am of the opinion that the least number of coats of paint applied to produce a surface for painting the better. There is not so much danger then of the finished surface cracking and checking as when four or five coats of japan or quick-drying material are used to produce a surface with rough-stuff, which, as a rule, is dry, brittle and non-elastic, and owing to the thickness of the four or five coats, is almost sure to check more or less within a short time after the work is finished."

This statement I consider not only misleading, but really without foundation. In the first place, the glaze coat that this writer speaks of, is as dry and as brittle as in the rough-stuff. Next, the statement of the four or five coats of rough-stuff, might seem formidable to the layman, but any painter knows very well that the process of reducing this by rubbing with stone leaves but a film of this stuff. Again, any painter knows that a surface rubbed with a flat stone will be more level than if rubbed with sandpaper, as the pressure of the fingers must follow all depressions and inequalities.

I consider that the objection to Mr. Brydges' plan are somewhat diminished in view of the fact that he writes of the painting of new cars, which, being just from the woodworker's hands, are supposed to be quite level.

But the greatest objection to the system is on sanitary grounds. For no one who has at heart the welfare of men will advocate sandpapering a glaze that is made up almost entirely of white lead. Because the dust occasioned by the process is terribly poisonous.

I trust that this well-meant criticism will be well taken, as I aim for the well-being of a class of toilers whose occupation is sufficiently injurious at the least.



### COMBINED SALT CAR AND SNOW PLOW.

The accompanying illustration shows a combined salt car and snow plow which has been in use for some time on the city and suburban lines of the Winnebago Traction Co., of Oshkosh, Wis. The car body is mounted on a St. Louis Car Co. single truck having a 7-ft. wheel base and 33-in. wheels. The body is 20 ft. long and 7 ft. wide, and the over all length of the car with one plow attached is 28 ft.

The plows are made of 3-16-in. steel and are 8 ft. long. They also have extension wings which may be attached which are 6 ft. long and 3 ft. wide. The latter are not shown in the illustration. The car is equipped with two G. E. 1,000 motors and two K 12 controllers.

This car has given excellent service on the company's interurban lines where it is used exclusively for snow plow work. When used for salting the tracks in the city the plows can be removed or not



COMBINED SALT CAR AND SNOW PLOW.

as required and their removal is accomplished with but little trouble and practically no expense.

The salt box is 11 ft. 6 in. long, 4 ft. wide and 4 ft. high and is capable of holding five tons of salt. This box is built so that it will fold down on the car floor, and by removing the plows and folding down the salt box it forms a very good construction car for summer use.

We are indebted to Mr. E. E. Downs, vice-president and general manager of the company, for the photograph and data concerning this car.

### CINCINNATI, NEWPORT & COVINGTON.

The statement of the Cincinnati, Newport & Covington Railway Co. for the month of March, 1901, gives its gross receipts at \$63,946; operating expenses, \$27,336; net earnings, \$36,610; tolls, taxes, damages, etc., \$12,562; net profit, \$24,048; ratio of expenses to earnings, .4274; same, including damages, taxes and rent, .5012. For the first three months of this year the company's gross earnings were \$179,616; operating expenses, \$75,352; net earnings, \$104,758; net profits, \$67,814.

### FATAL ACCIDENT ON ELEVATED ROAD.

On April 23d a man under the influence of liquor attempted to board a train on the Northwestern Elevated R. R. after the guard had closed the gate and clung to the gate until scraped off by the railing at the end of the platform.

The elevated roads of Chicago have found it necessary to make a stringent rule to the effect that the car gates shall not be opened to admit passengers after the signal to start has been given by the guard, and on the newer cars the gates have been extended clear up to the car hood so that belated passengers would not attempt to climb over the gates. The trainmen have much trouble with intoxicated men who attempt to board the train after the gates have been closed, but it is seldom that a serious accident results.

### FT. WORTH-DALLAS INTERURBAN.

There are two companies organized to build between Ft. Worth and Dallas, Tex., a distance of 31 miles. The Twin City Union Railways Co., of which F. H. Porter is president, has graded for a distance of 15 miles and has purchased the Glenwood & Polytechnic College Street Ry., of Ft. Worth, which extends to the two extremities of the city. Mr. G. Van Ginkel, president of the Dallas Consolidated Electric Street Ry. and owner of the North Dallas Circuit Ry., is allied with the Twin City company. F. C. Hand is engineer. This road is backed by New York financiers, of whom Mr. W. D. H. Washington, of No. 1 Broadway, is prominent.

The Northern Texas Transit Co., which is controlled by Messrs. Bishop and Sherwin, of Cleveland, purchased the Fort Worth Street Ry. in September last, and the company has 6 miles of the interurban line graded. Mr. George T. Bishop is president of this company.

### LONDON UNITED TRAMWAYS.

In an interview with a representative of the London Argus, Mr. J. Clifton Robinson, managing director of the London United Tramways, Limited, spoke as follows concerning the opening of the company's lines for electric operation on April 4th:

"We have made an excellent start from every point of view. At four o'clock in the afternoon, April 3d, the agreement with the Treasury respecting the Kew Observatory, so far as this company is concerned, was signed, and at six o'clock the next morning cars were running. Since that time we have carried probably a fifth of the population of Greater London.

"We have had no solitary scratch or injury to man, woman or child. No one who saw the surging, thronging mass at Shepherd's Bush, and the fearful press—the solid phalanx, in fact—of people at Kew Bridge, all and each determined at any hazard to mount those cars, will fail to understand what that statement means. We were compelled to requisition and call out the whole of our construction gangs, platelayers, 'navvies,' and others, to help in keeping a free passage to and from the vehicles. Those men, it would be safe to say, never did a harder day's work in their lives than on the days when they undertook this new duty. It was really a marvelous scene of popular enthusiasm. I think I may claim to have the largest and most diversified experience in the matter of tramway construction of any man in this or in any other country, commencing with the inauguration of tramways in 1860, and embracing work of that kind in every country under the sun, but I have never seen anything like the enthusiasm, the appreciation, the good humor, and the enormous congregation of sightseers shown on this occasion."

### COLORADO SPRINGS & SUBURBAN.

A new street railway company, to be known as the Colorado Springs & Suburban Railway Co., filed its certificate of incorporation last month. The incorporators of the new company are the same parties interested in the Colorado Springs Rapid Transit Co., and they propose to operate the lines, for which franchises were recently granted to W. S. Stratton. Another object stated in the franchise is the right to acquire right of way not to exceed 100 ft. in width on private property where it is not feasible to use public highways between Colorado Springs and Pueblo. The company also proposes to sell electricity for power purposes.

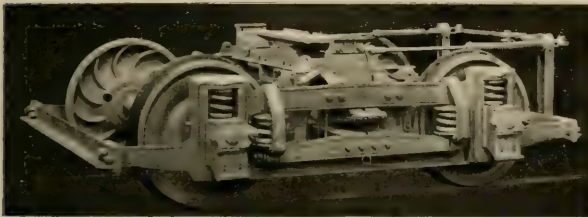
### LOW FARES IN COLUMBUS, O.

Under the new franchises granted to the Columbus Railway Co. on Feb. 4, 1901, the rate of fare is prescribed at seven rides for 25 cents, and provision is made for an all-night service and for universal transfers. The terms of the franchise were formally accepted by the company, and on April 19th the new ordinance went into effect. Besides selling seven tickets for 25 cents, on which transfers will be issued to all the lines, an owl car service has been organized which will run hourly, on which a 10-cent fare is charged. The different lines of the company will be connected as rapidly as possible.

## THE UNEASY MOTION OF STEAM CARS.

BY JOHN A. BRILL.

Passengers on steam railroads constantly notice that at certain rates of speed cars set up a shaking or vibratory motion which may be fairly described by the school-boy phrase of "joggling." The whole car is in a state of rapid and uncomfortable vibration which appears to be at once both longitudinal and vertical. It seems as though some giant machine was at work shaking the whole car. The vibrations are so rapid as to be trying and of sufficient extent to make reading difficult and writing almost impossible. All steam passenger coaches are subject to this defect whether they are mounted on four or six-wheel trucks. The big Pullman cars are constant offenders in this respect.



BRILL NO. 27 TRUCK.

Railroad men have for years been searching to find a remedy for this action. Most of them now freely confess that they have no idea whatever of its cause. Some of the great railroad systems of the country have instituted elaborate experiments for the purpose of finding a remedy, and after years of investigation have been compelled to admit that they are baffled. Reasons of all kinds have been advanced in regard to it; these reasons have been of the most varied character. They have included everything between the actions of the draw springs and the movement of the pistons in the cylinders of the engine. The latter theory was advanced by the late Charles E. Emory and was accepted by many because it lifted the blame entirely from the shoulders of the car builder and made it appear as one of the necessities due to the eternal nature of things. The shaking or trembling of the railroad car appears under such a wide range of conditions as to show that neither the action of the pistons nor the vibrations of the draft springs have anything to do with it. It often begins at 45 miles an hour or less and continues while the speed increases to 60 miles or more. Cars are affected by it in both slow and fast trains. Experiments made by the Pennsylvania R. R. show that this vibration is independent of the form and number of the bolster springs and is not connected with the amount of movement given them. It is sure to make its appearance at some speed. Even on the experimental cars where the greatest pains have been taken to have all the springs as easy as possible it begins as soon as certain speeds have been reached.

This fault of uneasy riding is one of the inherent defects of the Master Car Builders' standard passenger trucks, whether of the four or six wheel type. It is due to the improper placing of the equalizing springs upon the bar and the imperfect equalization which follows, together with the practically solid connection of the boxes with the bar. The fact that there are no journal springs aggravates the difficulty. In the Master Car Builders' standard passenger trucks the equalizing bar ends in a flat palm which rests squarely on top of the box which is also made flat to receive it. The weight holds the bar and boxes in rigid connection. When the bars rest flat on the boxes, the latter become practically part of the equalizer, the ends of which move up and down in circular area, the imaginary centers of which are situated midway between the equalizing springs. The boxes themselves are confined in parallel jaws and yet they are compelled to rise and fall in a circular arc. Consequently they bind at the corners and only move because there is usually sufficient lost motion to permit it, but they

bind and wear at the corners and there is a sticking, or hitch, at these points which reacts on the springs and a vibration is set up in them. As the motion of the spring comes in correspondence with the passing of the rail joints the "joggling," or shaking, begins. Once started it seems to proceed at all speeds.

The remarkable performance of the Brill No. 27 truck has been repeatedly mentioned in these columns, but with the development of very high speeds on electric railways a new feature of its action has been brought into notice in a remarkable way. Cars mounted on Brill No. 27 trucks are entirely free from the joggling motion at both high and low speeds, in fact it never appears under any conditions. A celebrated engineer, after a recent visit to the new road of the Albany & Hudson Railway & Power Co., made some interesting remarks in regard to his trip, laying special stress upon his surprise at the easy riding of the cars. It was so smooth that

he found it hard to appreciate the fact that he was going at the rate of nearly 60 miles an hour. He commented especially on the entire absence of the unpleasant vibration and shaking so constantly found in cars mounted on Master Car Builders' standard steam trucks. The cars of the new railway are mounted on Brill No. 27 trucks. The fact that the joggling motion is entirely absent from the No. 27 is due to their design and construction. The boxes themselves are free to rise and fall in the jaws in a vertical line. They do not tip or cant and consequently there is no tendency to bind. As they are surmounted by journal springs, instead of an equalizer, their motion is very free and easy. Under these conditions the wear is greatly reduced and both jaws and boxes remain parallel. The equalization is what theory requires, namely, that

the weight be concentrated at a point midway between wheels so that within limits the load on each wheel is the same, even when they are resting on an irregular surface. In the No. 27 truck the equalizer is made a part of the swinging motion and is hung by links from the wheel piece. These links contain springs of a draw and recoil character, which not only cushion its motion, but being an additional set under the car greatly increase the ease and smoothness of the riding. Each of these sets of springs are free to act together or independently as the motion of the trucks or the conditions of the load and road bed require. The draw and recoil springs in the links not only cushion the direct vertical and equalizing movements, but they also absorb the side motion or side thrust in passing curves. The boxes bearing the load directly through the intervention of journal springs move in vertical line without binding at any point. The disposition of the load in its proper place, in the centre of the equalizer, and making the equalizers independent of the trucks produces another immense advantage, namely; that the truck does not kick up when the brakes are applied, nor is there any tendency to kick when running free. It is for these reasons that these trucks run at high speeds without jar or shaking; even at the highest rates cars mounted on them ride as smoothly as at ordinary speeds.

## FIGHTING FRANCHISE TAX.

All of the surface and elevated roads in New York City, whose franchises have been assessed at \$217,930,932 in the aggregate by the State Tax Commissioners, are fighting the attempt to collect the tax. At the tax rate of 2.24, the total taxes of the companies reach nearly \$5,000,000 for last year. An attorney of the roads states that "the companies will resist the payment of this tax to the last ditch. At the present time the matter of collecting these taxes is in the courts, with little prospect of a speedy settlement. The companies instituted certiorari proceedings, asking that the State Commissioners show the companies how the commissioners arrived at a valuation of the properties for the purposes of taxation. It is understood that some roads were assessed on their earning capacity, while others were assessed on their length. There was apparently no uniformity or system governing the procedure of the State Commissioners. The companies are entitled to the information they seek, and until the courts say whether they are to have this information they will not pay the taxes levied against them."



### BUFFALO EMPLOYEES' ASSOCIATION.

The employees of the Buffalo Ry. and other companies controlled by the International Traction Co., of Buffalo, N. Y., on April 9th took formal possession of the handsome quarters provided for them by the company. The association rooms, covering two floors in the company's building at Main and Virginia Sts., include a parlor, library and smoking room, a card and billiard room, coat and locker rooms, a well equipped gymnasium, bath and toilet rooms, a secretary's office, etc. The rooms have been elegantly furnished throughout and are to be maintained at the expense of the railway company.

The rooms were thrown open to the members, their families and friends in the afternoon, and at 9 p. m. President Ely of the railway company called the meeting to order. He read a number of letters from directors of the several companies who were unable to be present, among them being one from Mr. Francis Lynde Stetson, enclosing a check for \$100 for the use of the association, which he hoped would grow and prosper. Mr. Stetson emphasized the statement that the officers and directors should never relax their efforts to treat their employes with perfect fair-

ness, and believed that if this spirit was shown the employes would be unwilling to demand from those whose capital has created the institution and is risked upon its results, concessions not necessary for the fair treatment of labor.

Another letter was read from Mr. Porter Norton, who, in behalf of his wife, presented the association with three pictures which will add to the attractiveness of the club rooms. Mrs. Norton's father, the late S. V. R. Watson, built the original railways in Buffalo and was president of the railway companies up to the time of his death, and Mrs. Norton thought it appropriate, therefore, that the first organization for the benefit of street railway employes in Buffalo should receive recognition from Mr. Watson's family. Following the reading of both of these letters resolutions of thanks were unanimously adopted by the association expressing its gratitude to Mr. Stetson and Mrs. Norton for their gifts.

Mr. Ely then briefly told the history of the association, its rapid growth and the good it has already done a large number of its members. Among other things, Mr. Ely said: "But few of us have any adequate idea of the magnitude of the operations of the companies represented by the members of your association. When reduced to figures they are simply startling. The operating sta-

istics of our combined roads exclusive of bridges for the year ending June 30, 1900, as set forth in the report of the New York State Board of Railroad Commissioners, reveal the following facts:

Number of passengers carried, including transfers.....	65,883,773
Number of transfers.....	18,112,910
Passenger car mileage.....	13,560,321
Average number of employes during year.....	2,687
Aggregate amount of salaries and wages.....	\$1,494,701.82
Gross passenger earnings.....	\$2,490,488.62

"Significant as these figures are, we will not yet properly appreciate and comprehend them until we compare them with the statistics of some other well-known corporation. For this comparison I have chosen the New York Central & Hudson River R. R., that vast four-track system, so often called 'America's Greatest Railroad.' The same book of statistics covering the same period of time, the year ending June 30, 1900, shows:

Number of passengers carried, through and local.....	27,816,343
Passenger train mileage, through and local.....	16,820,180
Passenger earnings.....	\$18,564,681.40

so that it appears that the number of passengers carried by our companies exceeded the number carried by the New York Central



EMPLOYEES' ROOMS, INTERNATIONAL TRACTION CO., BUFFALO.

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by 38,067,430, while the number of car-miles run was but 3,259,859 less than the passenger train mileage of the Central, although the earnings of the steam road exceeded ours by \$16,074,192.78."

For the benefit of strangers present, Mr. Ely explained that the objects of this association are to collect and disseminate knowledge of the construction and maintenance of street railroads and street railroad equipment, to promote good-fellowship among the employes of the Buffalo railway and allied companies, and to aid its members while they are disabled by reason of sickness or injuries, and at their death to contribute aid to their designated beneficiaries, provided such injuries, sickness or death be not due to intemperance or immoral conduct.

Active members while totally disabled or unable to labor by accident or sickness are paid \$1 for each day so disabled after the first seven days, and for a period not exceeding 90 days in all in any one year. In addition to the payment of cash benefits the services of physicians and medicines are furnished free to members.

In case of the death of a member in good standing his family receives \$150.

When the association was organized there were a large number of employes who were beyond the age limit to be taken into



any mutual insurance association, but in order that these employes might be taken care of they were put in what is called the honorary class, and receive the same benefits as younger men, provision being made so that their dues are placed in a special fund and their benefits are paid out of this fund. Should a deficiency in this fund occur it is made good by the president of the association with no expense to the association members.

The railway company pays for running the association rooms, the salaries of the secretary and assistants, and makes good any deficiencies which might occur.

Each member contributes 40 cents per month.

The association started with 628 charter members, and now has 968 members.

The direct benefits accruing to the employes from membership



EMPLOYEES' BATH ROOM.

in the association may perhaps be shown from the following statement:

Claims for sick benefits.....	224	
Members receiving sick benefits.....	154	
Physicians' office calls .....	1,100	
Physicians' visits to houses.....	824	1,924
Members cared for at hospitals.....	6	
Sick benefits to members.....	\$2,458.00	

Vice-President Douglass, on behalf of the association, then took the floor, and thanked the company for its generosity in furnishing the rooms in such a splendid manner, and accepted the same for the members. Speeches were also made by General Manager Van Horn, General Superintendent Mitten, John E. Pound, of Lockport, and Charles R. Huntley.

Following the speeches there was a pleasant social entertainment.

### CABLES FOR THE NEW EAST RIVER BRIDGE.

The first important steps in making and laying the cables for the new East River bridge at New York, were taken April 7th by the John A. Roebling's Sons Co., to which the contract for the bridge cables was awarded some months ago. All of the work under this contract is under the supervision of Mr. Charles G. Roebling, president of the company, who is assisted by Mr. William Hildenbrand. The preliminary work which has been finished was the placing in position of the 2½-in. diameter ropes which support the temporary foot bridge on which the workmen will stand during the main work of cable laying. Several methods of getting the first line across have been employed in the past, and kites, swimmers and other agents have been tried, but the method employed on this occasion has probably never been tried before, and is a distinct advance over all previous ones. The method adopted was to carry the drum containing the cable across the river on a float (one end having been previously secured) and pay out the cable, allowing it to rest on the river bed until at the proper time it could be raised from the water and to the desired height by means of a stationary engine and drum. The first cable has been successfully raised, the time required being only seven minutes. Navigation was suspended only during that period.

### A. S. R. A. CONVENTION COMMITTEES.

Since the arrangement of the plans of the next A. S. R. A. convention in Madison Sq. Garden, New York, the work of preparation has been progressing in a very businesslike way and it is expected that the large floor space for exhibits and the ample time for discussions afforded by the system of reading papers by title only will bring out a very large attendance. The following committees have been appointed:

General Committee: H. H. Vreeland, chairman; Clinton C. Rossiter, David Young, Col. H. N. Helt, Edward A. Maher, D. B. Hasbrouck, A. M. Young, J. R. Beetem, E. P. Bryan, Alfred Skitt, James H. McGraw, Gen. Eugene Griffin, B. H. Warren, Harry Sanderson, Frank J. Sprague, Henry L. Shippy, John L. Heins.

Exhibit Committee: Milton G. Starrett, chairman; Oren Root, jr., C. D. Meneely, Eugene Chamberlain, Calvert Townley, Charles M. Jarvis, J. R. Lovejoy, Capt. L. Candee, E. E. Gold, Peter M. Kling, Frank McGovern, J. R. Elliot, A. N. Berry, R. L. MacDuffie, L. G. Reed, Thomas Miller, Col. A. C. Woodworth, John T. McRoy.

Entertainment Committee: Clinton L. Rossiter, chairman; H. D. Cooke, Ralph H. Beach, Edward E. Higgins, W. Boardman Reed, Major H. C. Evans, F. H. Taylor, E. A. Merrill, Thomas G. Wood, James C. Barr, E. H. Wells, H. M. Littell, D. M. Brady, Charles F. Brooker, C. B. Fairchild, jr., Col. H. G. Prout.

Transportation Committee: James H. McGraw, chairman; W. W. Wheatley, Milton G. Roach, W. E. Baker.

Reception Committee: Col. T. S. Williams, chairman; A. C. Tulley, Charles E. Warren, E. H. Mullen, James M. Wakeman, Henry W. Blake, E. C. Long, L. B. Stillwell, Harold P. Brown, Giles S. Allison, Jacob Wendell, jr., Charles W. Price, H. A. Robinson.

Press Committee: St. Clair McKelway, chairman; Adolph S. Ochs, Collin Armstrong, Charles E. Miller, Herman Ridder, William Van Benthussen, John Burke, H. B. Cosgrove, Henry L. Stoddard.

### CONSPIRACY TO DEFAUD PHILADELPHIA COMPANY.

The trial, April 9, 1901, of a personal injury suit brought by Herman Blachman and his father, Samuel Blachman, against the Union Traction Co., of Philadelphia, proved to be very sensational. The plaintiff, a 15-year-old boy, alleged that he was thrown from a car of the defendant on July 29, 1900, by an intoxicated passenger. Besides the physician who attended the boy, the plaintiff has as witnesses two young men, both of whom testified that they had been bribed by the boy's father. One of them was to receive \$150 if the case were won and \$3 per day if it were lost; he was also instructed to get another witness and secured his chum, who was also offered a bribe. The principal witness made confession to his pastor and the priest told him to inform the railway company of the conspiracy, which he did. The case was submitted to the jury without argument, and the jury gave the boy \$500 damages and the father \$340. The company will doubtless appeal the case.

Another suit against this company wherein conspiracy was charged, was that of Benjamin Shandorf tried the last week in April. Shandorf alleged that he was injured in a collision Sept. 5, 1900. The railway company denied that the plaintiff had been a passenger on the car and claimed that the injury complained of antedated the accident. A large number of witnesses called by the plaintiff admitted that they had been concerned in numerous claims against the Traction company and other corporations and an organized prosecution of such claims was developed. The company further proved by passengers on the car that the plaintiff was not a passenger at all and by medical examination sought to show the plaintiff's physical condition antedated the supposed injury. By way of rebuttal the plaintiff then sought to charge the Traction company with endeavoring to suborn witnesses. The verdict was for the company.

The Chattanooga (Tenn.) Rapid Transit Co. will shortly inaugurate a greatly improved service on its north side lines.

## FRANCHISES.

BY H. S. COOPER.

## PART I.

The word "franchises" and the thing itself, when used as meaning certain so-called "privileges" "granted" by civil authorities to individuals or collections of individuals for the performance of quasi-public acts, is very often misapplied or misunderstood by the officials concerned in the granting, by the general public and even by the grantees themselves.

The term originally meant a special—and sometimes an exclusive—concession granted by the ruling or governing power to some person or collection or combination of persons, "franchising" or freeing them from some duty, service, tribute or tax. It was also used as giving a person or collection of persons certain rights from which they were debarred without such a franchise, i. e., it "franchised" or freed them from certain limitations or disabilities which legally or by custom prevented them from exercising certain privileges or doing certain acts. By gradual transfer it came to mean a particular—and generally an exclusive—privilege or right granted by some high, ruling or governing power either as a reward to some favorite, a recompense for services rendered, an honor for deeds performed or as an incentive to conquest, exploration or the establishing of commercial undertakings. In the last case the grantee often shared the profits with the grantor or paid or partly paid for the privilege by a percentage or by certain special duties or services.

The discovery, conquest and settlement of many parts of America, the operations of the British East India Co. in India, and of the Hudson Bay Fur Co. in Canada and the Northwest, were made under such franchises. Our own government has, in times past, given just such privileges, and within the last generation actual "franchises" have been granted by it to steam railroads, shipping companies, etc.

Such grants as these seem to be the popular understanding and acceptance of a "franchise" as usually "granted" to a street railway, a water works or a gas or electric light or power plant, and such an understanding is an erroneous one. The "granting of franchises" as generally understood supposes that the grantor owns or has exclusive and perpetual control of the rights, objects or territory so granted, and this is not often true of the minor civil authorities such as those of a county, township, parish, city, borough, town or village. In nearly every one of the states and territories of the United States today a franchise is one of two things.

1. An agreement or contract between some one of the minor civil authorities and a person or collection of persons by which the latter are allowed to perform certain acts on territory within the control of these civil authorities, these acts being such as are not allowed to the general public and their performance under the agreement or contract being usually limited by the general laws or by special conditions made a part of the agreement or contract. Very often these conditions are in the form of a service or duty which is indirectly a payment to the civil government, sometimes there is an actual cash payment either present or future on the part of the party of the person or persons, and sometimes there is an actual concession by the civil authorities, such as a remission of certain taxes, licenses or obligations.

2. In many cases the so-called "franchises" do not even rise to the dignity of an agreement or contract, but are simply a permission on the part of the civil powers allowing specified persons or collection of persons to perform certain legal acts under particularized conditions, for a limited period of time, and subject to the control or limitation of the permit. This permission may, and sometimes is, granted on similar conditions of direct or indirect payment, as in the contract form.

In few cases nowadays is there any attempt made by either party to make such contract or permission exclusive per se, but its first intention on the part of the civil powers is generally against the immediate making of a second similar contract or permit to other parties; and on the part of the person or persons there is generally an immediate effort to prevent the chance or opportunity being left open to any other persons, such efforts being, by work or expenditures, or by that "possession" which is "nine points of the law."

In many of the states the power of these minor civil authorities

to enter into such an agreement or to give such permission is so circumscribed and limited that their action is little more than perfunctory, especially when there is no competition for such agreement or permission. In all the states and territories there are also certain pre-requisite conditions under the general law which have to be fulfilled by the person or persons before the minor civil powers can act or before the person or persons can take advantage of the agreement or permission. While these general laws vary almost infinitely in detail, as a whole they agree in making the consent of the citizens affected a necessary part of the transaction, either directly by themselves or through their elected representatives, and in case such consent is lacking the laws allow a legal recourse to both parties and a means of recompense where injury is done or threatens to be done. In no state or territory is there any chance of the making of such an agreement or contract or the obtaining of such a permission, on any but a legal and equitable basis, if the people or their representatives do their duty. As a matter of fact, in many states the provisions of the laws on this subject are burdensome and onerous and if carried out to the letter would—at the present time—impede the starting of many quasi-public enterprises and rob the public of many facilities and benefits.

Many of these burdensome provisions which are in force are the results of "strike" legislation, which failed to strike in the way it was intended, others are the result of "crank" legislation, when "log-rolling" is indulged in and the weird, fantastic and impossible ideas of crude and impractical "backwoods" legislators are forced upon public corporations as a compromise between the country and the city members; still others are the direct result of the ill-luck, obstinacy or shortsightedness of some corporation in mortally offending some legislator—or his constituents, causing him to put through some general bill with a local sting and—after it is irremediable—to find that, like the bear in the fable, he has injured a friend in killing a fly. At this time the greatest cause of such legislation is the advocate of "public ownership," of whom more anon. With all these active, and in many cases, ignorant and unscrupulous enemies working against them at the very fountain-head of their well-being and often of their existence, is it any wonder that a very large item of the "contingent expense" of large public-serving corporations is that incurred by having to protect themselves from such attacks? The general public, misled by sensational newspapers, demagogues and "reformers," have an idea that the "hirelings" of these corporations spend their time and money at the state capitals in constant efforts to suborn the people's representatives, that—in the language of the campaign orator and the immature political-economist, they are there to "seduce the sworn representatives of the people into giving away for a mess of pottage the inalienable birthright of our children, in mortgaging their future to monopolies!" Which same is probably true in some cases, for the men constituting corporations are in no whit different from legislators and other human beings and doubtless, if the opportunity is given them, will take all they can get for as little as they can give, especially when their experience in legislation has shown them that, if the opportunity is given the other side they overdo it. From an experience of five years within touching distance of the legislature of a large and progressive state, the writer is free to say that in over 90 per cent of the cases where public service corporations were active in the lobby they were on the defensive against unwise, unjust, senseless, unnecessary and interested attack. In one session of this legislature over 60 bills which injuriously affected public service corporations, were introduced and pushed, not a single one of which, if passed, would have added the least bit to the comfort, convenience or safety of the public or saved them any money or rights and many of which would have seriously crippled public service in various directions. In those cases, and they were not many, where corporations were actually trying to influence legislation improperly in their favor, politics aided them in nearly every case and in no case could they have attained their ends had even a bare minority of the "people's representatives" been true to their constituents or had those constituents interested themselves in the matter. What is true of the legislatures is true of the minor civil bodies though in much less degree, for as one comes down nearer to the people, matters get nearer to an honest and equitable basis; the public themselves generally see and hear clearly and act equitably, it is only when they lend their eyes, ears and consciences that matters go wrong.

The worst enemies—and the term is used advisedly—to both the



public and the corporations at the present time are unrestrained advocates of "public ownership." Their basic principle "that value created by the people belong to the people and should be equally distributed among them," is an axiom; no reasonable person disputes its abstract truth. The difficulty with the reformers is that they wish to apply a general principle to particular cases without regard to equity, reason or practical business sense. For in forcing this principle in this country they fail to take into account that to force in one or two particular directions the application of a broad and generally applicable principle is unjust and inequitable and is bound to result in a revolt against it which delays its broad adoption. They also fail to consider that the adoption of a general principle must come in the shape of a natural and even growth and that to try to force it "in spots" is very liable to result in a general "set-back." Like most persons who ride a hobby, they do not realize that a hobby is an animal with a stiff neck and a single eye on one side of his head and that in consequence his point of view is limited. Were it not so they would realize that everything in nature—even public privileges and public corporations—have at least two sides to them, that they might both be worth looking at and that it would be the part of wisdom to look at all sides. Were this done, several things would be found:

1. That in this country, taken as a whole, the value of public rights and privileges given to corporations has been returned to the people tenfold! Because a few (and it is only a few) corporations in large cities have for a few years back been making large profits it is held as a principle that all corporations have done likewise and that the "priceless possessions of the people" have been given away to enrich a few. How untrue this is, even at this time of unprecedented prosperity, is easy to show, and how absolutely untrue it has been for the past fifteen years with regard to surface railways especially, has been patent to every one who has even glanced at the matter.

Throwing out the few large cities—giving the reformers the benefit of a doubt in regard to them—what smaller city, town, borough or village cannot show benefits immeasurable from the existence of its street railway, and at the same time how many owners or operators of those railways can show a return on their money invested or even—until very lately—an increased value on their property or even on the "franchises" that were supposed to be a prominent part of their value? In this class and size of corporation the money actually lost, sunk in the enterprises after being put in in perfect good faith, runs into millions upon millions, and of all this loss the public has reaped the benefit in increases in property values, in facilities for health, comfort, happiness and pleasure, in increased facilities for the conduct of all business. And on looking at the large cities we find these conditions in so marked a degree that it is doubtful if the extraordinary value and earning capacity of these properties is an overpayment for the money, the brains, the energy, the work that has pushed them to their present state and given the community the benefits they derive from their existence and operation! Who that remembers the largest cities of a generation ago, with their crowded tenements, dark streets, crawling stages and horse cars, would care to go back to them at any price? Once in awhile it is wise to look backward, "lest we forget, lest we forget!"

There were reformers in those days, the advocate of "public ownership" lifted up his voice even then, and if he could have had his own way the municipalities would have been in the lighting and railway business as well as in the water and sewer and paving and street-cleaning business, and we all know how successful they have been in these latter and how the people have received back in honest value and good work the money paid in taxes!

Place on one side the value of all the franchises as measured by the money actually made on operating under them; place on the other side the amounts raised by taxes for water, sewers, and paving—do it each one of you in your own city, and see which has given you the greater benefit for the money invested, which has been the most honestly operated—the private or the public enterprise, which has paid most regard to the general comfort, safety and convenience of the people—the corporations or the government? Looking at the thing simply from a practical and business standpoint, is it not true that—with our past experience—it is safe for us to say that until municipalities and other civil governments show their honesty and managerial ability to better advantage than ever at present, it is a very serious question if the public is not immeasurably better off under an equitable sys-

tem of "franchises" allowing private operation of many public duties, than it is under the systems and restrictions favored by the advocate of "public ownership and operation?" From an experience of over twenty years with civil governments in all parts of the United States and from an active experience of the same length of time in private lighting and transportation companies, the writer can truthfully say that he has found more equitable dealing with the public, more consideration for it and more accommodations to it by far from the private corporations than from the civil governments. He has seen no such cases of incompetent administration, willfully extravagant management, absolute dishonesty and flagrant disregard of the rights, privileges, comfort, convenience and safety of the public among private companies as he has seen in matters of paving, sewage, water and lighting in city governments, and his experience can be duplicated by almost every observing citizen.

That is the practical application of the matter at the present time, and no fine-spun theories will stand against the facts. "It is a condition and not a theory which confronts us" at this moment, and it is the part of wisdom to recognize those conditions both on the side of the public and that of the corporations. Willful blindness to existing conditions, rigid adherence to a theory, misrepresentation of existing facts and a desire to "get the best of the other fellow every time" are faults, on whichever side they occur and lead only to final difficulties to both. The only way to do is to face the facts and conditions as they are and make an equitable adjustment of them. On the one hand—that of the corporations—it must be considered that public ownership and operation is a tendency of the times and one to which our present civilization is pointing; on the other hand—that of the public and the advocate—it must be acknowledged that at this present time and in this country general public ownership and operation is an impossibility and that to force it in certain directions is an unwisdom and an injustice. Were such consideration given on both sides the present ill feeling and misunderstanding would become less and less and both sides would meet on an equitable and reasonable business basis, taking into consideration both the past, the present and the future. As it now is, the stand taken by the public under the teachings of the advocates of public ownership and operation has resulted on the one hand in unreasonable values being placed on so-called franchises and in onerous restrictions and unreasonable—and often impossible—conditions being inserted in them; while on the other hand it has resulted in the owners and operators under existing franchises taking desperate and dishonest means to protect or reimburse themselves, and on both sides it has led to the development of suspicion and antagonism where there should be only consideration and co-operation. It is also true that there has been in the past—and is even now in certain places—a laxity in such agreements, consents, franchises or conditions or in the making or "granting" of them that has bred on the one side a crowd of rapacious officials and on the other a horde of "promoters" and wild-cat schemes and companies which have done much to make fallacious evidence for the reformer and trouble for the corporations.

In the hope of aiding in a better understanding of the matter and forwarding the mutual interests of both parties the writer proposes in some future articles to take up the subject of franchises from an equitable and business standpoint, to show from his experience and observation the defects as observed in many that have passed through his hands, to suggest such changes and improvements as have been shown to be generally and particularly the best for both the public and the corporations and to give the reasons for such.

## COLORADO SPRINGS-PUEBLO INTERURBAN.

A syndicate composed of Chicago, Detroit and Cleveland capitalists represented by Mr. Charles W. Taylor, is attempting to secure rights of way for the construction of a high-speed interurban electric railway from Colorado Springs to Pueblo, with a branch to Denver, Col.

A petition for right of way over county roads in El Paso County was presented to the board of county commissioners by Mr. Taylor recently and a similar petition will be presented to the commissioners of Pueblo County. If favorable action is given by these two boards the construction of the Pueblo-Colorado Springs line will be undertaken within a comparatively short time.



THE BOSTON ELEVATED.

The elevated railway system of Boston was opened to the public with appropriate ceremonies on May 2, 1901, 34 months after work was commenced. The "Review," in its issue for February, March and April, 1900, published an extended description of this system, the elevated structure, the subway, and the company's operating method, and it is not necessary, therefore, at this time to describe at length the completed property. But there are one or two features that may be of interest in this connection.

The standard car for the elevated service is built on rather novel lines, the Sprague multiple-unit system of control, and the nature of the service, requiring unusual strength in the framing, without increasing unduly the dead weight to be carried. The company's

Passengers:

Normal load (seated), 50 at 150 lbs. each.....	7,500
Maximum load (seated and standing) exclusive of platform, 120 at 150 lbs. each.....	18,000

The car is mounted on two Baldwin Locomotive Works trucks, and the loads given in the foregoing table are divided equally between these two trucks. Each car is equipped with two Westinghouse 150-h. p. motors, both of which are carried on one of the trucks, known as the motor truck, the other truck being merely a trailer. This arrangement of the motor and the distribution of the remaining weights, as shown on the plan, bring about 64 per cent of the total weight of the car and its equipment upon the four driving wheels. The motor truck has 33-in. wheels; the trailer



1—Typical Elevated Station.  
4—Sullivan Sq. Station.  
7—Standard Elevated Car.

VIEWS ON BOSTON ELEVATED.  
2—Work on the Structure.  
5—Interior—Sullivan Sq.  
8—Sullivan Sq. Shops.

3—Feeders and Walks.  
6—Dudley St. Terminal.  
9—Causeway and Charlestown Sts.

engineers first determined what were to be the weights of the car and the various parts of the equipment, and then decided upon the proper way to distribute these loads to obtain the best results for tractive, operating and maintenance purposes. They then designed a car that would best carry these weights. A plan showing the distribution of the loads is given herewith, together with a floor plan and elevation of the standard car, of which 100 have now been purchased.

The weights as finally determined are as follows:

	Weight, Lb.
Car body (light), including couplers and everything above the trucks, with the exception of brake rigging, car heaters, and the various reservoirs and apparatus shown on the plan.	21,000
Foundation brake rigging, piping, hose couplings and fittings.	705
Car heaters .....	256

truck, 30-in. wheels. The main dimensions of the car are given on the drawings.

The various trimmings and supplies were furnished by the following concerns: Platform gates and car heaters, Gold Car Heating Co., New York; couplers, W. T. Van Dorn, Chicago; curtains, Curtain Supply Co., Chicago; seats, all of which are longitudinal, running the entire length of the car, Heywood Bros. & Wakefield, Wakefield, Mass.; air-brakes, Christensen Engineering Co., Milwaukee. The 100 cars now on hand were built by three different companies, the greater part being furnished by the St. Louis Car Co., St. Louis, Mo.

The inside finish of the cars is plain mahogany with striping and scroll work in gold. The outside is a deep carmine tint.

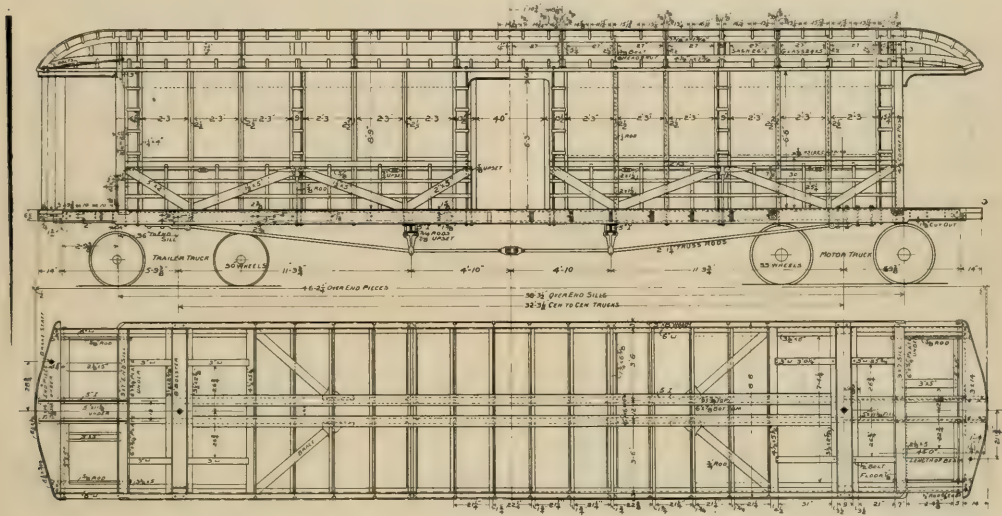
The question of schedules and running times over the elevated structure has not been entirely settled, and cannot be definitely

arranged until the actual traffic conditions have demonstrated what are the requirements.

It is probable that each morning, operation will be commenced with two-car trains, increasing in an hour to three-car trains. During the morning and evening rush, four-car trains will be run at one-minute intervals. In the middle of the day three-minute intervals will be maintained. Trains will operate at an average speed of 30 miles an hour, including stops, but can be run at 40 miles if necessary. From tests carried out it has been found prac-

minute interval apart in this way will necessarily limit the number of trains during times of heavy rush, but the officers of the company considered it best to introduce this safeguard rather than permit any chance of collision. In conjunction with the automatic signals there are eight switching towers, one of which contains 35 levers, and two with 23 levers each. The apparatus at five of the towers will be operated by compressed air.

The safeguards at the Charlestown drawbridge are particularly complete, and include a system of interlocking levers and devices



ELEVATION AND PLAN OF STANDARD CAR—BOSTON ELEVATED.

ticable to attain with the standard equipment as decided upon, an average acceleration of 2 miles per hour per second when passing from rest to full speed.

The elevated structure itself via Atlantic Ave., is just a trifle over 5 miles from the Sullivan Sq. terminal, in Charlestown, to the Townsend St. terminal. Part of the elevated trains will remain on the elevated tracks at all times, but part of them will be switched through the present subway in the heart of the city, incline connections at the entrance and exit of the subway having been built for that purpose.

An important feature of the elevated road's equipment is the elaborate system of interlocking signals, which has been installed

for tripping the air-brakes which will make it mechanically impossible for a train to approach within 200 ft. of the bridge when the draw is open.

The automatic signalling apparatus is of the electro-pneumatic type, supplied by the Union Switch & Signal Co., of Swissvale, Pa., but the details of arrangement and installation were worked out by Mr. S. S. Neff, superintendent of the Boston elevated lines.

In engaging men for the elevated service, the railway company has given preference to its old surface car employees, the new positions coming in the nature of promotion, with increased pay. For instructing the men in their new duties Mr. Neff has fitted up an attractive school room, with complete apparatus for training the



LOCATION AND WEIGHT OF APPARATUS ON STANDARD CAR.

for the protection of trains. The elevated tracks have been divided into 85 distinct blocks, the block signals being spaced a distance apart, corresponding to one minute in schedule running time; that is, it will take a train at least one minute to run through a block. On straight away tracks where the speed is high, the blocks are longer than on curves and at approaches to stations, where the speed is lower. At each block signal there is an automatic tripping device that will instantly set the air brakes on any train attempting to run past a danger signal. Keeping the trains a

men in the management of the elevated cars, the air brakes, the electrical multiple unit control system, and the interlocking and block signal systems. Here daily lectures are given, illustrated with stereopticon views and practical demonstrations.

On the opening of the road a tour of inspection was made by over 180 guests of the Elevated company, all of whom were members of the New England Street Railway Association. After an inspection of the lines, way stations and power house in the afternoon, the guests were entertained at a banquet in the evening.



### AMERICAN ELECTRIC SWITCH.

An automatic electrical and mechanical track switch has recently been introduced by the American Electric Switch Co., of Pittsburgh, in which the switch tongue is operated directly at all times by the motorman with his controller. This device does away with switchmen, derauling of cars and saves the time otherwise required for the motorman or conductor to do this work. With this device no insulated section of track is necessary. The car receives the current through a solenoid coil which throws the switch tongue by means of a wheel cam every time power is applied. The solenoid is placed in a box attached to a pole where it is well ventilated and is free from moisture.

No blocking of cars can happen, as the switch tongue can also be thrown either with a switch iron or a lever attached to the pole. The mechanism works positively in all kinds of weather and can be attached to the tongue of any switch. The general arrangement of this device is shown in the accompanying illustration.

A water tight iron box containing the mechanism which operates the switch tongue is placed in the ground next to the switch casting. This mechanism is connected by means of a rod to a lug attached to the switch tongue. A wheel cam in this box always revolving in the same direction operates the switch tongue at each one-sixth of a revolution. All parts are thoroughly lubricated, as the



DIAGRAM OF SWITCH CONNECTIONS.

box is partly filled with oil. The mechanism is protected from water by means of a stuffing box through which the rod is attached to the switch tongue. An iron box containing the solenoid coils is placed on the nearest pole supporting the trolley wire at a height of 10 ft. from the ground. This box is perforated so as to give perfect ventilation and yet not permit rain or moisture to harm the coils. The armature of this magnet is connected by means of a steel rod protected by pipe with the switch mechanism.

Two section insulators which are furnished with or without hangers, as needed, are cut into the trolley wire, one about 20 ft. and the other 35 ft. from the switch point, leaving a small section 15 ft. long between the two breakers.

One wire from the solenoid coils is connected to the 15-ft. section between the two section insulators, and the remaining end of the solenoid is attached to the feed or trolley wire through a fuse box. The electrical mechanism is protected by a lightning arrester which can be grounded on the pole which is directly connected to the rail.

If a motorman desires to throw the switch tongue he uses power going over the 15-ft. section, so that the car receives current through the solenoid coil. This energizes the magnets, which lift the armature which is attached to the switch mechanism, thereby giving the wheel cam one-sixth of a revolution and forcing the switch tongue over. The car passes through the switch and the mechanism is set ready for the following car.

In case the motorman does not desire to throw the switch, it being in the proper position, he lets his car pass over the 15-ft. section of trolley wire with the power off. The mechanism operating the switch tongue allows a car to back through the switch in whatever position it may lie.

The switch is provided with an emergency lever, attached to

the pole by means of which the switch can be thrown in case a green motorman is on the car. The tongue can also be thrown with a switch iron. It is not necessary to erect a pole on which the solenoid coils are placed providing there is a pole supporting the trolley wire within one to fifteen feet from a line drawn from the switch tongue to the curb.

A special section insulator is used with this switch which has been thoroughly tested before being offered to the public. It is cylindrical in shape so that it offers the side and bottom surfaces to the trolley wheel and therefore does not wear in ridges. This accounts for the durability which it has been found to possess. It is formed with two cone-shaped ends of brass with a very slight taper, into which the trolley wire ends are inserted and these brass pieces are rigidly connected by an insulated steel rod running through a sleeve of extra hard fibre, the whole being but a little larger in diameter than the trolley wire. It contains no sticks to break or to be replaced, and it can be placed under a span or in the trolley wire between spans with equally good results. Its tensile strength is several times greater than the trolley wire, and a car in traveling at a high rate of speed will not cause the trolley to leave the line, on account of the circular section of the line breaker. It is flexible and for this reason the wave motion or vibrations of the trolley wire are carried through the breaker which reduces to a minimum the crystallization of the trolley wire at the ends of the breaker. This has frequently been the cause of broken trolley wires. It is said that the fibre used will outlast the brass and will not warp or become pulpy from the action of the weather. The device is very simple and very light, its weight being but three pounds.

### COLD SPLICING OF ELECTRICAL CONDUCTORS.

The Morris Electric Co. has recently placed on the market a device for splicing electrical conductors without the outside application of heat, thus avoiding the tedious and costly splicing by soldering and the damage to insulation resulting from the use of heat. The new method is to remove the insulation for a short distance from the ends of the cable or wire and then insert the ends in a short sleeve of copper of high conductive. The joint is then compressed into a solid mass, the external crevices of the cable being filled with the metal of the sleeve, making an air-proof and moisture-proof splice. The surface of contact between the cable and the sleeve is about nine times the sectional area of the cable, thus insuring a joint of low resistance. The whole operation is done cold and completed in a few moments; and the joint is reported to be even stronger than the cable itself.

Three types of the splicing device are made to meet the varying conditions. The one illustrated is operated by hand and is suitable



MORRIS COLD SPLICING TOOL.

for splicing wires from No. 20 to No. 8 B. & S. gage. The larger sizes, for from No. 8 to No. 0000 and for from No. 0000 wire to 1,000,000-c. m. cables, respectively, each have a small hydraulic pump furnishing a pressure of 40,000 lbs. per sq. in. of the projected area of the sleeve.

The company reports that these machines are coming to be extensively used in this country and that a number have been exported.

The Grand Rapids (Mich.), Grand Haven & Muskegon Inter-urban Railway Co. has put several crews at work on its route, and proposes to have the road in operation by July 1st.



# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

## WATER COOLING APPARATUS.

Though the advantages of locating power stations where an ample supply of water for condensing is available are recognized, it is often necessary to build the power house at a point remote from a satisfactory water supply. Where condensing water has to be used over and over and the cost of land and nature of the soil admits of it, it is customary to build a pond or reservoir having a large surface where the water can be cooled by natural evaporation. The exposed surface and therefore the efficiency of such cooling ponds is greatly increased by tables or racks over which the hot water from the condenser flows before returning to the pond proper.

As an auxiliary to its storage reservoir the Newton & Boston Street Ry. has built a frame or tower which is shown in the

## RECENT IMPROVEMENT AT WESTERN AVE. STATION, CHICAGO UNION TRACTION CO.

The Western Ave. power plant of the Chicago Union Traction Co. which was first put in operation in the summer of 1895, was originally equipped for burning oil only, but in April, 1899, a contract was made with the Green Engineering Co., of Chicago, for the installation of a Green traveling link grate under one boiler, another boiler being fitted with grates of another make for the purpose of making a competitive trial. As a result of the tests the Green company was in June, 1899, given the contract for equipping the entire plant, 8,600 h. p. As it was desired not to interfere with the operation of the station, only the grates for one pair of boilers were installed at one time and the work was only completed in February of the present year. The Green En-

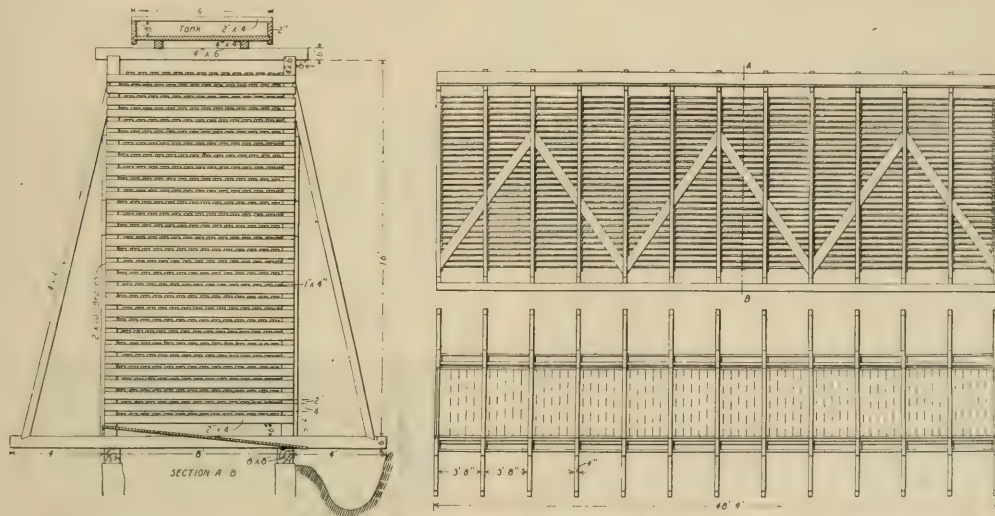


DIAGRAM OF WATER COOLING FRAME.

accompanying illustration; in passing over this tower the temperature of the water is reduced by 18 or 20 degrees Fahrenheit.

The structure is of wood. The frame is 8 ft. wide, 48 ft. 4 in. long and 17 ft. high; on top is a shallow tank, made of 2-in. stuff, into which the water from the condenser is delivered. From the tank the water trickles over shelves which are 1 x 4-in. spruce planks running the length of the frame, and paced 2 in. apart; from the end elevation of the structure it will be noted that each shelf is placed under an opening in tier above.

The tank, frame and shelves are made of spruce boards and timbers, nailed at the joints. The structure has become thoroughly water-soaked, and as water is kept flowing through the frame almost continually, the wood does not have an opportunity to dry out, and the water therefore tends to preserve rather than rot the fiber.

About 150,000 gallons of water per day flow over this tower, and as before mentioned the temperature is reduced 18 or 20 degrees. The design is by Pierce & Barnes, No. 7 Water St., Boston, to whom we are indebted for the drawings.

gineering Co. has been extremely successful in perfecting its designs so that the grates will work efficiently in large sizes and not require costly repairs. The grates in this plant are 9 ft. long and have an effective area of 83½ sq. ft. The boilers are Stirling water tube, rated at 400 h. p. each, and with these grates have developed as high as 785 h. p. each.

The decision of the company to use coal required that adequate arrangements be made for handling both coal and ashes. A Hunt conveyor was installed for the coal. The problem of handling the ashes, which is the most annoying one connected with power station operation, because seldom fully appreciated until after the plant is running, was solved in an admirable manner by Mr. John Z. Murphy, chief engineer of the Chicago Union Traction Co.

For each of the 20 boilers a hopper was built of 3-16 in. plates. Each hopper has a capacity of 315 cu. ft. At the bottom is a gate and inside near the top, is a line of ¾-in. pipe with ½-in. holes at intervals of 4 in., through which water is introduced to dampen the ashes when necessary. The hoppers are below the boiler room floor and inside the air chambers used in connec-

tion with the forced draft system and air is admitted through dampers in the sides of the hoppers near the top, thus introducing the air immediately below the grates. Two 10-ft. Sturtevant fans, motor driven, provide the forced draft, one fan supplying 14 boilers and one 6 boilers.

From each of 18 of the hoppers a screw conveyor leads through the wall to the bucket conveyor trench, as shown in the plan view, Fig. 1. By reason of the location of the stack in the middle of the building, the screw conveyors from 2 hoppers cannot be led through the wall and these deliver into the conveyors of the adjacent hoppers, as seen in Fig. 1. The conveyor screw is 14 in. in diameter with a pitch of 12 in. Each of the air compartments where the hoppers are located has a  $5\frac{1}{4} \times 7$  in. pendulum type steam engine driving a shaft at 150 r. p. m. Friction clutches are provided at each hopper, which drive the conveyor screws through bevel gears, the speed of the screws being 40 r. p. m. When the forced draft is on the air chambers must be closed, and, hence, the shafts operating

nace hoppers is varied from  $2\frac{3}{4}$  in. to 5 in., as the demand for steam changes. Mr. Murphy found that the men were prone to neglect adjusting the gates because time and labor required to manipulate the screw device with which these gates were originally equipped. He therefore designed a simple rack and pinion, which has been applied to all the furnaces.

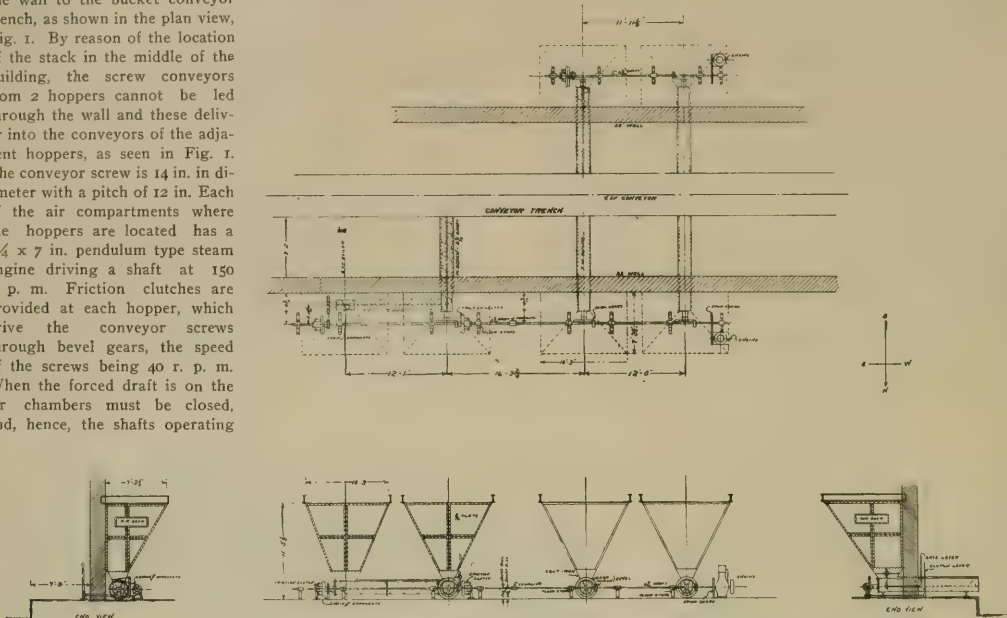


FIG. 1—ASH HOPPERS AND CONVEYORS, WESTERN AVE. STATION.

the clutches and the hopper gates are extended through the wall and the levers for turning them placed on the outside, as seen in the end views, Fig. 1.

The loading the buckets of the main conveyor a 9-hopper continuous filler was purchased but its design was considerably modified by Mr. Murphy. When the frame carrying the filler is in use the four corner posts rest on track rails placed on either side of the main conveyor pit. An auxiliary frame with four wheels running on these rails is provided and the weight of the filler may be transferred to the wheels by means of a listing mechanism consisting of four stone jacks operated in pairs. A movable chute receives the ashes from the screw conveyor, whence they drop into the loading hoppers. The chain of loading hoppers is driven through projections which mesh with the chain of the main conveyor.

When one ash hopper has been emptied the weight of the loading device is eased off the rails and the main conveyor carries the frame along to the next hopper, when the loader is let down, the chute run out and the screw conveyor thrown into action. The ash hoppers in the entire station can be emptied in two hours.

The best proof of the efficiency of the ash handling arrangements is the fact that the basement of the station is perfectly clean. A prominent engineer who visited this station recently said of it, "This is the only plant I ever saw that is clean where it ought to be clean."

Fig. 2 is a view of the boiler room. In front of the furnaces are seen the aprons which are lowered when forced draft is used. The air doors in the sides of the ash hoppers are manipulated by means of rods located just to one side of the furnace, each furnace having its own rod.

The load varying greatly in street railway plants, and it being necessary to keep the grates constantly moving in order that they may not be burned, it is quite evident that there must be close regulation of the gates controlling the coal supply in order to secure economy. In this station the gate opening in the fur-

Five overhead bins are located west of the station building. Within the building are 28 overhead coal hoppers holding 10 tons each, making the coal storage capacity of the station about 1,300



FIG. 2—BOILER ROOM.

tons. The coal crushers are in a tunnel extending west from the building under the out door coal bins, and the coal is delivered to them through trap doors, falling from the overhead bins.

## CONVENIENT POWER STATION CARD.

Mr. William Pestell, while electrical engineer of the Lynn & Boston Railroad, designed a small card for keeping in condensed form power station records of efficiency, cost, etc.

As will be seen, several places are left for coal records, and in these the station engineer enters the several kinds of coal used, as well as screenings. The next four lines of the left-hand column are devoted to amount of water used; the evaporation; cost; temperature of feed water; watt hours per lb. of water; and lb. of coal

POWER STATION L. & B. R. R. CO.				
Ending			190	
Coal	Lbs.	Cost Coal	K. W. H.	
"	"	" Labor	" " "	
"	Tons	" Rep.	" " "	
"	"	" Sup.	" " "	
Cu. Ft.	Water	Lbs.	" " "	
Evap.	"	W. Hrs. Per Lb.	" Total	
Cost	"	Temp. Feed	Total K. W. Hrs.	
Lbs. Coal per K. W. Hr.		" Miles		
C. Eng.	Asst. Eng.	Miles Track		
F.	T	Watt Hrs. per Mile		
		Rep. B	E.	
O. Oil	E. Oil	Gals.	" P.	Elec.
Load Factor		" Misc.		

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per kilowatt-hour. These show directly the working efficiency of the station.

The abbreviations, C. Eng., Asst. Eng., F., and T., refer to wages of chief engineer, wages of assistant engineer, wages of firemen, and wages of "trimmers," this latter term including all other help employed in the station, as cleaners, helpers, etc. The term "load factor" refers to the average percentage full load on the station for the period for which the card is made out.

In the right-hand column are noted the various costs. The items, Rep. B., Rep. P., Rep. Misc., E., and Elec., refer to repairs of boilers, piping, miscellaneous, engines, and electrical equipment.

The item "miles of track" means the miles of track operated from the particular station.

The cards are 5x3 in., printed on medium bristol, to facilitate handling. They are used at all stations on the Lynn & Boston, and have been found of considerable value for purposes of comparison and for checking increases in fuel and other power house expenses. The records are made out for both weekly and monthly periods.

## STEAM BOILER EFFICIENCY.

A lecture on this subject was delivered recently before the Engineering College, University of Illinois, by Mr. William Kent, M. E. The lecturer stated that in designing a new steam boiler plant the first consideration is the quality of the coal that is available. When there are several different kinds that may be used, it will usually be found that the coal of the poorest quality is relatively undervalued in the market, and is therefore the cheapest to use, provided the furnaces are suitable for burning it. The size and kind of furnace required for a given horse-power depend upon the quality of coal. The furnace should therefore be designed to suit the coal.

If the coal is bituminous the furnace should be designed so that it will consume the smoke. This is not difficult. There are several kinds of furnace that will accomplish it. Whether automatic stokers should be used or not will depend upon the size of the plant. If the plant is over 1,000 h. p. it will generally pay to use them. In large plants also it will pay to install overhead coal storage bins and mechanical appliances for elevating and storing the coal, which is then fed by gravity through tubes into the hoppers of the stokers.

The furnaces should be designed of such a capacity that they will burn the maximum quantity of coal that will be needed to make the steam, when the steam demand is the greatest, when the coal is of the poorest quality that is likely to be used and when the atmospheric conditions are the most unfavorable. The capacity of a boiler for producing steam is limited by the capacity of the furnace for burning coal, and this capacity depends upon the quality of the coal and upon the draft.

Having settled upon the style of furnace and upon the area of grate surface required to burn the coal, the boiler itself is next to be considered. The area of heating surface to be furnished for a given power will depend upon the degree of economy which it will pay to secure. In order to have a boiler efficiency of from 70 to 75 per cent, the furnace being designed so as to effect complete combustion, it will be necessary to provide one square foot of heating surface for every three pounds of water to be evaporated per hour. If less than this amount of heating surface is provided the economy will be diminished. How much the economy will be decreased with rates of driving more rapid than three pounds of water per hour per square foot of heating surface is quite a complex problem. It may be solved mathematically by an equation containing not less than five variables. The most important of these is the air supply, per pound of fuel. Next in importance are quality of coal and thoroughness of combustion, and design of gas passages so as to avoid as much as possible the short circuiting of the gases. Of lesser importance are the loss by radiation,

and the pressure of the steam.

The amount of air supply being the factor of greatest importance in the efficiency of a boiler, and it being impossible for the fireman to determine by the ordinary means of observation whether the air supply is what it should be, it is highly desirable that some means be provided to assist in determining it. One of these is an apparatus for continuous indication of the amount of carbonic acid or of free oxygen in the chimney gases. Another is a recording furnace pyrometer. The maximum possible furnace temperature is the condition upon which depends maximum economy, and this corresponds with an air supply of about 20 pounds of air per pound of carbon when the fuel is anthracite or a high grade of bituminous, and a somewhat smaller supply when the fuel is low grade bituminous or lignite.

## NEW POWER PLANTS AT KANSAS CITY.

The Metropolitan Street Railway Co., of Kansas City, and the Kansas City Electric Light Co., of which Mr. C. F. Holmes, general manager of the street railway, is president, are each building new power stations. The consulting and designing engineers for both companies are Pierce, Richardson & Neiler, of Chicago, and Mr. Richardson is also manager of the Light company.

The plans for the lighting station are further advanced than the railway station and a number of new and interesting features are involved in the design. Contracts for two 1,500-kw., 6,600-volt, 25-cycle General Electric alternators, two 34 and 72 by 48 in. vertical cross compound condensing Allis engines, six Babcock & Wilcox water tube boilers, and Green traveling chain grates have been let. These engines will run at 75 r. p. m., taking steam at 175 lb. per gage; the engines have the valves in the heads and the pistons are to be fitted with Allan's red anti friction metal. The boilers have 5,143 sq. ft. of heating surface each, and are designed for 200 lb. pressure. The boilers are 18 tubes wide and 14 tubes high, with three 36-in. drums; the drums have double strap, triple riveted butt joints. The Green traveling chain grates have an effective area 10 ft. 2 in. wide by 9 ft. long, or 91½ sq. ft.

The width of a battery of two boilers is practically the same as that of the floor space occupied by one engine unit so that the engine and boiler rooms will be of the same length, each engine being located opposite the two boilers which, normally, will supply it with steam. The space opposite the third battery of



boilers will at first be occupied by a number of arc machines, which can be moved when a third engine is added. It may be noted in passing that the arc machines mentioned will each be direct connected to synchronous motor. The ultimate capacity of the station will be for six units such as described, arranged symmetrically with two stacks at the center of the building. The stacks are to be 200 ft. high, of steel, full lined, and 9 ft. internal diameter. The chimney capacity is designed to carry the rated load on the engines with natural draft, and induced draft apparatus will be provided to carry the peaks. Economizers will probably be installed as they would be very efficient in connection with the induced draft and the arrangement of boiler tubes 14 rows high. The plans contemplate one motor-driven and one steam-driven exciter will be provided.

It has been decided to carry the exhausts from all the engines to a main exhaust header extending the entire length of the building. Either a central condenser of siphon type or surface condensers will be used, if of the surface type one for each engine or one for each pair of engines. If the surface condensers are decided upon they will be located near their engines but connected to the exhaust header instead of direct to the engine exhaust pipes, thus carrying out the same principle as for the high pressure piping where there is a header connected to both engines and boilers. The same idea would be carried out with respect to the injection and discharge water, and an air pump main also provided. With surface condensers it is the intention to provide an auxiliary main so that the direction of flow of the condensing water can be reversed; this arrangement is desirable because the condensing water is to be taken direct from the Kaw River and leaves and other foreign matter entering the condenser tubes could thus be easily washed out. A centrifugal circulating pump would be used.

There will in any case be two air pumps capable of working efficiently at all speeds between 25 and 50 r. p. m., so that one pump could practically care for the ultimate station capacity, leaving the other in reserve. Vacuum oil separators will be provided between the engines and the exhaust header, and the air pumps will discharge into a tank from which the feed pumps draw. Electrically driven feed pumps will be used if economizers are adapted.

Coal handling machinery will be put in, but no contracts except for engines, generators, boilers and grates have been let.

This station is to be on the opposite side of the river and also on the opposite side of the viaduct from the present Kaw River plant of the Metropolitan company. As the high water level of the river is about 6 ft. above the present grade, it is intended to make foundation walls water proof and underlay the entire station by a concrete monolith.

For the Metropolitan Street Ry. station there have been let the engine, generator, boiler and grate contracts: Three Allis vertical, cross compound, condensing engines with cylinders 46 and 94 by 60 in. (the largest ever designed for similar service), to run at 75 r. p. m. and develop 4,600 h. p. at most economical load with 150 lb. steam; the maximum capacity with 175 lb. steam is 8,900 h. p. Three General Electric three-phase, 3,000-kw., 6,600-volt, 25-cycle generators. Eighteen Babcock & Wilcox boilers and Green traveling grates similar to those for the lighting station.

This station will also have coal and ash handling machinery and traveling chain grates.

## ACTIVITY IN STREET RAILWAY BUILDING.

Bucyrus, O., has lately been the center of considerable activity in the direction of electric railway promoting and building. The line from Bucyrus to Galion owned and operated by the Ohio Central Traction Co. has proved very successful and the same company is constructing a line from Crestline to Galion, a distance of three miles. The Buckeye Traction Co., of Bucyrus, has a franchise for a line from Bucyrus to Tiffin, by the way of Sulphur Springs and New Washington. Another company has secured the right of way and a franchise to build a line from Bucyrus to Marion to connect with the Columbus line which is building to Marion. The Central Ohio Traction Co. contemplates the construction of a line from Bucyrus to Upper Sandusky by way of Nevada. Most of the right of way was secured last year and the company expresses its intention of building the line next year.

## SOUTH SIDE "L" FRANCHISE.

Stockholders of the old Chicago & South Side Rapid Transit Railroad Co. have come forward with charges that the road now known as the South Side Elevated is operating without a franchise, that it never had a franchise, and that it has no right to exist.

The franchise under which the South Side Elevated Railroad Co. is now operating was granted to the Chicago & South Side company March 26, 1888. Section 16 of the franchise ordinance, the complainants claim, specified that the company should never authorize any other railroad company in any way or manner to exercise or use that franchise.

The old Chicago & South Side company, under a foreclosure sale, passed into the hands of Leslie Carter and George E. Adams. They sold it to the South Side Elevated Railroad Co., of which Leslie Carter is president, in January, 1897. Since then the South Side Elevated company has held possession of all property of the road and has operated under the old ordinance.

The question has already been decided in favor of the present company by the Appellate Court, and is now pending in the Supreme Court of Illinois on an appeal taken by the stockholders of the old company.

## GAS ENGINE FOR PHILADELPHIA ROAD.

The development of the gas engine for electrical driving has attracted much attention within the last few years, and steady improvement has been made in the design of larger sizes. In the "Review" for June, 1900, page 337, we illustrated a 250-h. p. gas engine built for the Oil City Street Railway Co. by the Standard Automatic Gas Engine Co., of Oil City, Pa. This company has just accepted an order from the Union Traction Co., of Philadelphia, for a 1,000-h. p. double acting tandem gas engine which is to be direct connected to a General Electric railway generator, the guarantee being that the fuel consumption shall not exceed 1 lb. of coal per h. p. hour, using the Taylor gas producer. This order will be followed by one for six other engines of the same size.

## COLUMBUS-DEFIANCE INTERURBAN.

A company known as the Defiance, Ottawa, Kenton & Columbus Interurban Railway Co. has recently been incorporated in Ohio for the purpose of building and operating an interurban electric road between Columbus and Defiance, with a branch from the latter place through the counties of Defiance and Williams, to a point on the Michigan state line.

The new road will enter Columbus from Delaware over the tracks of the Columbus, Delaware & Northern Electric Railroad Co. President Loren, of the latter company, agreed to this proposition at a recent conference with the promoters of the new enterprise.

## GAS-TRACTION-WATER POWER COMBINE.

It is reported that a large combine of 16 gas, traction and water power companies is being arranged by Emerson McMillan & Co., of New York. The following is a list of the companies it is proposed to consolidate, their aggregate capital being in excess of \$34,000,000.

Detroit Gas Co.	\$4,925,500
Birmingham (N. Y.) Gas Works	450,000
Columbus (O.) Edison Co.	750,000
Consolidated Gas Co., Long Branch, N. J.	1,000,000
Grand Rapids (Mich.) Gas Co.	1,000,000
Jackson (Mich.) Gas Co.	250,000
Laclede Gas Co., St. Louis	12,000,000
Madison (Wis.) Gas & Electric Co.	400,000
St. Joseph (Mo.) Gas Co.	1,000,000
St. Paul Gaslight Co.	1,500,000
Western Milwaukee Gas Co.	4,000,000
Denver Gas & Electric Light Co.	2,650,000
Southern Light & Traction Co., Oshkosh, Wis.	1,762,500
Winnebago Traction Co., Oshkosh, Wis.	650,000
Jacques Cartier Water Power Co., Quebec, Can.	500,000
Montgomery (Ala.) Light & Power Co.	1,500,000
Total capital	\$34,238,000

### COMPRESSED AIR TRACTION.

Electric railways on which the demand for power during rush hours is fully up to the maximum of their power house capacity may find it to their advantage to consider the adoption of compressed air as an auxiliary. Power plants that are idle at night and are not used to their full capacity during the hours of light traffic through the day, could be used to store the air in cars to run during the rush hours. This plan, carefully carried out, would result in a more nearly constant load at the power house, which, in the end, would result in economy of operation.

We understand that one large company is considering the question of removing all trolley wires from its barns and using compressed air cars for switching; at night the air cars would be put in service on the line, permitting the power plants to be shut down. Experience with the air cars already in service in Chicago, Rome, N. Y., and New York City shows them to be reliable, and with the improvements which are being made in compressed air motors there is every reason to expect that the near future will see more applications of the system.

Some details concerning the operation of air cars in the cities mentioned will be of interest. For the North Clark St. line in Chicago a small air compressor is supplied with steam from one of the boilers furnishing steam to the engines of the cable plant. While the fires under the other boilers are banked, a small amount of oil is used under one of them to run this compressor. When the cable shuts down at 12:45 a. m., the air car starts out with air which has been left over from the previous night's service, and is not recharged until it has traveled from the city limits to the court house and back again to the Elm St. power house. The entire cable system has to run, however, until it brings the last cable car back to the house, but during this time the air car has made no demands for power at the power station. On reaching the power house, after performing two-thirds of the round trip with air left over from the night before, the first charge of the car is taken from the air storage, which has also been left over. The compressor is then started up, and thus for five hours' service of the cars the compressor does not probably run more than three hours.

The entire system of the Rome (N. Y.) City Street Railway Co. is equipped and operated with compressed air, and from Sept. 26, 1900, until April 6, 1901, 20 air cars on 28th and 29th Sts., New York City, were in service, carrying 3,250,820 passengers without serious accident, excepting the breaking of a hot water heater which was purely mechanical, and which caused no serious damage or injury to anybody. In fact, the car upon which this accident occurred was in service the day following with a new heater.

Concerning this accident Mr. Ashley W. Cole, chairman of the New York Board of Railroad Commissioners wrote Pres. Henry D. Cooke, of the Compressed Air Co., giving the following extracts from the report of the board's experts:

"The accident was caused by the bursting of the reheater cylinder. \* \* \* This was undoubtedly due to the lower perforated pipe in the cylinder becoming broken from its fastenings and lying loose on the bottom of the cylinder and oscillating on the plate of the cylinder. The oscillation was caused by the motion of the car and the action of the air entering the cylinder. A groove had been worn in the steel plate of the cylinder as perfect and true as though done by a tool, reducing the thickness of the middle of the cylinder to less than 1-16 in. \* \* \* It will be seen from the above description of the operation of compressed air as a motor power for street surface cars, that this was not an explosion caused by compressed air under high pressure contained in the reservoirs on the car, but was the fracture of a reservoir containing hot water and compressed air at a pressure of not more than 150 lb. per sq. in."

In operating the crosstown lines in New York it was found that the construction of the air cars was too light for the severe service, and the Metropolitan Street Ry. has decided to place them on another part of the system and has ordered new motors with heavier and stronger moving parts; these are now being built by the Compressed Air Co. The parts that failed were axles, wheels, rocker arms, crossheads and piston connections, all of which proved to be too light for operation over the twenty-five curves on the line and for withstanding the rough handling of

green motormen. In this the Metropolitan Street Ry. has only had the experience that usually goes with the adaptation of machinery to a new service, and the company is deserving of great credit for what it has done toward encouraging the development of air motors.

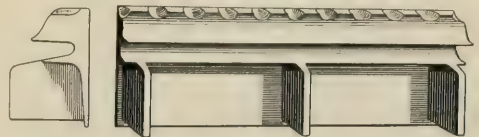
The advantages possessed by air cars on the crosstown lines in New York City, where to install an electric conduit would mean an enormous expenditure for relaying gas and water mains, sewers, etc., is readily appreciated. The saving in interest charges on conduit installations as well as that in maintenance gives air an important advantage where the overhead trolley is not permitted by municipal authorities. The field is full of promise and important developments may be expected of air and air cars when there shall have been expended upon them even a small portion of the thought and money that were spent on electric traction, and the efforts of those engaged in the work deserve the encouragement of all who are interested in the operation of street railway properties.

### FIRE AT THE STURTEVANT WORKS.

The fire which occurred at the works of the B. F. Sturtevant Co., at Jamaica Plain, Mass., on Sunday, April 14th, proved to be far less disastrous than was first reported. Only the engine and electrical departments were injured. The power plant was started up with but a single day's delay, incident to renewing belts damaged by fire, and the entire blower, heater, forge, galvanized iron and shipping departments, with the foundry, pattern shop, etc., were in full operation on that day, and the shipments going forward as usual. No valuable office records were lost, the most serious damage occurring in the advertising department, where a large amount of printed matter was destroyed. Fortunately, however, an entirely new general catalog was in press at the time, and copies were issued on the 16th in time to meet all demands for information. New offices were established on Monday morning in a nearby building, and on Monday noon the business was running as usual. With these facilities at its disposal there is no likelihood of any delay in shipments, except such as may occur in the electrical and engine departments, and arrangements are already made for handling this work.

### BUCKLAND PAVING BLOCK.

In the "Review" for April we noticed that the American Street Railway Paving & Improvement Co., of Springfield, Mass., is engaged in laying a large amount of Buckland paving block for the Hartford (Conn.) Street Railway Co., this block having been endorsed as a substitute for the grooved rails required by ordinance in that city. The following illustration shows the details of this block which practically converts the flat rail into the grooved type. The blocks are made of cast iron so as to form a wall between



BUCKLAND PAVING BLOCK.

the head and the bottom flange of the rail and a lip extends over the top of the rail to form the groove as shown. The blocks are reinforced by ribs which extend in to the web of the rail and have the same outline as the inside of the rail, thus securing a rigid seat for the block which prevents it being easily displaced. The ribs also add to the stiffness of the blocks, which are made in any size or shape to suit the rails against which they are to be laid.

A considerable increase of traffic over the lines of the Wilmington (Del.) City Railway Co. is reported since the system of selling six tickets for 25 cents went into effect April 9th.



### PLASTIC PLUG BONDS.

Fig. 1 shows a completed joint with the standard plastic plug rail bond, one of the types made by Harold P. Brown, of New York. Fig. 2 is a section of the joint. In this bond the lower part of the plug is a little out of center with the top, since less clearance is required on the inner side of hole because further motion of angle plate inward can occur only after rail and plate surfaces have worn. This eccentricity allows a groove to be made in top of the plug, and this groove should always face the outside of the rail.

The groove serves in the first place to prevent air binding as plug is driven home, and is then closed by a tap of the hammer



FIG. 1.

on the edge. It can afterward be slightly opened with the proper tools in case the bond is injured by accident or neglect, and through this small opening sufficient of the contact alloy can be introduced to brighten all the surfaces and restore the conductivity of the bond.

On the left side of Fig. 3 is shown a modification called the plastic screw plug, in which provision is made for easy examination and repair. The hole in the plate is of large diameter and is screw-threaded and amalgamated before distribution along the road. A hardened steel jig is screwed into hole to properly locate rail drilling. When this hole is drilled and amalgamated, a copper tube is driven home, and around the top of the tube is placed a diagonal strip of elastic packing. The hole is then partly filled with the plastic alloy and the plug screwed down to compress the packing and seal the joint. With any of these bonds, a small bit of the amalgamating alloy, if placed in the slot on upper part of the plug, will almost instantly reamalgamate the contact surfaces beneath and renew the plastic alloy.

The application of the plastic plug bond is made after the completion of the track, so that delay through interference of two different gangs is avoided. Between the first and second bolt holes from the end of each rail, a hole  $\frac{5}{8}$  to  $\frac{7}{8}$  in. in diameter is bored diagonally downward through the flange of the angle plate into, but not through, the base of the rail. The hole is

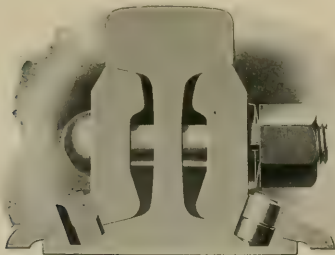


FIG. 2.

nearly at right angles to the plate flange and as near the vertical web as possible. An ordinary ratchet drill and a J-shaped clamp, passing under the base of rail are the only tools necessary, though a portable hand-power drill may be used. With this tool from 30 to 40 joints per day can be bonded. The drill point is lubricated with a solution of pearline and water instead of oil, so as to avoid the trouble which follows the use of an insulating fluid on metal contact surfaces, and the hole is usually drilled to  $\frac{3}{8}$ -in.

from bottom of the rail base. The drill chips are removed with a permanent magnet, and the proper depth determined by template or collar fastened on the drill. The plates may be drilled before distributing along the road; this more than doubles the number of joints which can be bonded in a day.

After the hole is drilled it is amalgamated by filling with water and rubbing with the end of a rod of the Edison solid alloy. This coats the steel with a layer of bright amalgam which will not rust, nor will it permit the steel below to rust. On bonds of large diameter an amalgamated copper tube is driven into the hole so as to completely seal the crack between the meeting surfaces of rail and angle plate as shown on the right side of Fig. 3. This is unnecessary with small sizes. The hole is then partly filled with the plastic alloy, which adheres to the amalgamated surfaces of the steel and forms a conducting path of very low resistance between the rail and angle plate.

An amalgamated copper plug, which is T-shaped in section, is then driven to seal the hole and to complete the circuit between the rail and angle plate by dipping into the plastic alloy. The rail and angle end of the plate may move,  $\frac{1}{8}$ -in. in any direction without touching the lower end of the plug and merely bends inward without breaking the top of the tube, if any is used. Even if the plastic alloy above the level of top of hole in rail base should escape, there is still enough retained in the hole to maintain a perfect contact, and this cannot be shaken out, since it is absolutely inelastic and adheres to the steel; mercury used in this way would be quickly thrown out.

The current passes from one rail through the plug to the angle plate, then through the second plug to the next rail. A bond

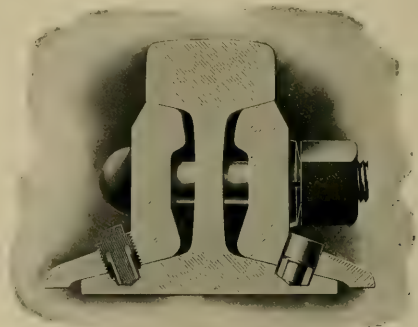


FIG. 3.

formed by a pair of  $\frac{5}{8}$ -in. holes into one angle plate and a 70-lb. T-rail of A. S. C. E. section is computed to have practically four times the conductivity of one No. 0000 flexible copper bond.

Mr. Brown states that tests show the plastic rail plug bonds used on light rails subjected to heavy traffic to have practically the same conductivity after four years as when first installed. Therefore it is confidently recommended as cheap, durable and efficient, and particularly adapted for bonding steam roads or re-bonding electric track. Among the advantages claimed are these: The bonds are not exposed to theft nor to mechanical accidents as are bonds placed outside the angle plates. They are more easily applied than are bonds under the plates. They are not injured by the unavoidable motion of rails and fish plates under heavy wheel loads.

The Montgomery (Pa.) & Chester Electric Railway Co. was recently robbed of 2,100 ft. of trolley wire, which thieves cut from the company's line between Spring City and Phoenixville.

The Dunkirk (N. Y.) & Point Gratiot Traction Co. has approved plans for its proposed new power house. Mr. H. C. Hequembourg, who has been interested in the company since its inception, has withdrawn and his interest has been purchased by Mr. Peter Meister, jr. Mr. Daniel F. Toomey has been reelected as president.



### SPRING LOCK FOR TRACK SWITCHES.

We illustrate herewith a new spring lock switch for street railway tracks which has recently been patented by Edward E. Burke, of Anderson, Ind. Fig. 1 shows an interior view of the box in which the mechanism is contained and the cover. A transverse slide rod provided with springs as shown has its outer end connected to the bottom of the switch tongue near its point. The two springs act in compression and are separated by a collar fastened to the slide rod. This collar also forms an integral part of the yoke lying parallel to the slide rod. At right angles to this rod is an operating bar on one end of which is a rack which

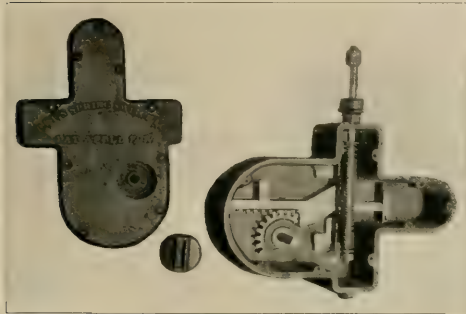


FIG. 1—SWITCH LOCK.

meshes with the sector of a pinion which is turned by the operator in setting the switch. This operating bar is provided with cam surfaces upon which the shoulders in the yoke slide, giving the yoke a motion at right angles to the motion of the operating bar. The motion of this yoke and its attached collar compresses either one or the other spring, according to its direction, and the spring under compression actuates the slide rod and the switch point to which it is connected. The cam surfaces terminate with a short length parallel to the axis of the operating bar and when the shoulders of the yoke rest upon this portion of the cam surface



FIG. 2 METHOD OF OPERATING.

the yoke is locked in position, the pressure of the springs tending to further lock the switch point in position.

Fig. 2 shows the method by which this switch is operated by the motorman from the front platform of the car. The cap shown in Fig. 1 is connected to the end of the pinion stud, which projects through the cover and the motorman's rod has an end which fits into the slot in the cap. Under the cap is a stuffing box filled with axle grease, which entirely prevents the entrance of water into the switch box.

The Union Traction Co. of Indiana has been using these switches

for 10 months and they have proved very satisfactory in every particular and work well in all kinds of weather. The Traction company recommends them highly on account of the locking feature which prevents accidents which are very liable to occur, especially with double truck cars or trains of a motor car and trailers. The patent on this switch is owned and controlled by Messrs. Sears, Leeb and Burke, of Anderson, Ind.

### MOTORS FOR MANHATTAN ELEVATED.

The Manhattan Railway Co. on May 1st let the contract for the electrical equipment of its cars to the General Electric Co. The number of motors is 1,600, the first of which is to be delivered within three months and the last within 21 months. The plan is to equip 800 cars with two motors each; the cars will be run in trains of three, the front and rear cars being motor cars. The motors are to be the G. E. No. 66 rated at 125 h. p. each, on the basis of the General Electric Co.'s standard rating.

The cars are to be equipped for the General Electric system of train control with "Type C" controllers; this is perhaps more widely known as the General Electric multiple-unit system. This system consists in general of two parts: First, a number of electrically operated switches constituting the series parallel motor controller, which effect the different combinations of the motors and vary the starting resistance in circuit with them. Second, two master controllers, one at each end of the car, which operate the motor controller. Cables connect the various motor cars in the train and synchronous action of all the motor controllers is had by manipulating any one of the master controllers. The whole contract amounts to over \$3,000,000.

### TACOMA & SEATTLE INTERURBAN.

The promoters of the Tacoma & Seattle Electric Ry. announce that cars will be running over this 36-mile road by January 1, 1902. Henry Bucey was the original promoter of the line, but he has been succeeded in the enterprise by a company of which George B. Blanchard, of Tacoma, is principally interested. Kidder, Peabody & Co., of Boston, are financing the road, and the contract for its construction and equipment has been awarded Carl G. M. Miller, also of Boston. The company will spend approximately \$1,500,000 for the construction of the line. If the rights of way are obtained by May 15th, grading will be commenced by June 1st, and will be finished by September 1st. Ballasting, track-laying and electrical equipment will be completed during the present year. Rails have already commenced to arrive at the Seattle end of the line, where Mills & Tweeden, of Tacoma, have the construction contract. An excellent grade for the line has been secured, and work will shortly be commenced on the excavation of a tunnel, 300 ft. long, at Stewart's Point. The power house, which will be located midway on the route, will distribute the current at high potential. The company owns its own coal mines and will either develop power or rent it from the Snoqualmie Falls Power Co.

The route of the Tacoma & Seattle line is almost a direct one between the two cities, passing through the finest farming district in western Washington. Every mile of the line will be easily accessible by the Northern Pacific R. R., which will facilitate quick construction and obviate the necessity of supply roads. The Seattle Electric Co., which is a large stockholder in the company, owns the Renton coal mines and 100,000,000 ft. of timber along the right of way. The business of marketing these products will engage the freight transportation facilities of the new interurban for some time after its completion.

### CITY OF BUTTE IN SLIDING.

A portion of Butte, Mont., believed to embrace the larger part of the big hill upon which some of the Anaconda mines are located made a very perceptible movement last month. At the foot of the hill the slide pushed the tracks of the Butte Consolidated Railway Co. about 6 in. for a distance of 300 ft. along the line. There are no large buildings here and the slide would not have been noticed except for the displacement of the railway tracks. Mining men state that the shaft of one of the Anaconda mines has moved 7 ft. in about 10 years, but no danger is apprehended from it.

## PERSONAL.

MR. FREDERICK SARGENT, of Sargent & Lundy, Chicago, sailed for England May 15th.

MR. H. C. LANG has been elected secretary and assistant treasurer of the Southern Ohio Traction Co., of Hamilton, O.

MR. N. A. CHRISTENSEN, of the Christensen Engineering Co., sailed on the St. Louis for a four months' pleasure trip in Europe.

MR. DAVID MOFFATT, formerly of the Brooklyn Heights R. R., has been appointed master mechanic of the Cleveland Electric Ry.

MR. W. T. HELLER, formerly of Allentown, Pa., has been appointed electrical superintendent of the Muskegon (Mich.) Traction & Lighting Co.

MR. J. W. LESTER, recently elected treasurer of the Worcester (Mass.) Consolidated Street Railway Co., assumed the duties of that position April 9th.

MR. M. M. HEDDER, who has for some time been acting as accident adjuster for the Buffalo Ry., has resigned that position and will engage in other work.

MR. FRANCIS GRANGER, 26 Cortlandt St., New York, has been appointed general eastern sales agent of the Lehigh Car Wheel & Axle Works, of Catasauqua, Pa.

MR. GARRY FOX has been promoted to the position of assistant superintendent of the Chippewa Valley Electric Railroad Co., succeeding Mr. Henry Knott, resigned.

MR. A. H. STONE, who resigned April 8th as treasurer of the Worcester (Mass.) Consolidated Street Railway Co., has accepted a position as cashier of the Mechanics National Bank, at Worcester.

MR. JOHN STROHM SPEER, general manager of the Speer Carbon Co., St. Marys, Pa., was on Tuesday, April 30th, married to Miss Helen May Fryling, daughter of Mr. and Mrs. Henry Y. Fryling.

MR. JOHN D. CRIMMINS is mentioned as an anti-Tammany candidate for mayor of New York and it is said that Senator Platt may be willing to give him the support of the republican organization.

THE SALT LAKE CITY RAILROAD CO. has elected W. P. Read, E. V. McCune and Joseph S. Wells as directors, to take the place of Spencer Clawson, resigned, and R. C. Chambers and W. L. Hoge, deceased.

MR. A. S. THOMPSON, superintendent of the Paducah (Ky.) Railway & Light Co., has resigned that position in order to engage in the management of the Barnhill stockyards at Paducah, which he has leased.

MR. W. P. COSPER, general agent of the Consolidated Car-Heating Co., has removed his offices from No. 513 Western Union Bldg., to No. 1207 Fisher Bldg., Chicago, the change being necessary to secure more room.

MR. S. R. SMITH has resigned as superintendent of the Black River Traction Co., of Watertown, N. Y., to accept the position of general manager of the Cincinnati, Columbus & Southern Ry., a projected line of 100 miles length.

THE NEW CASTLE & SHARON (PA.) ELECTRIC RAILWAY CO. has elected a board of directors, comprising: Richard Quay, Beaver Falls, Pa.; George F. Penhale, New York; M. A. Devitt, Chicago; H. W. Whipple, New York; M. A. Norris,

Youngstown; Alexander McDowell, Sharon, and William Wallace, New Castle. Of these, Mr. Whipple was elected president and Mr. Norris secretary.

MR. A. C. SALISBURY, formerly of Utica, has been chosen second vice-president of the Albany & Hudson Railway & Power Co., and will remove to Rensselaer, N. Y., where the general offices of the company are located.

MR. CHARLES CURRIE has recently been appointed general manager of the Detroit & Toledo Shore Line Railroad Co. and has resigned his position as general superintendent of the Cleveland Electric Railway Co. to assume the duties of his new office. Mr. Currie was born in Toronto, Canada, and entered the street railway field in 1882 when at the age of 14 years he commenced as office boy with the London Street Railway Co., London, Canada. A few



CHARLES CURRIE.

years later he was appointed cashier of the company and continued in this capacity until 1894, when the company was purchased by the Everett syndicate, which immediately equipped the system with electricity. Mr. Currie was retained by the new owners in the capacity of secretary of the company until 1896, when they purchased the Lima Electric Railway Co., of which Mr. Currie was appointed general manager. In July, 1899, he was appointed superintendent of transportation of the Cleveland Electric Railway Co. and later was made general superintendent of the same company, which position he held until his present appointment. While in Cleveland the employees were under Mr. Currie's direct charge and the most cordial relations existed between them. Resolutions of regret at his departure were adopted by the employees of the Cleveland Electric Railway Co., who also presented him with a solitaire diamond ring and a handsomely bound autograph album containing the names of about 800 of the men. Mr. Currie takes with him the good wishes of a host of friends for every success in his new situation.

MR. ARTHUR L. LINN, JR., of Cleveland, O., will act as auditor of the Utica (N. Y.) Belt Line Street Railroad Co. Mr. William H. Dunkerly, formerly auditor of the road under Pres. John W. Boyle, will assist Mr. Linn.

MR. J. PEYTON CLARK, formerly of Seattle, Wash., has been appointed manager of the Terre Haute (Ind.) Electric Co., succeeding Mr. C. B. Kidder, who has gone to Atlanta, Ga., to take charge of other interests for Stone & Webster.

MR. H. F. J. PORTER, formerly manager of the Chicago office of the Bethlehem Steel Co., and more recently at the works at South Bethlehem, has been appointed New York sales agent of the company, with headquarters at 100 Broadway.

THE SARATOGA TRACTION CO., Saratoga Springs, N. Y., has elected Joseph A. Powers, Troy, president; Addison B. Colvin, Glens Falls, chairman; W. W. Worden, Saratoga Springs, vice president, and M. M. Waterman, Troy, secretary and treasurer.

MR. FELIX SCHUSTER, governor of the Union Bank of London, England, who is traveling in America, was entertained in Baltimore, April 12th, and taken to ride in a private car over the entire system of the United Railways & Electric Co. Mr. Schuster highly praised the transportation facilities in Baltimore.

MR. FRANK M. ZIMMERMANN, superintendent and chief electrician of the Atlanta (Ga.) Railway Co., will assume the management of all the street railway lines in Illinois controlled by the Everett syndicate, including the Elgin City, Carpentersville & Aurora Ry., the Aurora Street Ry., the Aurora & Geneva Ry.,

the Aurora, Yorkville & Morris Ry., and a projected line from Chicago to Wheaton. General offices for these roads will be located for the present in Aurora, but may later be removed to Batavia, where the central power house and shops will be erected.

MR. S. EDGAR WHITAKER has resigned as general manager of the Portland (Me.) & Yarmouth Electric Ry. Mr. E. A. Newman, secretary, treasurer and manager of the Portland Railroad Co., will assume the duties of the position which Mr. Whitaker leaves vacant.

MR. LOUIS H. MOUNTNEY, formerly connected with the Philadelphia Traction Co., has resigned as superintendent of the Springfield (O.) Railway Co. to become general superintendent of the Lima Railway & Light Co. Mr. Mountney removed to Lima April 1st.

MR. J. L. GREATSINGER, president of the Brooklyn Rapid Transit Co., was presented with a costly watch and chain, April 12th, by the employees of the Duluth & Iron Range R. R., with which he was until recently connected. A letter, signed by 400 employees, expressing regret at his departure and cordial wishes for his success, accompanied the gift.

MR. BAYARD L. KILGOUR, who has been the electrical engineer of the Cincinnati Street Railway Co. for the past ten years, has resigned and will become supervising engineer of construction and maintenance, and supervisor of contracts for the City & Suburban Telegraph Association.

MR. H. G. BRADLEE, a special representative of Stone & Webster, of Boston, who control the Terre Haute (Ind.) Electric Co., has recently visited Terre Haute and Brazil, examining the company's property with a view to its improvement and an extension of the street railway lines.

MR. GEORGE W. BAUMHOFF, formerly general manager of the St. Louis Transit Co., is one of the incorporators of the Las Vegas & Hot Springs Electric Railway, Light & Power Co., which has been recently organized with a capital stock of \$200,000. Associated with Mr. Baumhoff in the enterprise are Messrs. Joseph E. Meryman, of Las Vegas, and V. O. Saunders, of St. Louis.

MR. GEORGE F. BAER, of Reading, Pa., who was recently elected president of the Philadelphia & Reading Ry., is also interested in several electric lines and will probably be chosen president of the West Chester Street Ry. Mr. Baer has been counsel for the Philadelphia & Reading since 1870 and for a number of years a director also. He is also president of the Temple Iron Co., of the Reading Paper Mills, of the Board of Trustees of Franklin and Marshall College, and of the Park Board of Reading, and is a director of the Lehigh Valley R. R., Pine Creek Ry., Beech Creek Ry., Cambria Iron Co., Cambria Steel Co. and other corporations. Mr. Baer is a veteran of the civil war, having served in the 133d Pennsylvania.

MR. W. F. WEH, claim agent for the Cleveland (O.) Electric Railway Co., has established an efficient system of investigation in case of accidents on the lines of the "Big Consolidated" which has saved the company the inconvenience of many damage suits and reflects much credit on his ability as a detective. The system includes obtaining responsible witnesses for every accident, no matter how trifling, and the profession of the "ambulance chaser," who is often paid 50 per cent of the damages awarded the injured for the value of his testimony, is not a thriving one in Cleveland. It is Mr. Weh's office to see that the injured are promptly attended, as well as to head off any fraudulent conspiracy between the victim and his legal adviser.

MR. WILLIAM PESTELL, electrical engineer for the Lynn & Boston R. R., constituting Division No. 1 of the lines of the Massachusetts Electric Companies, has resigned this position to

become superintendent of motive power and machinery for the Worcester Consolidated Street Railway Co. Mr. Pestell has been with the Lynn & Boston system since November, 1892, having been connected first with the lines at Salem. Previous to this time he was with the New England Electric Co., agent for the Sprague company. Mr. Pestell has had a thorough training in electrical construction and repair work and while in charge of the Lynn & Boston shops has introduced many labor-saving devices and methods by which substantial economies have been effected. He leaves his present position with the best wishes of his superiors and associates.

MR. RICHARD E. DANFORTH has resigned as superintendent of the Buffalo Ry. and was on April 15th appointed general manager of the Lorain & Cleveland Railway Co., the Sandusky & Interurban Electric Railway Co. and the Sandusky-Norwalk Railway Co., which latter operates the Peoples Electric Ry., of Sandusky. These and other companies are to be merged with the Lake Shore Electric Railway Co., of which Mr. B. Mahler of Cleveland is president. These companies now have 70 miles in operation and 30 miles more nearly completed. Mr. Danforth was born in Buffalo in 1868 and after leaving the public schools entered Cornell University, where he was graduated in electrical



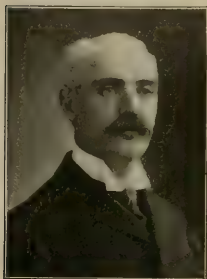
R. E. DANFORTH.

engineering in 1891. He then entered the employ of the Buffalo Railway Co. as a laborer in the line construction department and worked up to the position of line-man, going next to the company's Niagara St. power house as greaser. Soon after he was put in charge of the erection and repairs of boilers and engines. In October, 1892, he was made superintendent of the Buffalo, Bellevue & Lancaster Ry.; after completing the construction of this road he remained in charge of operation till 1897. During this period he also acted as consulting engineer for various companies and firms. In 1897 Mr. Danforth was appointed superintendent and purchasing agent of the Buffalo Ry. and the Cross-town Street Ry., of Buffalo, and on the purchase of these lines by the International Traction Co. in April, 1899, General Manager Van Horn made Mr. Danforth superintendent of the Buffalo lines of the company and of Buffalo, Bellevue & Lancaster, the Buffalo, Tonawanda & Niagara Falls and the Buffalo, Kenmore & Tonawanda divisions, constituting 240 of the 320 miles of International system. Because of the extensive engineering and practical railway experience of Mr. Danforth he was called upon to assist Mr. Van Horn in perfecting the organization of the road and in preparing plans and estimates for the improvement and extension of the entire system, and was given full control of the operation and maintenance. His experience under Mr. H. H. Littell also enabled him to be of assistance to the heads of other departments. In his new position Mr. Danforth will have charge of a very important property, as the published plans of the Lake Shore Electric Railway Co. contemplate a system of electrical railways connecting Detroit, Toledo, Cleveland and Ashtabula. The general offices of the company are in the Electric Bldg., Cleveland.

MR. STEPHEN L. COLES, who recently resigned as managing editor of the Electrical Review, of New York City, after twelve years' service with that journal, has associated himself with Mr. M. J. Shaughnessy, of New York City, in the business of preparing and publishing technical and trade literature and advertising for manufacturers and others who wish really helpful assistance in such matters. Mr. Shaughnessy is well known among general advertisers. He organized the advertising department for John Wanamaker when the latter began business in New York City. He also prepared and placed advertising for the first Electrical Show at the Grand Central Palace, New York, in 1896, which will be recalled as a great success. Messrs. Shaughnessy and Coles are established in Temple Court, 5 Beekman St., New York City.



MR. W. S. DIMMOCK has resigned as general manager of the Omaha & Council Bluffs Railway & Bridge Co., a position which he has held for eight years, to become general manager of the Richmond (Va.) Railway & Power Co., in which capacity he will have entire charge of over 100 miles of electric railways. The forerunner of this system was one of the first in America to be equipped for electric traction. The persistent solicitation of the Richmond company, and the opportunity extended to develop



W. S. DIMMOCK.

its lines, a work which Mr. Dimmock enjoys and in which he excels, sufficed to bring about his resignation as general manager of the Omaha road, although he expresses a regret that the severance should be necessary while the extension of the Omaha lines, and the rehabilitation of the Lake Manawa property are still under way. Mr. Dimmock will leave Omaha for Richmond June 1st. It is understood that the offer made by the Richmond company was a most flattering one.

Mr. Dimmock's entire career, except for the space of two or three years, has been in close connection with the transportation and freight departments of steam railways, and the management of electric railway systems. He has held positions of trust with the Burlington, the Wabash, the Union Pacific and other railroads, and his success is developing the interurban system at Omaha is largely due to the fact that the lines under his management have been operated on steam railway principles. Mr. Dimmock was at one time manager of the Postal Telegraph Co., at Omaha, and directed the construction of that company's lines between Sioux City and Omaha, and between Des Moines and Omaha. He is a competent electrician, and his success in Omaha has proved his ability as an organizer and promoter. With such a record his success in an enlarged field of activity is assured.

MR. A. S. LITTLEFIELD has just returned from a four months' trip to California.

THE KEENE, MARLOW & NEWPORT (N. H.) ELECTRIC RAILWAY CO. has elected the following officers: E. A. Jones, Marlow, president; Frank I. Nesmith, Surrey, vice-president; John A. Smith, Gilsum, clerk; and I. A. Loveland, Gilsum, treasurer.

MR. LUTHER ALLEN, president of the Toledo & Western Railway Co., who has been interested in banking in Cleveland for some years, has been elected president of the new Bankers National Bank of that city, which has attractive and beautiful headquarters on Superior St., fronting the Hollenden Hotel.

THE NORTH TEXAS TRACTION CO., which is building an interurban electric railway to connect Fort Worth and Dallas, has elected the following officers: George T. Bishop, Cleveland, O., president; John Sherwin, Cleveland, first vice-president; F. M. Haines, Fort Worth, second vice-president and general manager; and C. A. Taylor, Fort Worth, secretary and treasurer.

MR. C. L. ALLEN, general manager of the Lorain (O.) Street Ry., has resigned that position; he will still be associated with Mr. P. S. du Pont, president of the Lorain Street Ry., who is interested in an electric railway between Orndale, N. Y., Sylvan Beach and Sherrill, about 15 miles in length, which they hope to have in operation by midsummer. Mr. Allen's successor has not yet been chosen.

MR. J. C. HENRY, widely known as an inventor and pioneer in the street railway field, died at Denver, May 4th. Mr. Henry was born at Woodstock, Ont., in 1848; at the age of 16 he learned telegraphy and continued in the railway telegraph service until 1883, when he resigned and began to build electric railways. In

the "Review" for October, 1900, page 581, was published an interesting article by Mr. Henry describing the experimental lines built by him in Kansas City.

MR. W. J. COOKE, vice-president and general manager of the McGuire Manufacturing Co., accompanied by Mrs. Cooke, sailed for Europe on May 15th, to look after the foreign interests of the McGuire Co. He will be gone three months.

### NEW PUBLICATIONS.

THE GENERAL ELECTRIC CO. has issued the following new publications: Bulletin No. 4246 on Power Circuit Enclosed Arc Lamps for 220 or 550 Volts. Bulletin 4247 on Sewing Machine Motors. Supply Catalogs Nos. 7537, 7538, 7540, 7541, 7542, covering parts of arc lamps and LWP-5 motors

MICA MINING is the title of a very handsomely illustrated pamphlet which is being distributed by Eugene Munsell & Co. It consists of reproductions of a unique collection of photographs, gathered by members of the company, of the mines all over the world from which mica is obtained, besides views in the processes of mining and preparation of mica for the market. The illustrations in this pamphlet are printed on heavy paper, making an artistic production, from which all advertising matter has been entirely eliminated.

ELECTRICAL MEASURING INSTRUMENTS is the title of a new catalog just issued by the Keystone Electrical Instrument Co., of Philadelphia, which includes descriptions and illustrations of all the instruments made by this company. The catalog is conveniently classified into eight sections, each of which is devoted to a special line of instruments. A feature of this catalog is a separate chapter devoted to the selection, use and care of this class of apparatus. The catalog is well illustrated, is printed on heavy paper and has been carefully compiled.

DEVELOPMENT OF STREET RAILWAYS IN THE COMMONWEALTH OF MASSACHUSETTS. This is a pamphlet of 26 pages prepared by Mr. Walter S. Allen and published by the state of Massachusetts. It comprises a most interesting review of the history of street railways in the state and of the present situation. It is to be regretted that no statistics later than those for the year ending June 30, 1898, are given, but this defect is more than compensated for by the excellent map of the street railways of the state which forms a part of the book.

ENGINEERING PRACTICE AND THEORY. Written and published W. H. Wakeman, New Haven, Conn. Price \$1.00. This book is designed for the benefit of those men in charge of steam plants to enable them to pass examinations where a license is required. It contains 170 pp. of reading matter and illustrations devoted to explanations of the theory and practical use of all the apparatus entering into the construction of a modern steam plant. The information contained is of a very practical character and of a kind which every engineer should be familiar with.

TINSMITH'S PATTERN MANUAL, By Jos. K. Little, C. E. —The first edition of this book which was published several years ago by the American Artisan has been exhausted for some time and the unusual demand for this work which is recognized by sheet metal workers as a standard in that industry led to the publication of the present new edition. This has been revised and brought up to date, the latest changes in sheet metal work having been included in this edition. The book is a very practical treatise on geometry, and the principles are laid down so as to enable the reader to construct any desired pattern or surface by geometrical methods which are clearly explained and illustrated.

BRUSH ELECTRIC TRACTION CATALOG, published by the Brush Electric Engineering Co., Ltd., of London, discloses a very comprehensive range of manufactures in the field of electric traction. While the electric street railway business is a much newer industry in England than in this country and English manufacturers as a rule have been slow in undertaking this line of work,

the Brush company is building dynamos, alternators, car motors, controllers, trucks, car bodies, etc., all of which are illustrated and briefly described in this catalog. The Brush company makes everything required for the installation of a complete electric railway system with the exception of the over-head construction material, and in this respect it stands unique among British manufacturers.

**AMERICAN STREET RAILWAY INVESTMENTS**, published annually by the Street Railway Publishing Co., New York, has just been issued for 1901. This book has become a recognized authority on street railway statistics, and has been carefully revised up to April 1, 1901. It includes the reports of all the street railway companies in this country and Canada, and wherever possible gives the history of organization up to date, description of capital stock and bonds issued or proposed, with dates of issue and maturity, interest, dividends paid, trustee of mortgage, etc., a description of the plant and equipment and the names of present officers and directors. For a large proportion of these companies four or five years comparisons of official statistics are made, and the details of many consolidations of the smaller companies into the large systems now extensively operated throughout the country are given. Maps are also published of the principal street railway properties. In many of these maps the different systems used, that is, conduit or overhead electric, cable or horse operations, are indicated by different colors. In other cases the lines under construction or proposed are shown, as well as those in operation, the two being distinguished so as to be readily understood. A special feature of the book is a comparison of all gross receipts of the companies whose income amounted to \$25,000 or over in 1900, with the gross receipts of the previous year. The receipts of these companies approximate \$150,000,000, and show an average increase for 1900 of 10 per cent.

**WONDERLAND, 1901**, the regular annual publication of the Northern Pacific Ry., has made its appearance and surpasses all previous issues as an effective and attractive advertisement. An interesting history of the western country is graphically given, and liberally illustrated. The book is, in short, with its great number of half-tone reproductions, an album of the grandest scenery on the American continent. The leading feature of the publication, however, is an explanation of the peculiar design used as a trade mark by the Northern Pacific Ry. The double crescent, a simple but striking geometrical device which appears on the company's ticket office windows in every city of importance in the United States, was derived from the Korean flag. Its origin is Chinese, and dates from the eleventh century. In China, the double crescent symbolizes the mysteries of the Great Monad, and is sacred to the philosophy of one Chow Lien Ki, an oriental reasoner of note who propounded philosophical problems from a crescentic cave. The origin and significance of Chow Lien Ki's double crescent, as appropriated for the company's purposes, afford a subject for an interesting thesis and a number of brilliantly colored illustrations. In accord with this suggestion of oriental mysticism, the volume "Wonderland" is bound in heavy paper appropriately decorated with a reproduction from a clay model of a Chinese houri surrounded by crescents. The clay model is admirably executed, and its reproduction, in exquisite tints, forms an attractive feature of the book. Copies may be obtained by sending six cents in stamps to Charles S. Fee, general passenger and ticket agent, Northern Pacific Ry., St. Paul, Minn.

#### CARS FOR BROOKLYN ELEVATED.

The Brooklyn Heights Railroad Co. has recently placed orders for 150 cars of different types. The Jewett Car Co., of Newark, O., will supply 50 elevated cars; the Laclede Car Co., St. Louis, 50 convertible cars, and the John Stephenson Co., Elizabeth, N. J., 50 open cars. All cars are to be built after the designs of Mr. E. Chamberlain, superintendent of equipment for the Brooklyn Rapid Transit Co. The convertible cars will have seats made by the Heywood Bros. & Wakefield Co.; these are individual seats set in pairs and have cane backs and bottoms, with bent wood frames for the backs. In the elevated cars longitudinal seats are specified except in the center of the car, where, on account of the side doors, are theater chairs with folding seats

counterweighted so that they turn up when not in use. Christensen air brakes will be used on the elevated cars. All cars will have "Pantasote" curtains. The 100 surface cars are to have Wood gates made by the R. Bliss Manufacturing Co., and the 50 elevated cars will be fitted with Gold's platform gates, such as described in our issue for March, 1900, page 174.

All of these cars are to be mounted on Brill trucks, the maximum traction type will be used for the surface cars, and a truck of special design for the elevated cars.

#### OHIO NOTES.

The Little Miami Traction Co. of Xenia, Ohio, has increased its capital stock from \$1,000 to \$500,000. Frederick A. Henry is president and H. B. McGrew, secretary.

Mr. W. B. Francis, of Martins Ferry, is promoting a new road from that city to Steubenville along the north bank of the Ohio river. Nearly all of the right of way has been secured.

The Scioto Valley Traction Co. is rushing its work just outside of the corporation line south. Nearly three miles of the track have been graded and a large order for steel rails has been given.

The Southern Ohio Traction Co. has purchased the old steam line known as the Cincinnati Northwestern, and has begun extensive improvements that will let them three miles nearer into the heart of the city of Cincinnati.

Marion and Bucyrus parties have secured a franchise from the commissioners of Crawford county for a new line from Marion to Bucyrus. The company has two routes in view and the commissioners granted the franchise over both lines.

The Cincinnati Traction Company is putting guard rails on all the summer cars now in use in that city, and will also experiment with a new lower step that has been submitted to the company. If it is found practicable, it will be adopted on all the cars.

The county commissioners of Fairfield county have granted a franchise to the Columbus, Winchester and Lancaster Traction Co. This line extends from Columbus to Lancaster, a distance of 33 miles. It is claimed by the promoters that the road will be in operation by fall.

The Columbus, London & Springfield Ry. officials have moved into their new quarters on West Gay St., which will be used also as the general passenger and freight depot. It has been fitted up nicely at considerable cost and presents a nice appearance. The company is considering the advisability of placing a large electric arch in front of the building.

The Central Market Street Railway, of Columbus, has also graded about a mile and a half in the southern part of the city. Work has been suspended just at present, a controversy having arisen over the kind of ballast to be used. The city authorities want a concrete foundation, while the owners of the road think a crushed stone foundation will do fully as well. The Scioto Valley Traction Co. will enter the city over this line.

General Manager Fisher of the Columbus & Buckeye Lake appeared before the state board of public works recently for the purpose of leasing rights on the water front of the Licking Reservoir. The company has in mind the construction of a narrow gage electric railway around the western, southern and part of the eastern shore of the reservoir. Mr. Fisher states that his company wants to build this line right down by the water's edge, and have cars with the seats all turned toward the lake, so that passengers can have a front view of the entire sheet of water. From what was said, it is inferred that the company expects to make this place a great summer resort, a fine place for fishing, rowing, boating, etc.

It is announced that the Brooklyn Rapid Transit Co. has leased the Brighton Beach Hotel to Mr. C. A. Lindsay who will open it to the public in the latter part of May.



### NEW INDIANA RAILWAY.

A new electric railway about 21 miles in length will soon be built by the new Garrett, Auburn & Northern Indiana Electric Co. Besides connecting Garrett, Auburn and Waterloo, the objective points north will be Fish Lake, Hamilton, near Green Springs, an already popular summer resort. Franchises will be shortly procured from DeKalb and Steuben Counties and all the towns through which the road will pass.

A meeting of stockholders of the company was held last month at which the following officers were elected: Dr. J. F. Cameron, Hamilton, president and treasurer; E. B. Johns, Toledo, vice-president; F. L. Welsheimer, Auburn, secretary; J. D. Houseman, St. Louis, general manager.

### MUNICIPAL OWNERSHIP PROPOSED IN KANSAS.

Mayor Craddock, of Kansas City, Kas., has selected a committee to consider the application of the Kansas City-Leavenworth Railway Co. for a franchise over a route from Kansas City, Kas., to Kansas City, Mo. The mayor and council have also under consideration a project for purchasing the lines of the Kansas City-Leavenworth company already laid within the city limits and of extending these over the streets covered by the company's application for a franchise, in which case the road would be operated as municipal property. Rights would be leased to the Kansas City-Leavenworth company to run its cars over the city's tracks in order to handle the Leavenworth traffic. This plan was recommended to the mayor as a means of testing the advantages of municipal ownership of public utilities.

### RENOVATING CAR SEATS.

A cheap and efficient means for thoroughly renovating the plush so widely used in railway cars has been developed by the American Plusholeon Co., of Cincinnati, and the company, being the first to put on the market a compound meeting the requirements, has met with great success. Where solid colors are used the company usually prefers to dye the fabric at the same time it is cleaned. For such use "Plusholeon" is made in all colors and shades to suit the demand, and shipped in barrels or half-barrels. The compound is guaranteed to clean perfectly and to dye in fast color; it is also a positive preventive of moth.

Many street railway companies use fabrics of several colors and consequently do not wish to dye them when cleaning, and for such patrons the American Plusholeon Co. supplies the material without coloring matter, and guarantees this product to be equally efficacious in renovating.

"Plusholeon" requires no mixing or boiling, and will not injure the fabric or the hands of the employees using it. It is applied cold, and if coloring matter is an ingredient it cleans and dyes with one application.

### INSULATOR FOR BOSTON ELEVATED.

The accompanying illustration shows the type of insulator adopted by the Boston Elevated Railway Co. for supporting and insulating the conductor rails on its elevated structure. The insulators are placed on every fourth tie, these ties being 4 ft. longer than the others, and are secured by three lag screws through the feet. It will be noted that the clips for holding the rail flanges are quite different from those on the insulators used on the Chicago elevated roads. Instead of having clips which are a part of the



insulator cap and securing the rail by twisting the whole insulator after the rail is laid across it, one of the clips is removable, having a shank on the bottom which fits a hole in the lug on the insulator and is fastened in place by a cross pin. It is quite evident that

this permits of the rail being removed or the clips tightened with a great deal less work than with the earlier types. These insulators were supplied by the Albert & J. M. Anderson Manufacturing Co., of Boston.

### UNIFORM SUMMER CAPS.

It is but a few years ago that American railroad employees objected strongly to the use of uniforms, claiming that they lowered the wearers socially. Many men resigned their positions rather than submit to the alleged degradation. When uniforms were first introduced they were made by any tailor and hat manufacturer whose establishment the purchaser was in the habit of patronizing. Today all steam and street railroads uniform their employees and



large establishments employing thousands of men and woman are working night and day to supply the demand, and the growth of the business has resulted in a great improvement in the product.

There has of late been a marked inclination on the part of railway managers to thoroughly investigate what can be done in the way of providing clothing for summer wear that is more comfortable than the regulation winter uniform, and can be adopted without detracting from the neat appearance of the men.

To meet the demand for a summer uniform cap the Pettibone Brothers Manufacturing Co., of Cincinnati, which is an extensive maker of all kinds of uniforms, caps, badges, etc., is this year making a specialty of a straw cap for street railway employees, the shape of which is shown in the accompanying illustration. The advantages of the straw cap are well appreciated; they are lighter and cooler and in appearance more appropriate to the season. There are, of course, difficulties to be overcome by the manufacturer, and the production of a summer uniform cap that is durable and otherwise in every way acceptable, and at the same time is cheap in price, may properly be considered a triumph over trade conditions.

The Pettibone company calls particular attention to the fact that the cap illustrated, which is dark brown in color, is well ventilated, is sufficiently pliable that the straws will not break and will conform to the shape of the head, that the visor is of solid leather (not of strawboard veneered), and that exposure to rain all day will not affect the cap's shape.

### ARREST OF MAIL WAGON DRIVER.

The Brooklyn Rapid Transit Co. caused the arrest of a United States mail wagon driver last month on the Brooklyn bridge for obstructing the car traffic on the bridge. The mail wagon was on the car track in front of a line of cars and the driver refused to turn out of the track onto the driveway alongside. He was thereupon taken from his wagon by the bridge police to the police station and afterwards was taken in custody to the post office, during which time the mail wagon was delayed. The case was heard before a police magistrate and the driver was held for the special sessions. The assistant United States district attorney claimed the court had no jurisdiction in the case and that complaint should have been made to the federal authorities instead of arresting the driver and thereby obstructing the mails. The officers making the arrest will probably have their cases presented to the United States grand jury for interfering with the mails.

August Schabel, Algiers, La., is promoting an electric railway to connect Algiers, McDonoghville and McLellanville.



## GENERAL MANAGER'S CAR, UNION TRACTION CO. OF INDIANA.

The St. Louis Car Co. has just completed for the Union Traction Co. of Indiana a special car which was designed to serve as

dows are of beveled plate glass, except in the vestibules where bent bevel plate conforming to the curved ends of the car is used. The entrance is at the center, there being two sections. The interior finish is in the French renaissance style, South African mahogany, elaborately carved being used for the wood work ex-



SPECIAL CAR FOR UNION TRACTION CO. OF INDIANA—ST. LOUIS CAR CO.

an office and if need be a home for the general manager of the system, Mr. George F. McCulloch. The headquarters of the company are at Anderson. Mr. McCulloch's home is in Muncie and it being necessary for him to make frequent trips to Marion and Indianapolis, the north and south termini of the system, the special

cept the ceilings which are decorated in light blue. Four electric chandeliers of cut glass, two in each section, and 25 single socket lamps furnish ample light.

The office section, which is furnished in red, contains two desks, one for the general manager and one for his stenographer, a buffet, bookcase, water coolers and two folding tables, and at one end is a smoking compartment. The other section is furnished in green and has sleeping berths, upper and lower, bath room and lavatory with tile floors, kitchen with all necessary utensils, china closet and ice box. Small compartments for the motorman are provided at each end of the car. The furnishings and trimmings are very elaborate; the chairs, with the exception of those in the office, which are of red leather, are upholstered in silk damask harmonizing in color with the rest of the apartment.

The St. Louis Car Co. desired to place the "Martha" on exhibition at the Pan-American Exposition but could not do so because the car was badly needed by Mr. McCulloch during the summer months; it will probably be sent to the street railway convention at New York in October, however, where it will be sure to attract much attention because of the design and fine workmanship.

## BROOKLYN COMPANY'S BARNS BURNED.

Fire broke out in the Brooklyn Rapid Transit Co.'s car houses at Flushing and Nostrand Aves., Brooklyn, early on the morning of April 30th, and burned until the company's two-story brick building, and 55 new summer cars, which had been stored therein but the day before, were totally destroyed. The loss will probably aggregate \$200,000, that on the cars amounting to half the sum. Twelve men comprising the emergency crew were asleep in the barns when the conflagration was discovered, but all escaped without accident except one whose leg was broken in his leap from the window. Several neighboring dwellings and tenements caught fire from the burning stables and were damaged to a considerable extent. No definite cause for the fire can be assigned.

## NEW SUMMER RESORT AT AKRON.

Springfield Lake, which is situated between Uniontown and Akron, O., and is said to be one of the finest inland lakes in the state, is to be improved for a summer resort, and will be run in connection with the Canton-Akron Electric Railway Co. The lake covers 600 acres and has fine sandy bottoms and beaches, which make it an ideal spot for a summer resort.



INTERIOR OF CAR.

car was built so that the general manager might do his office work while en route.

The car is 50 ft. long over all and is mounted on St. Louis Car Co's No. 23 B special trucks. It has two 250 h. p. motors and is equipped with Christensen air brakes. The exterior is painted olive green with the name "Martha" in gold letters; all the win-

## CHASE-SHAWMUT RAIL BONDS.

The question of efficient rail bonding is one that is of the greatest importance to all trolley roads. The necessity for each bond connecting the ends of rails to be of sufficient capacity to avoid any added resistance to the track circuit is well understood. A good rail bond is a good investment for any railway, as it saves in the coal consumed, in the copper feeders by utilizing the full conductivity of the rails, in the repairs on motors because the voltage on the line is kept up and in the indefinite but ever present danger from electrolysis of buried pipes and cables.

At the present time two of the types of bonds widely used are the short bond concealed under the fish plate or rail joint and the long bond which spans the plate. Objections are urged against both types, the long bond as being expensive and exposed to theft, and the short bond as being liable to rapid wear due to the working of the rails and plates under heavy wheel loads.

The Chase-Shawmut Co., of Boston, has placed on the market a new type of flexible bond that is soldered to the rails by a simple and inexpensive process which gives a lasting contact;



CHASE SHAWMUT RAIL BOND.

this method of attaching the bond is designed to obviate all difficulty due to deterioration of the contact because of vibration and difference in the coefficients of expansion of the steel and iron that may cause the bonds to work loose where they are attached by expanding their heads into holes in the rails.

The form of the Chase-Shawmut bond is shown in the accompanying illustration. As will be seen it terminates in a pair of flat feet which are soldered to the rails. It is composed of strips of annealed copper, soldered together at the feet, which form gives the most enduring flexibility, little liable to breakage as the result from expansion and contraction.

The Chase-Shawmut company states that in a test of the leading bonds in use, made by Messrs. Stone & Webster, electrical engineers, to determine the endurance under expansion and contraction of  $\frac{3}{8}$  in. maximum, it was found that the mean value of the Chase-Shawmut bonds are relatively 13,603 as compared with 727, the highest mean value of all other bonds tested.

Chase-Shawmut bonds applied four years ago are in use today reported in as perfect condition of contact and efficiency as when put on. In addition to its long life the points of advantage claimed for this bond are: it is not a concealed bond and there is no wear upon it due to expansion under the fish plate. It may be attached to the bottom of the rails when joints are suspended, and where patent rail joints are used, two bonds may be attached, connecting the plate to the rails. In old construction, where there are angle or splice bars, the bonds may be attached to the top of the base of the rails, thus avoiding the necessity and expense of removing the plates. Not being concealed, the bonds are always in sight for examination, and as its developed length is but eight inches it offers but little inducement for theft.

The motormen employed by the Springfield (O.) Railway Co. recently threatened to strike unless the management should grant higher wages, and agree to employ only union men on its lines. Through the efforts of General Manager J. H. Miller the strike was avoided without concession on the part of the company and shortly afterwards the union was disorganized by the vote of its members.

## MEETING OF THE SOUTHWESTERN ASSOCIATION.

The third annual meeting of the Southwestern Gas, Electric & Street Railway Association was held at Houston, Tex., April 19th to 21st. After calling the meeting to order on the first day President Strickland introduced the mayor of Houston, who welcomed the association in the name of the city. The president then delivered his address, and the rest of the session was devoted to routine business.

At succeeding sessions the following papers were read:

"Municipal Ownership v. Private Corporations," T. D. Miller, Dallas.

"Water Power for Small Plants," F. R. Starr, Gonzales.

"Corporations and Their Employees," H. F. MacGregor, Houston.

"Station Work," George Cushman, San Antonio.

"What Are We Here For?" E. L. Wells, Marshall.

Officers for the ensuing year were chosen as follows: President, H. F. MacGregor, Houston; vice-president, E. H. Jenkins, San Antonio; C. F. Yeager, Laredo, and J. R. Cullinane, Denison; secretary, T. H. Stuart, Waco; treasurer, T. D. Miller, Dallas. The membership now includes 44 active members and 27 associate members.

On Friday and Saturday the delegates at the convention visited the power plants and car houses in Houston; Friday evening a reception was tendered the association at the Elks Club and Saturday evening a banquet was held at the Hutchins House, which was a most delightful function. On Sunday the local entertainment committee of Houston escorted the association to Galveston, a special car being provided; at Galveston, another committee, headed by Maj. R. B. Baer, president of the Galveston City R. R., took the party in charge. The entertainment at Galveston included a trip on the Gulf in a yacht, luncheon being served on board.

Among the street railway men and representatives of street railway supply houses present were: E. H. Jenkins, president San Antonio Street Ry.; Frank E. Scovill, general manager Austin Rapid Transit Co.; Chas. W. Ford, G. A. Collier, F. J. Bennett, jr., and J. T. Payne, of the Galveston City R. R.; T. H. Stuart, secretary Citizens Ry., Waco; H. F. MacGregor, president Houston Electric Ry.; E. S. Ellis, J. W. Payne and D. D. Cooley, Houston Electric Ry.; George Cushman, San Antonio Traction Co.; T. H. Bailey Whipple, Buckeye Co., Cleveland, O.; William W. Kingston, who represents the Lorain Steel Co. at Atlanta, Ga.; E. J. Pietzcker, of the electrical department of the American Steel & Wire Co., Chicago; Harry L. Monroe, special agent of the General Electric Co., Dallas, Tex.; Warren B. Read, secretary and treasurer of the Safety Electric Manufacturing Co., New Orleans; William T. Spranley, manager of the Newman-Spranley Co., New Orleans; J. D. Lehman, of the Columbia Incandescent Lamp Co., St. Louis; Fred S. Kenfield, "Street Railway Review," Chicago.

## EXTENSION BY MCGUIRE CO.

The McGuire Manufacturing Co. has purchased the plant and business of the C. & G. Manufacturing Co., of Chicago, and will henceforth carry on the manufacture of high grade rheostats, motor starting boxes and speed regulators as one of the departments of the McGuire company's business. The manager of this department will be Mr. McKruger, who has had an extended experience with the Siemens & Halske company at Berlin and with the Siemens & Halske Co. of America. The company expects to put a new electric heater on the market within a short time.

## NO STREET RAILWAY BILL FOR CHICAGO.

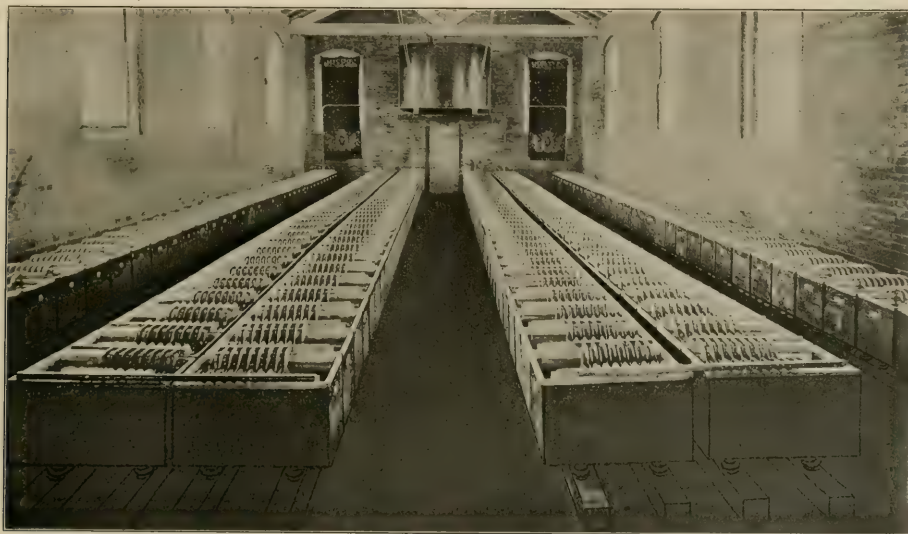
The bill prepared by the Chicago street railway commission and submitted to the Illinois Legislature failed to pass, as did also a substitute bill authorizing the city of Chicago to acquire control of street railway plants. The provisions of this bill were abstracted in our issue for February, page 81.



### STORAGE BATTERIES ON THE CLEVELAND & CHAGRIN FALLS.

The Cleveland & Chagrin Falls Railway Co. has recently contracted for a second set of Willard batteries made by Sipe & Sigler, of Cleveland, consisting of 265 cells of 400 ampere hours capacity. This battery will be located on the eastern division of the road 14 miles east of Chagrin Falls. The former battery was installed but a short time ago on the western division of the road, 11 miles west of the power house at Chagrin Falls, and consists of 220 cells of 400 ampere hours capacity.

There are several ways in which batteries may be used in traction work, and these two batteries are each used differently. The first set installed was arranged to float on the line and in this case the number of cells used is smaller than when a feeder is employed. The last set of batteries will be supplied with a separate feeder. In the first case the number of cells depends upon the resistance of the line and the demand for current upon it. If too many cells were used it would prevent the battery from becoming properly charged and if the cells numbered too few the battery would be always overcharged.



STORAGE BATTERY FOR THE CLEVELAND & CHAGRIN FALLS ELECTRIC RAILWAY CO.

The feeder which will supply the battery to be installed will maintain it by means of a booster at practically the same voltage as at the power house, thus making the battery a separate substation or distributing point. The first battery of 220 cells herewith illustrated was placed at the point mentioned for the reason that the road could hardly be operated between this point and the western terminus on account of the excessive drop in voltage which occurred here. Under the ordinary running conditions the voltage along this part of the road fell as low as 190. Since the installation of the battery the average voltage at this part of the line is 450 and the minimum pressure at any part of the road is not less than 350 volts.

A careful estimate was made before installing the battery as to the cost of additional copper necessary to accomplish the same results and it was found that this cost would be nearly three times as much as the price of the battery. From tests which have been made on this system it has been found that the influence of the battery is felt between three and four miles east as well as about three miles west of the battery house. Further, there have been several occasions when the station has been entirely shut down, at which times the battery carried the entire load from the western terminus for a distance of 15 miles for 2½ hours.

The plates of this battery are set in lead lined tanks large enough to contain the additional elements necessary to raise the capacity to 600 ampere hours. The tanks are insulated from the ground by eight glass petticoat insulators which are arranged in two tiers of four insulators each. The plates are burned to heavy lead bus bars which are reinforced at points where they pass from one group of cells to another and from the cells to the switchboard. The leads are of bare copper covered with lead wherever there is danger of their coming in contact with acid fumes.

The first battery is installed in a substantial brick building having a slate roof and brick paved floor. A room is partitioned off at one end of the building for the switchboard apparatus, which consists of the standard Weston instruments and I-T-E circuit breakers. The height of the building was so arranged as to permit a second battery of the same size to be placed above the one already installed.

The new battery to be installed on the eastern division of the road will maintain the voltage on the Garrettsville extension, which is now building. The two plants were designed and installed by Sipe & Sigler, of Cleveland.

### PARK FOR INDIANAPOLIS INTERURBAN.

The Indianapolis & Greenfield Rapid Transit Co. has secured a franchise to build a line through Spring Lake Park, which resort it proposes to improve. Entertainments will be given at the park during the summer, and a number of special amusement features will be added. The branch of the Indianapolis & Greenfield line running to the park will cross the tracks of the Pennsylvania R. R., at which junction the street railway company proposes to erect a suitable waiting station. Special summer cars have been purchased in anticipation of heavy traffic over this portion of the system during the summer.

The Michigan Traction Co. is preparing to remove its headquarters from Augusta to Kalamazoo, where two car houses will be erected this summer. The change will afford an improved service at the Battle Creek end of the line.

The Worcester (Mass.) Consolidated Street Railway Co. on April 12th announced that thereafter the wages of operatives on all the lines absorbed by it would be the same as the wages of operatives of the old Consolidated system. This means an increase of wages for some 200 employees.



## UNITED STATES ELECTRIC SIGNAL.

The electric block signal system for single track roads introduced about two years ago by the United States Electric Signal Co., of Watertown, Conn., has met with great success, practically all the roads installing it having extended its use. In this system the circuits are made by the passage of the trolley wheel along a switch box inserted in the trolley wire near the turnout, thus avoiding setting the switches by hand. The boxes are used in pairs, one set when going in one direction and the other for the opposite direction.

Among the street railways using this signal system are the following:

Lynn & Boston, Plymouth & Kingston, Brockton & Plymouth, Lexington & Boston, Quincy & Boston, Newton & Boston, Haverhill & Amesbury, Union Street Ry., New Bedford; Northampton & Amherst; Springfield Street Ry., Springfield, Mass.; Palmer & Monson Street Ry.; Hartford Street Ry., Hartford, Conn.; Meriden Electric Railway Co., Schenectady Street Railway Co., Schenectady, N. Y.; United Traction Co., Albany, N. Y.; Stillwater & Mechanicsville, Troy, N. Y.; Auburn & Interurban Railway Co., Auburn, N. Y.; Beaver Valley Traction Co., Beaver Falls, Pa.; Dayton, Springfield & Urbana, Springfield, O.; Monongahela Street Railway Co., Rankin, Pa.; Halifax Tramway Railway Co., Halifax, N. S.; Terre Haute (Ind.) Electric Co.; Mexico Street Ry., Mexico City.

## LOCKE PORCELAIN INSULATORS.

A short time ago glass was practically the only material used for insulating telephone and telegraph wires for outdoor lines, though porcelain insulators were used on power transmission lines where the voltage was higher. Recently, however, the advantages of using the stronger porcelain insulators has led to their intro-



NO. 2 PORCELAIN INSULATOR.

duction for telegraph and telephone lines and Fred. M. Locke, of Victor, N. Y., who is one of the largest manufacturers of porcelain insulators, is now making thousands of them every day for this purpose. The increase in this branch of the business is largely due to the perfection of machinery invented by Mr. Locke, by which the cost has been reduced.

Insulators for the high potential transmission lines are a very important part of the business and when a "Review" representative visited the Locke factory recently an order of 80,000 insulators for a 60,000-volt line in the west was just being completed; these were tested to 100,000 volts. Mr. Locke stated that last year his plant made and shipped over one million insulators, and the number will be much larger for the present year because of the business in small insulators.

The Haverhill (Mass.) & Amesbury Street Railway Co. is preparing to erect a fine hotel at Salisbury Beach this summer, and will extend its line to the beach.

## HALF FARES.

The Toronto Street Railway Co. is negotiating for the purchase of Palisade Park, in the vicinity of Toronto.

The Boston Elevated Railway Co. will have a street railway mail service between Boston, Everett and Malden.

The Chicago Union Traction Co. has reduced the number of trail cars in its cable trains from three to two.

Four large modern cars, equipped with 100-h. p. motors have been purchased by L. J. Wolf for service between Elgin and Aurora, Ill.

"The Park on the Palisades" is the title of a handsomely illustrated pamphlet recently published by the New Jersey & Hudson River Railway & Ferry Co.

King Leopold of Belgium is reported to be interested in a project to construct a system of electric railways connecting Brussels with Antwerp, Ostend and Paris.

The Rock County Electric Railway Co. has withdrawn its application for a franchise in Beloit, Wis., having received, it is said, unfair treatment from the City Council.

President John A. Rigg, of the United Traction Co., Reading, Pa., has caused the arrest of H. F. De Gour, editor of the "Labor Advocate," on a charge of criminal libel.

The Duluth-Superior Traction Co. has made extensive improvements and repairs of its system. The new double truck cars for the interstate line have been put into service.

The Minikahda Golf Club, of Minneapolis, is considering the construction of a street railway to the golf links, following the example of the Midlothian Club, of Chicago.

The Metropolitan Street Railway Co., of Kansas City, Mo., has purchased a site of 1¼ acres in the eastern part of the city, on which the company's car shops will be erected.

The Toledo, Fostoria & Findlay Electric Railway Co. has commenced track-laying between Findlay and Fostoria. A consignment of 3,000 tons of steel rails was recently received.

The new car houses of the San Francisco & San Mateo Electric Railway Co. have been completed. The company has inaugurated an improved service through the suburban districts.

Saturday, May 11th, the Duffys and the Campbells, employees of the general office of the Chicago City Railway Co., played base ball at Auburn Park, the game being called at 3 p. m.

A suit has been commenced to test the authority of the railroad commissioner of Michigan as regards the prevention of the construction of crossings of steam and electric roads at grade.

The Kansas City-Leavenworth company is preparing to erect a car house and sub-power station near Chelsea Park. The company has purchased new machinery for its power station at Wolcott.

An electric car in Syracuse, N. Y., collided with a hose cart on its way to a fire, April 12th, with the result that five firemen and the motorman and one passenger of the car were seriously injured.

Mr. J. W. Van Cleve, who is promoting an electric line to connect Benton Harbor and Kalamazoo, is negotiating for the privilege of entering Benton Harbor over the tracks of the local company.

The Des Moines (Ia.) Street Railway Co. is relaying its down town system with 90-lb. rails, which are much heavier than those formerly used. Rapid progress is being made on the army post extension.

The Winnipeg (Man.) Electric Street Railway Co. recently presented to the Winnipeg general hospital an electric motor and rheostat complete, with which to drive the static electric machine for the X-ray apparatus.

Mr. C. F. Holmes, general manager of the Metropolitan Street Railway Co., Kansas City, Mo., is quoted as denying the report recently circulated that the Metropolitan company had absorbed the Kansas City-Leavenworth Ry.

Eighteen hundred feet of trolley wire was stolen from the lines of the Inland Traction Co., Allentown, Pa., on the night of April 24th. The theft was committed between Hatfield and Souderton, where the electric road passes through the woods.

The endless chain operators who deal in street car tickets are still at work—this time it is in Milwaukee where the philanthropic dealers give a dollar's worth of street car tickets for 25 cents after three other people have paid one dollar each.

An electric car on the main line of the Cripple Creek & District Ry. jumped the track at the Cripple Creek terminus, April 13th, turning completely over upon its side. The motorman and 10 of the 20 passengers in the car were more or less injured.

The Rochester (N. Y.) Railway Co. has issued a folder, after the regular pattern of railroad folders, describing in detail its superb electric railway system and giving a bird's-eye view of Rochester and suburbs traversed by the company's lines.

In the Illinois Legislature, the Moline bill, framed to ratify the consolidation of the Moline, Davenport and Rock Island street railway companies in order to remove clouds from bond issues floated under a provisional agreement, was killed in the house.

The Chicago City Railway Co. has commenced the work of burying the electric feed cables along its right of way in streets that are paved. The feeder poles are being removed from the streets of the south side and a system of conduits is being laid.

The Waterloo (Ia.) Gas & Electric Co. is to build a new 500-kw. steam plant. The consulting engineer for the company, Mr. Geo. M. Brill, of Chicago, advises us that direct connected units and water-tube boilers will be used; the minor equipment has not been decided upon.

The Toledo & Findlay (O.) Traction Co. has filed, through President George B. Kerper and Secretary James A. Bope, a certificate with the secretary of state showing the title of the corporation to be changed to the Toledo, Bowling Green & Southern Traction Co.

Mr. Clinton L. Rossiter, ex-president of the Brooklyn Rapid Transit Co. and a director of the New York Central R. R., was recently in the City of Mexico for the purpose, it is reported, of consolidating a number of street railway properties in the large cities of the republic.

The Chattanooga (Tenn.) Rapid Transit Co. has offered a prize of \$25 in gold to the person who shall suggest the most appropriate name for the park which the company will locate at the terminus of its line. The contest was opened May 1st and will be continued till June 1st.

The Brooklyn Rapid Transit Co. has issued a catalog of its surplus real estate as a means of attracting purchasers. The book contains diagrams and illustrations, so arranged that the casual observer may see at a glance the exact location and boundaries of the properties for sale. The book is tastefully printed and bound and its half tone illustrations are of the first class.

The Metropolitan Street Railway Co. has now a monopoly of the street railways in Kansas City, Mo., having recently purchased the East Side Electric Ry., commonly known as the Heim line, from the proprietors of the Ferd Heim Brewery. The purchase price is quoted as \$250,000.

The Grand Rapids & Eastern and the Grand Rapids, Spring Lake & Grand Haven Electric Railway Cos., which will be consolidated, will decide upon a new title for the projected extensive system. Two names are under consideration; the "Riverside Ry." and the "Consolidated Interurban R. R."

A number of street railway promoters, claiming to represent the Gordon Traction Co., backed by Senator Gordon of Ohio, have secured a franchise in a Michigan township for an electric road to connect Lansing and Battle Creek. Another company some time ago secured franchises through villages along the same route, but failed to obtain township rights. A lively contest is anticipated.

The Hudson River Electric Co., which was recently incorporated with a capital stock of \$1,000,000, purposes the construction of dams across the Hudson River in Saratoga, Warren, and Washington Counties, and elsewhere on other streams, and will furnish light, heat and power to the cities of 10 counties. H. W. Williams, Robert Delong and F. G. Baker, of Glens Falls, are among the directors.

The employees of the Indianapolis Street Railway Co., after an unsuccessful attempt to organize a local union, have relinquished the charter recently granted them by the Labor Federation and disbanded. President McGowan readily agreed to reinstate, with one or two exceptions, the men whom the company had discharged since the formation of the organization, and the old friendly relation between the company and its employees is renewed.

The Atlanta (Ga.) Railway & Power Co. declines to bear half the expense of public concerts at Grant Park, this year, as has been its custom. The concerts have cost the company \$800 per season, and although the music attracted many visitors to the park, and thus increased travel on the company's lines, the plan has been given up as impracticable. If the Atlanta Rapid Transit Co. extends its lines to Grant Park this summer, as proposed, it will contribute \$400 toward the support of the orchestra.

The State Board of Tax Commissioners, of New York, has fixed the aggregate of the final valuation of franchises operated by corporations in New York City at \$211,334,194, which is \$8,345,157 less than the aggregate valuation of franchises fixed in 1900. The properties figuring principally in the reduction are: the Brooklyn Rapid Transit system, reduced \$1,824,000; the Manhattan Elevated, \$1,719,500; the Metropolitan Street Ry., \$1,402,205; the Consolidated Subway Co.'s property, \$495,000; and the Third Avenue R. R., reduced \$322,816.

April 23d Governor La Follette vetoed a bill passed by the Wisconsin Legislature which granted street railway companies the right to endow their employees with police powers. In the governor's message rejecting the bill he stated: "The serious troubles that sometimes arise between employees, if left to themselves, invested with the power which is here sought to be given, would inevitably lead to bloodshed and loss of life." He further declared the bill to be subversive of good government and vicious in principle.

The Lake Erie Park & Casino Co., which operates the delightful summer resort at Toledo, has just issued a very attractive pamphlet describing the park. Last season over a million people visited this resort during the 110 days it was open, and as extensive improvements have been made, an even more successful season is anticipated this year. The excursion season will open May 19th. The president and manager is Mr. Frank Burt, and Mr. J. W. Pickens is excursion agent. Mr. Pickens was last year excursion agent for the Columbus (O.) Railway Co.

## ECHOES FROM THE TRADE

THE MAYER & ENGLUND CO. on May 1st removed its New York offices from the 12th to the 9th floor, 85 Liberty St.

THE WESTON ELECTRIC INSTRUMENT CO. has removed from No. 214 William St., Newark, N. J., to Waverly Park, Essex Co., N. J.

THE BABCOCK & WILCOX CO. has removed its New York offices to No. 85 Liberty St., where it will occupy one floor in the Singer Building.

THE AMERICAN CIRCULAR LOOM CO. on April 22d removed to 128 West Jackson Boulevard, Chicago. The company's premises at 141 South Clinton St. have been leased to the Aaron Electric Co.

THE VOSE SPRING CO. reports that business is first-class. The manager, Mr. Gus Suckow, has returned to New York after a week's trip and states that he succeeded in placing a number of large orders.

"CROSS" OIL FILTERS, made by the Burt Manufacturing Co., Akron, O., have recently been installed in the immense plant of Vickers, Sons & Maxim, the largest manufacturers of war material in the world.

THE HOOVEN, OWENS & RENTSCHLER CO., Hamilton, O., manufacturer of Hamilton-Corliss engines, has been recently reincorporated with a paid-in capital of \$2,000,000. The present works are to be greatly enlarged.

SARGENT & LUNDY, mechanical and electrical engineers, on May 1st removed from the Monadnock Bldg., to the Isabella Bldg., No. 46 East Van Buren St., Chicago, where they have quarters on the 10th and 11th floors, the number of the office being 1000.

PAWLING & HARNISHFEGER, of Milwaukee, have just published the fifth edition of their Crane Catalog which is a finely printed book of 130 pages profusely illustrated with half-tone engravings showing many of the installations made by the firm.

THE CONSOLIDATED TRACTION CO., of Pittsburg, has just ordered (after making an exhaustive test covering a period of two years), 50 more of the American Electric Switch Co.'s automatic electric switches, making a total of 54 of these switches which it will have on the system.

DIXON'S SILICA GRAPHITE PAINT is used on the roof, 57,000 sq. ft., of the John Wanamaker store in New York. Two coats were applied, the first coat covering 619 sq. ft. to the gallon and the second coat 838 sq. ft. to the gallon. This paint is furnished in one grade only, of which there are four colors.

"THE WHITE STAR" is the title of a recent pamphlet published by the Pittsburg Gage & Supply Co., of Pittsburg, Pa., as a guide to wise men. It describes the construction and operation of the "White Star" filters for purifying oil, and will interest all those having the supervision and care of machinery.

HARTSHORN'S ROLLER for April contained 14 pages of wit, wisdom and clever illustrations. This periodical of fun which is not at a disadvantage compared to "Life" is published by the Stewart Hartshorn Co., at East Newark, N. J., in the interest of Hartshorn's shade rollers, awnings and similar manufactures.

PARK & HAMILTON, Youngstown, O., the contracting firm which will build the Youngstown & Sharon Electric Ry., will be

incorporated as a stock company. Messrs. Park and Hamilton are largely interested in the Penhale-Devitt syndicate, the amount of whose street railway investments will shortly reach \$5,000,000.

A. O. SCHOONMAKER, 158 William St., New York, reports a large demand for his mica segments this year from the street railways, showing that they have given satisfaction. He says there is nothing like "Solid Sheet Mica" for street railway work and would be pleased to send samples of his segments to any road wishing to give them a trial.

THE LORAIN STEEL CO.'S works at Johnstown, Pa., are running night and day to keep up with the orders in hand, and the company is doing a larger business than it has for four or five years. Large quantities of special work for street railway construction are being shipped to England and Europe in addition to the orders from this country.

THE BULLOCK-WAGNER SALES ORGANIZATION has established a district office at No. 1624 Marquette Building, Chicago. It will be in charge of Mr. H. B. Foster, who has for about two years served the Wagner company as sales agent. He will have the able assistance of Mr. E. W. Goldschmidt, formerly of the Western Electric Co., in covering this most important field.

CHARLES HENRY DAVIS, C. E., and JOHN S. GRIGGS, JR., M. E., who installed the electrical equipment of the new mechanical building for the Curtis Publishing Co., Philadelphia, publishers of the Ladies' Home Journal and the Saturday Evening Post, have issued an interesting and instructive book of 30 pages, entitled "Mechanical and Electrical Equipment of a Printing House."

WILLIAM O. JOHNSON, receiver of the Freeport (Ill.) General Electric Co., has notified interested parties that on May 17th he will ask the United States District Court, Judge Grosscup, sitting in Chicago, to approve his report of claims, to order the payment of claims for operating, supplies and expenses from Sept. 11, 1898, to Mar. 11, 1899, and to order the exclusion of all other claims prior to the mortgage.

THE AUTO APPLIANCE CO., Marquette Bldg., Chicago, has arranged with the St. Louis Car Co. for the latter to manufacture and sell the "Auto" car coupler which was illustrated in the "Review" for January, page 56. The Auto Appliance Co. has recently made some minor improvements in this coupler, one being the substitution of a round for a square gravity block.

"THE WILLARD STORAGE BATTERY" is the title of a 50-page pamphlet just issued by Messrs. Sipe & Sigler, of Cleveland, the manufacturers. In addition to a complete description of the Willard batteries there are half tone engravings showing a dozen or so of the principal plants installed by this firm, diagrams showing the loads carried by the batteries in service, illustrations of details, etc.

THE DE WITT SAND BOX CO. will hereafter have its offices and factory in Troy, N. Y., which will be in charge of Mr. E. F. DeWitt, who for years has been at the head of the business. Mr. DeWitt has a very wide acquaintance among street railway men as the DeWitt sand box has been on the market for at least ten years and is in use on nearly 500 roads. The company takes great pride in the fact that with the thousands of boxes sold it has never had a complaint as to their working.

THE MORRIS ELECTRIC CO. expects to occupy its new shops at Ampere, N. J., by June 1st, the machinery now being put in place. The company is going to manufacture a large line of



street railway supplies, including the Morris rail bond, and the "Monarch" fare register, and the equipment of the factory will be very complete so that the largest orders can be given prompt attention. In the past the company has been considerably handicapped by not being able to fill its bond orders as promptly as it desired.

F. C. RANDALL, the eastern representative of the Christensen Engineering Co., has held an excellent trade during the past month. Among his sales are orders for 79 equipments for Brooklyn Heights R. R.; 100 equipments for Union Traction Co., of Philadelphia; 25 equipments for the Hartford Street Ry., Hartford, Conn.; 20 equipments for the Worcester Consolidated Ry., Worcester, Mass.; 25 equipments for the United Power & Transportation Co., Philadelphia, and a large order for the Boston Elevated.

THE DUFF MANUFACTURING CO. advises us that on April 3d a decree was rendered in the United States Circuit Court for the Western District of Michigan, in the case of the Duff Manufacturing Co., against the Kalamazoo Railway Supply Co., enjoining the latter company from using the handle and pawl construction covered in the Barrett patent No. 312316, and which has been used for many years in the Barrett jacks. This refers to the trip jacks recently put upon the market by the Kalamazoo company, which are substantial copies of the Barrett jacks.

THE CURTAIN SUPPLY CO., of Chicago, has just issued a handsomely illustrated 40-page pamphlet on car curtains and curtain materials which is called the company's Catalog E. This company bought the entire business of the Adams & Westlake, the E. T. Burrows, the Forsyth Brothers and the Davis Car Shade companies and being the owner of all the foundation fixture patents it announces that it can furnish any type of shade-holding mechanism desired entirely free from any fear of litigation. The cable fixtures described include the well-known "Acme," "Climax" and Forsyth styles.

THE IRONSIDES CO., of Columbus, O., whose business is the manufacture and supply of special lubricants for the preservation and protection of metallic surfaces, wire ropes, gearing, belting, fibre ropes, etc., reports the business of its past fiscal year just closed, as showing a gratifying increase, and anticipates a further increase of 100 per cent the coming year, owing to improvements and extensions of the factory. The company's market includes the largest rolling mills, general manufactures, mining and other industrial institutions, whose decreased expenses in operating departments attest the value of the goods.

NEARLY ALL STREET RAILWAYS operating pleasure parks have a dancing pavilion and find that though it is a very popular attraction, the expense of providing musicians is a serious burden which materially reduces the profits of the floor. The orchestrons sold by August Pollman, 70 Franklin St., New York, are especially adapted for dancing pavilions and have the great advantage of being always ready with music for all dances, and they keep perfect time and never grow weary. The income from a dancing floor due to its use by small parties at hours when the management would never think of providing musicians will under ordinary circumstances more than pay for an orchestron in a single season.

THE UNDER-FEED STOKER CO., of America, has recently removed its general offices to the Marquette Bldg. (No. 204 Dearborn St.) Chicago. The company has been doing an excellent business and among recent sales of the Jones underfeed stokers are the following, many of the orders being second and third orders: Hammond Bldg., Detroit; 4; Hiram Walker, Walkerville, Ont.; 10; Christian Moerlein, Cincinnati; 4; Bavarian Brewing Co., Covington, Ky.; 2; Danville (Ky.) Ice & Cold Storage Co.; 2; Hecker Jones Jewell Milling Co., New York; 6; John Ellis & Co., Edgewater, N. J.; 4; Mass & Waldstein, Newark, N. J.; 6; Montreal Mining Co., Hurley, Wis.; 4; Brand & Hardin, Saginaw, Mich.; 1; J. G. Schemm Brewing Co., Saginaw, Mich.; 2; Peoples Ice & Cold Storage Co., McKeesport, Pa.; 2; Lynn (Mass.) Gas & Electric Co.; 1; Toledo (O.) Heating & Lighting Co.; Posten Pav-

ing Brick Co., Crawfordsville, Ind.; Alaens Portland Cement Co., W. Camp, N. Y.; Cedar Hollow (Pa.) Lime Co.; Renington-Martin Co., Watertown, N. Y.; Lozier Motor Co., Plattsburg, N. Y.; Hudson County Consumers Brewing Co., Hoboken, N. J.; Wellston (O.) Portland Cement Co.; Columbus (O.) Ice Co.; Traders Paper Co., Lockport, N. Y.; Newport Mining Co., Ironwood, Mich.; Butte (Mont.) Reduction Co.; Lyon, Clement & Greenleaf, Wauson, O.

THE JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J., makes daily use of generators and motors in its factories, and for the past three years has made use of graphite brushes of its own make. It states that electrical engineers who have seen the commutators on which the Dixon graphite brushes have been used for two or three years, have expressed great surprise at the slight wear of the brushes and commutators, and at the general perfect condition and freedom from burns and sparking, and for this reason the company has no hesitation in offering the Dixon graphite brushes to electricians generally. In fact, the company has full confidence that Dixon's graphite brushes will be found superior to any kind of brush in the market. The company is sending out price lists indexed under the names of makes of motors, showing sizes and prices of brushes.

THE ERICSSON TELEPHONE CO., 296 Broadway, N. Y., recently received the following letter from the chief signal officer of the War Department: "Referring to the order this day placed with you for 200 bridging telephones, this office desires to state that, as you are probably aware, in the early part of 1900, we shipped a lot of telephones of six different makes to Manila, for test purposes. The report upon the Ericsson telephone has been favorable. As the telephones covered by the present order are going to Manila, you should understand that it is expected that they will be in every respect of the very highest class of workmanship, in every detail, and it is believed that your company will readily see that it is to your own advantage to turn out the very best instrument possible. The telephones when ready will be subjected to a very careful and thorough inspection."

THE TRIUMPH ELECTRIC CO., of Cincinnati, is enjoying an exceptionally good business, the orders so far this year being considerably in excess of those received in any previous year. Among orders recently received are the following: One 200-kw. generator for the Laclede Gas Light Co., St. Louis, this being the third machine of this size ordered in the last six months. One 200-kw. direct connected unit for the Globe-Wernicke Co., a duplicate order. One 60-kw. generator and one 5-h. p., three 10-h. p. and one 15-h. p. motors for the Heer Shoe Co., Portsmouth, O. Two 100-kw. generators and three 10-h. p., two 15-h. p. and three 25-h. p. motors for the R. & H. Simon Co., Easton, Pa. Generators as follows: Village of Perham, Minn., 75-h. p. direct connected; Garretson Hotel Co., Sioux City, 100-kw.; Carroll (Ia.) Electric Light Co., two 50-kw.; Manning (Ia.) Electric Light Co., 80-kw.; M. A. Bradley, Cleveland, 300-kw.

THE UNITED STATES PROJECTILE CO., First Ave. and 53d St., Brooklyn, N. Y., is having great success with its open hearth cast steel machine cut gears, patent pressed high carbon steel pinions, bushings, sleeves and forgings for street railways. The company has recently installed a large new and modern plant for the production of gears and pinions, and is thus prepared to promptly fill all orders. In making the pinions the billets are subjected to a total pressure of over 1,000,000 lb., which compresses, toughens and solidifies the material, and secures a continuous grain which ensures good wearing qualities. The plant is equipped with improved gear cutters producing mechanically correct teeth, which is a most important consideration. These products of the company are well known, having been used for the past eight years by electric railways in this country, Canada and Europe, and adopted as standard by many of them.

THE BULLOCK ELECTRIC MANUFACTURING CO., of Cincinnati, has for some time been sending to its customers each month a beautifully printed calendar. On the card for May the design refers to Memorial Day and on the back is the announcement that the Bullock company and the Wagner Electric Manu-

facturing Co., of St. Louis, have effected a consolidation of their selling organizations, which will be of mutual advantage. The products of the two companies do not interfere and customers wishing the product of one will also need that of the other. The Bullock company has a complete line of direct and alternating current motors, generators, controllers and rotary transformers, while the Wagner company makes static transformers, instruments, switches, and single phase, self-starting alternating current motors. The combined sales department is under the management of E. H. Abadie, formerly sales manager of the Wagner company.

THE PECKHAM TRUCK CO. has received an order from the Chicago Union Traction Co. for 30 No. 14-D-3 maximum traction double trucks.

THE JEWETT CAR CO., OF NEWARK, O., holds the unique position of being the only car builder in this country to make a specialty of long double truck cars for elevated, suburban and interurban service. The company is reported to have recently shipped ten 44-ft. open center-aisle cars to Grand Rapids, Mich.; 25 14-bench open cars to the Cleveland Electric Ry.; six 45-ft. suburban coaches for the Toledo, Fostoria & Findlay Electric Ry., and 12 suburban coaches to the Youngstown-Sharon company. Orders in hand include the following: Detroit, Lake Orion & Flint, six parlor cars; Toledo & Maumee Valley, two coaches; Indianapolis, Greenwood & Franklin, two coaches; Columbus, London & Springfield, five 60-ft. coaches; Grand Rapids, Holland & Lake Michigan, eight coaches; Toledo & Monroe, two 55-ft. open cars; Brooklyn Rapid Transit Co., 50 elevated cars. All of these have Hale & Kilburn seats, Peckham trucks and Curtain Supply Co. curtains and fixtures.

The Montreal (Que.) Street Railway Co. has obtained an option on the property of the Montreal Park & Island Ry. The purchase price is \$1,600,000.

The Tennessee Legislature has passed a bill requiring all street railway companies operating within the state to furnish their cars with vestibules during the winter months.

The Mahoning Valley Railway Co., Youngstown, O., on May 1st increased the wages of motormen and conductors from 16 to 18 cents per hour. The advance was made voluntarily, and affects several hundred employees.

The Brooklyn Rapid Transit Co. recently put in effect the same wage scale on the elevated system that has been in force two years on surface lines, thus increasing the wages of all elevated road employees from 5 to 15 per cent.

The Utica (N. Y.) Belt Line Street Railroad Co. purposes to lay double tracks through East and West Utica this summer, and to effect various other improvements. The company has leased the Utica Y. M. C. A. building in which it will open general offices.

A franchise for an electric railway from Santa Ana, Cal., to the Orange County line has been granted D. H. Thomas of that city, who has agreed to pay 3 per cent of the gross receipts of the company for the privilege. The road will be extended to Los Angeles, and cars are to be running within 18 months.

Members of the New York, New Haven & Hartford Railroad Co. have purchased the Worcester (Mass.) & Webster and the Webster & Dudley Street Rys. The purchased roads will form a part of a proposed system to parallel the Norwich & Worcester division of the N. Y., N. H. & H. R. R., and will shortly be extended through Connecticut and New York.

### BRIDGE WHIST.

The Passenger Department of the C. H. & D. Ry. has just issued a beautiful set of rules on "Bridge Whist," which will be mailed on request. Enclose two cent stamp. Address Bridge Whist, Advertising Department C. H. & D. Ry., Cincinnati, Ohio.

## NEWS NOTES.

### NEW CORPORATIONS.

CAMDEN, N. J.—The Ocean Street Passenger Railway Co., of Camden, has been incorporated with a present capitalization of \$4,000, by R. M. Obertentfer, L. E. Miller and James E. Taylor. An electric railway system through Camden and suburbs is projected.

BLUEFIELD, W. VA.—The Flat Top Electric Railway Co., of Bluefield, has been organized to build a line from Bluefield, including Keystone on the route. A franchise has been granted the promoters by the council of the latter city, and franchises are pending before the council of Bluefield.

BUFFALO, N. Y.—The International Rapid Transit Co. has been incorporated under the laws of Delaware, with T. C. Freneyar, of Buffalo, agent and resident manager of the Westinghouse Electrical Manufacturing Co., as president, and has taken over the property and franchises of the International Ferry Co. and the Fort Erie Ferry Ry. The new corporation proposes to extend these properties, and to build a costly system of electric railways connecting Buffalo and Fort Erie with Crystal Beach, Niagara Falls, Toronto and the Fort Erie race track. The first step in the project will be the construction of an 11-mile line from Fort Erie to Crystal Beach, and a line from Fort Erie to Chippewa along the Canadian shore of the Niagara river. Transfer arrangements have been made between the new corporation and the International Traction Co., of Buffalo, and the Niagara, St. Catharines & Toronto Ry.

WEBSTER, PA.—The Webster, Monessen, Bellevernon & Fayette City Street Railway Co. has been chartered with a capital stock of \$60,000 to build a 10-mile electric line from Webster to Fayette City. The incorporators are: Samuel M. Graham, Charles H. Seaton and Frank M. Furr, of Uniontown; John R. Byrne, of Scotland, and Col. James M. Shoemaker, of Pittsburg. The line is to be in operation by early fall.

TOLEDO, O.—The Toledo-Bryan Air Line Co. was recently incorporated with a capital stock of \$1,250,000, by Joseph H. Yost, William C. Brewer and Milton Taylor, of Toledo, who purpose building an electric line from Toledo to Bryan.

AUGUSTA, GA.—The North Augusta Electric & Improvement Co. has been incorporated with a capital of 1,500,000 and proposes to build a 16-mile electric line.

FORT WAYNE, IND.—The Fort Wayne, Dayton & Cincinnati Traction Co., capitalized at \$1,000,000, has been incorporated under the laws of South Dakota, by Samuel T. George, A. J. Miller, and Charles L. Hyde, of Fort Wayne. An extensive interurban system connecting Fort Wayne, Dayton and Cincinnati is projected.

The Fort Wayne & Wabash Electric Railway Co. with a capital stock of \$50,000, has been incorporated to build a 42-mile electric line between the cities named in the title, paralleling the Wabash & Erie canal.

DEFIANCE, O.—The Defiance, Ottawa, Kenton & Columbus Interurban Railway Co. has been incorporated with a capital stock of \$50,000, by Daniel J. Ryan, George H. Jones, Charles Kinney, Nelson E. Matthews, John M. Sheets and H. A. Fisher. An electric railway extending from Defiance through Henry, Putnam, Allen, Hancock, Hardin, Union, Marion, Delaware and Franklin Counties to Columbus is projected. General offices will be located at Ottawa.

DULUTH, MINN.—The North & South Railway Co. has been incorporated with a present capitalization of \$300,000, and proposes to build either a steam or electric line from Duluth to the southern part of Wisconsin. The first board of directors comprises: E. C. Hollidge, and S. M. Hanley, of Minneapolis; Elwood Furnas, Thomas Wardall, S. V. Wardall and W. D. Wardall, of Nevada, Ia., and I. B. Brandenburg, of New York.

PHILADELPHIA, PA.—The Philadelphia, Media & Wilmington Electric Railway Co. has secured a charter for a 30-mile electric line which will extend from Philadelphia through Overbrook, Haverford Mills, Marple, Media, Lenni and thence to Wilmington. George J. Horwitz, Philadelphia, is interested. It is announced that the road will form a part of an interurban system aggregating 110 miles, for which six other charters have been taken out. The six charters were issued in the names of the following companies: the Philadelphia, Norristown & Phoenixville; the West Chester & Wilmington; the Philadelphia, Wayne & West Chester; the Coatesville, Downingtown & West Chester; the Chester, Wayne & Norristown; and the Parkersburg & Coatesville. The trunk line of this system will extend from Chester to Norristown, and the other lines will branch out from it. The capitalists interested will furnish, it is stated, \$550,000 for the consummation of the project.

NEWTON, MASS.—The Haverhill, Plastow & Newton Street Railway Co., with a capital of \$100,000, will apply for incorporation, and proposes to build an eight-mile electric line as soon as all rights shall be obtained. Edwin L. Price, Boston, and W. D. Lovell, Newton, are interested.

ROCKVILLE, CONN.—An electric railway to connect Rockville and Stafford Springs is being promoted by E. C. Dennis, Stafford; Fred E. Healy, Windsor Locks, and George Sykes, Rockville, who are organizing a company which will be incorporated with a capital stock of \$50,000.

EAST WINDSOR, CONN.—The East Windsor Street Railway Co. has been incorporated with an authorized capital of \$100,000, by Lewis Spry, James Price, John B. Noble and Henry W. Allen. It is proposed to build an electric line from the terminus of the tracks of the Hartford Street Railway Co., in East Windsor, to South Windsor. Connections will be made in the latter city with the lines of the Enfield & Longmeadow Electric Railway Co.

NEWARK, N. Y.—The Newark Electric Railway Co. has been incorporated by Charles Lux and C. A. Rooker, of Clyde, N. Y., and S. P. Nichols, of Palmyra, with a capital stock of \$50,000.

READING, PA.—The Reading, Fleetwood & Kutztown Railroad Co. has obtained a charter to build a 13-mile electric line from Kutztown to Lyons, Fleetwood, Blandon, Walnuttown and Temple, in Berks County. The company is capitalized at \$130,000, and will open general offices at Reading. James W. Shepp, Philadelphia, president.



## The Pan-American



## Exposition

As a preface to an issue commemorative of the Pan-American Exposition, which was last month open to the world, a few words may properly be devoted to the city of Buffalo—variously styled the Bison City, the Electric City, the Queen City of the Lakes—to whose public-spirited and energetic citizens is due the honor of successfully carrying out the plans for an exposition showing the progress and development of the western hemisphere during the nineteenth century.

Buffalo, called Cibola in the Indian tongue, takes its name from Buffalo Creek, along the banks of which, in pre-colonial days, were the hunting grounds of the Senecas, then the strongest branch of the Iroquois tribe. The Iroquois, who have been styled the "Romans of the Western World," possessed many of the attributes and accomplishments that are thought to attend only the white man's civilization.

During the seventeenth century the land of the Six Nations, as the allied tribes of western New York came to be called, was explored by adventurous men, among whom were Father Dailion, a French missionary, who passed the winter of 1626 between the Genessee and Niagara rivers; La Salle and his 24 companions, who arrived from the East in 1669; and Father Hennepin, who, with his band of Jesuits, is supposed to have been the first white man to look upon the falls of Niagara.

In 1776 the Six Nations, listening to the counsel of the Canadian traders, threw their support to the English troops, and the territory became the scene of a wild Indian warfare. But it was the last war of the Iroquois, and before the year 1780, the American militia under General Sullivan had broken their power forever.

In 1789, according to the best records, the population of Buffalo consisted of "one white man," who kept a small trader's store somewhere near what is now the center of the city. Two years later Joseph Elliott, a surveyor for the Holland Land Co., which had purchased large tracts of territory in western New York, platted a map for a settlement on Buffalo Creek, and gave it the name of New Amsterdam. The settlement grew, but the name did not find favor with the settlers, and the hamlet soon took a title from the stream upon which it was built and became known as Buffalo.

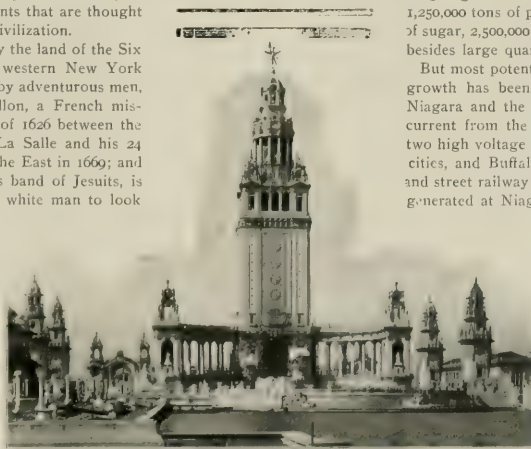
The advancement of the city has in later times been almost unprecedented. Its location as the chief commercial center between New York and Chicago makes it an important exchange point for Eastern and Western trade, and its position on Lake Erie and the Erie Canal gives it the bulk of the freight shipping over these waterways. It is the common center for 29 railroads and 250 passenger trains leave the city daily, putting it in direct communication with all parts of the country. The lake vessels, of which there are nearly 6,000 regularly clearing at the port of Buffalo, bring in annually 230,000,000 bushels of grain; 11,000,000 barrels of flour; 200,000,000 feet of lumber, 1,000,000 tons of iron ore; 400,000 tons of lead; 110,000 tons of copper and 160,000 tons of spelter. The outgoing fleet of merchant craft take away each year 1,250,000 tons of plaster and cement, 1,400,000 barrels of sugar, 2,500,000 tons of coal, 800,000 barrels of salt, besides large quantities of other products.

But most potent of all in its influence on the city's growth has been the development of power from Niagara and the successful transmission of electric current from the Falls to Buffalo. There are now two high voltage transmission lines between the two cities, and Buffalo's manufactures, lighting system and street railway lines are utilizing over 15,000 h. p., generated at Niagara Falls, 22 miles away. As the

facilities of the power company are from time to time improved and enlarged, current will be available in Buffalo at so low a cost that, together with the shipping and storage accommodations, will enable the city to offer inducements to new industries and enterprises that can be held out by no other municipality in the country.

The last census gives Buffalo 355,000 population, but of far greater importance

when considered as an exposition site, is the fact that if a circle with a radius of 500 miles be struck with Buffalo as a center, there will be found within it 40,000,000 people, or more than one-half the entire population of the United States, and this not including three-fourths of the population of Canada, which will be found within the same range. The outer edge of the circle would touch Augusta, Me., on the East; Raleigh, N. C., on the South; Louisville, Ky., on the West, and would include the cities of Boston,



ELECTRIC TOWER.



New York, Philadelphia, Baltimore and Washington, Pittsburg, Cincinnati, Chicago, Milwaukee and Detroit, all within a half-day's journey of Buffalo. It would be indeed difficult to find among the cities of the American continent one better fitted to be the site of this Pan-American enterprise.

The following figures and facts tell of Buffalo's growth and prosperity: Number of theaters, 9; public schools, 60; churches, 187; banks, 24; hotels and boarding houses, more than ample to accommodate the 20,000,000 visitors expected during the next five months; customs receipts for 1899, \$763,339; post office receipts for 1899, \$777,042; internal revenue receipts for 1899, \$2,088,338. The city has the largest coal trestle in the world; the longest breakwater in the world (four miles long); 700 miles of steam trackage within the city limits (greater than that possessed by any other city); and 223 miles of streets paved with asphalt, giving Buffalo more miles of asphalt paving than Paris, Washington, London or New York.

A review of the city of Buffalo leads naturally to mention of Niagara Falls and the beautiful region along the Niagara River. The Falls are situated 22 miles north of Buffalo, and may be reached by steam road, by trolley line or by steamers on the

was brought forward, the meeting unanimously accepted the suggestion that no more suitable place could be found than some point on the Niagara Frontier in close proximity to the falls. Messrs. Hill and Brinker returned to Buffalo in January, 1896, and after energetic work succeeded in enlisting the enthusiastic interest of a number of leading men of New York, Buffalo and Niagara Falls, with the result that in June of the following year a company was incorporated under the Business Corporation Act of New York, with a capital of \$50,000. The intention was that this company would do the preliminary work necessary to enlist a wider interest in the enterprise, after which the scope of the company would be extended. Among the officers of this corporation were Roswell P. Flower, former governor of New York; Chauncey M. Depew; a number of steam railroad capitalists, and John M. Brinker, W. Caryl Ely, Herbert P. Bissell, George A. Ricker and other prominent street railway men of Buffalo and Niagara Falls.

The company immediately set about outlining the plans necessary for launching the enterprise. Cayuga Island, a picturesque spot in the Niagara River, four miles above the falls, was selected as the exposition site. Plans for the buildings, architectural features,



Summer St.  
Post Office.



Monument to Red Jacket.



State Hospital.  
Ellicott Square.



VIEWS IN THE CITY OF BUFFALO.



Niagara River. Visitors to the Pan-American Exposition will have an opportunity of visiting under the most advantageous conditions, the great American and Canadian cataracts, the islands above the falls, the gorge, and the beautiful State Reservation, and perchance after weary of viewing the diversified handiwork of man displayed at the fair, it will be a pleasing and restful change to turn for a time to the stupendous works of Nature.

To the late James G. Blaine belongs the distinction of having first broached the subject of drawing more closely the social and commercial ties uniting the Republic states of North and South America by holding an All-America Exposition, wherein could be gathered representative exhibits of arts, manufactures and products of the soil and mines from the two continents of the New World. The suggestion took definite shape at a banquet held in conjunction with the International and Cotton States Exposition at Atlanta, Ga., in 1895, when a body of representative business and public men pledged their support to the movement. Chief in enthusiasm of those present at this dinner were Mr. R. C. Hill, a Buffalo newspaper man of wide reputation, and Mr. John M. Brinker, president of the Niagara Falls Gorge road, and when the question of selecting a site for the proposed exposition

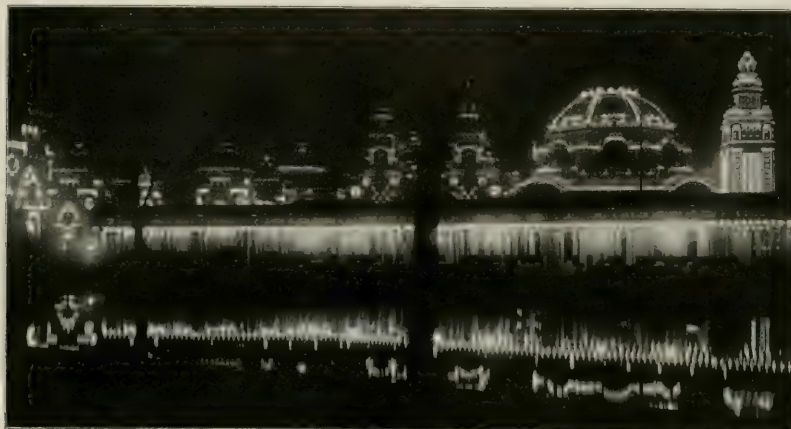
grading and landscape work were prepared by A. C. Esenwein and George A. Ricker. Applications for space were received from Mexico, Canada and the republics of Central and South America. Resolutions heartily endorsing the enterprise and voting substantial appropriations were passed by the New York Legislature and by both branches of Congress, and on Aug. 26, 1897, President McKinley visited Cayuga Island, and drove a memorial stake signifying that work had been commenced. It had been planned to hold the exposition during the summer of 1899.

Thus matters stood when in March, 1898, war with Spain was declared, and it soon became evident that the year 1899 would not be an opportune time for an exposition devoted to the arts of peace. The directors of the company accordingly met and announced that although the success of the project was assured, it was thought best to postpone the fair until the summer of 1901.

The matter rested until December, 1898, when in response to a call issued by Mayor Diehl, of Buffalo, the friends of the Pan-American enterprise met in conference, with the result that efforts were soon under way for carrying the project to successful conclusion. It was decided to let the original exposition company give way to a more comprehensive public organization, represent-

ing all the leading business and industrial interests of the city. The citizens of Buffalo took the matter into their own hands. At a public dinner nearly half a million dollars were pledged within three hours. A new charter was secured by special act of the Legislature and to the new company the original promoters generously turned over all their effects and the fruits of their three years' labors.

William I. Buchanan; chairman of the executive committee, John N. Scatterd; director of concessions, F. W. Taylor; superintendent of electric exhibits, G. F. Sever; director of fine arts, William A. Coffin; superintendent of machinery and transportation exhibits, T. M. Moore; superintendent of liberal arts, S. H. Peabody; superintendent of manufactures, A. M. Wheeler; superintendent of press department, Mark Bennitt; director of works, Newcomb



THE EXPOSITION AT NIGHT.

The movement now became a distinctly Buffalonian enterprise. The original limit of stock was increased to \$2,500,000, and a large portion of this was taken in small blocks by individual citizens, many of the single shares being held by women and children, and this in face of the fact that the prospects for any direct financial return were exceedingly meagre. The mayor of Buffalo had appealed to the public spirit and pride of the citizens, and they responded with an energy that augurs well for the city's future growth and prosperity.

Steps were at once taken toward perfecting a working organiza-

Carlton; landscape architect, Rudolf Ulrich; chief engineer, S. J. Fields; director of color, C. Y. Turner.

In the meantime, through the efforts of a provisional committee, Congress was induced to appropriate the sum of \$500,000 for a group of government buildings and exhibits, and as a token of further recognition the Government has authorized a special commemorative issue of postage stamps to be sold during the six months the gates of the Pan-American are open. Appeal to the New York Legislature resulted in an appropriation of \$300,000 to cover the expense of a New York state exhibit. These actions



MACHINERY AND TRANSPORTATION BUILDING.

tion, and the magnitude of the enterprise will be evident when it is stated that the list of officers, directors and members of committees includes over 300 names, not to mention a small army of clerks and assistants. Among the prominent officials may be mentioned the following: President, John G. Milburn; secretary, Edwin Fleming; treasurer, George L. Williams; director-general,

were at once followed by legislative endorsement and appropriations on the part of other states in this country, Mexico, and practically all of the Latin-American countries.

In response to popular demand the proposed exposition site was moved from Cayuga Island to a point nearer the center of Buffalo, the location finally selected comprising 350 acres of

wooded park land and a beautiful lake in the northern portion of the city. Here, with an expenditure of many millions of dollars, has been erected a fairy city whose beauty, variety and gorgeousness has already startled the world, and whose harmony of colors, tints and shades has won for it the appellation, "The Rainbow City."

"This is the epic of the hour.  
Industry holds her own  
And wears her crown of silver wheat  
When kings are overthrown.  
Columbia is 'at home' within  
The Exposition gates.  
Let all the nations come and read  
The story of the States."

The general plan of the courts at the exposition grounds can be compared to an inverted T, with the cross arm as the Esplanade extending east and west, and the vertical stem extending north, terminating in the Propylaeum or entrance to the railway terminal building. The various sections are known as the Plaza, the Court of Fountains, the Court of Lilies, the Court of Cypresses, and the



ENTRANCE TO ELECTRICITY BUILDING.

Esplanade, and it is within these courts that the principal decorative effects are carried out.

In planning the twenty principal buildings, which are arranged around the system of courts, architectural adornment has been secured by the artistic use of towers, domes, minarets, medallions, arabesques and other plastic relief work, the general treatment being a free adaptation of the Spanish renaissance, in compliment to the many Latin-American countries represented. As a striking color scheme has been followed in the final ornamentation, an effect has been secured, never before obtained in a large exposition of this kind. In the coloring the artist has endeavored to represent the evolutionary struggle of man to overcome the elements, the idea being carried out by the use of heavy deep reds, blues, greens and gold, as the visitor enters the main court, these colors graduating gently in tints, until the electric tower is reached, where the victory of man is symbolized in deep greens, the shade of the laurel branch. The tower itself is a cream white with sculpture work on the four corners, and is tinted with blue, green and gold, these growing fainter until the top is reached, the whole surmounted by a splendid statue of Light, standing 375

ft. above the ground, and forming the center piece and dominating feature of the exposition.

From the southern face of the tower a waterfall 70 ft. high and 30 ft. wide gushes forth and leaps into a broad basin below, where



ELECTRICITY BUILDING.

the water is again thrown toward the sky from a number of memorial fountains.

Striking as is the effect produced by the exposition by day, the scene as viewed at night, certainly surpasses anything ever before seen in this country. Over 500,000 incandescent bulbs have been used in outlining the tower and prominent buildings, and in addition 94 searchlights and hundreds of arc lights are distributed throughout the grounds, giving the impression, when viewed at night from a distance, of a mirage rather than of an actual creation. This lavish illumination has been made possible by the comparative ease with which more than ample electrical energy is transmitted from Niagara Falls.

A grand canal, over a mile in length, extends around the central portion of the exposition site, and from this main canal, winding lagoons branch off in all directions. The outer banks of this waterway are sodded and set with trees and flowers, a trip through the canal and lagoons in an electric launch or a gondola, affording one of the most refreshing and charming experiences to be had at the fair. At night this ride gives an excellent opportunity of viewing the illumination.

Standing at the electric tower, the visitor obtains the best view of the main group of buildings. To the east are the edifices devoted to Agriculture, and Manufactures and Liberal Arts, and



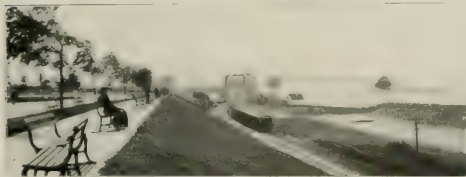
TRIUMPHAL BRIDGE.

on the west, Electricity, and Machinery and Transportation Buildings, with the entrance to the Midway just north of Electricity Building. To our readers, the Machinery and Transportation, the Electricity Buildings and the Railway Terminal Build-



ing in the extreme northern portion of the grounds, will be of special interest, for these three buildings contain practically all the exhibits illustrative of developments in the street railway transportation industry.

Electricity Building covers an area of 75,000 sq. ft., the structure being 150 x 500 ft. It contains complete displays of recent



LAKE FROM THE "FRONT."

developments in electrical science, extensive exhibits of the newest electric vehicles, the latest types of dynamos and motors, and here popular lessons will be given upon the various uses of electricity. In one corner are transformers of 5,000 h. p. capacity which receive and transform the current as it comes from the Falls, prior to its distribution about the grounds for lighting and other purposes.

South of Electricity Building is Machinery and Transportation Building, 350 x 500 ft., and covering nearly four acres. Here are the exhibits of heavy machinery for performing innumerable operations, stationary engines, boilers, road vehicles, models and photographs of locomotives, cars, railroad appliances, etc. This

is one of the finest structures on the grounds and cost, exclusive of ornamentation, \$205,000.

The heavier street railway and steam railroad exhibits, as locomotives, cars, sweepers, etc., are housed in the Railway Terminal Building.

The United States Government Buildings are located at the extreme end of the Esplanade, facing the east fountain. They cost with their contents about \$500,000. The Departmental exhibits are said to be the largest and most complete ever made at any exposition.

Other buildings belonging to the principal group have been named as follows: Horticulture, Mines, Graphic Arts, Ethnology, Women's, Art, Ordnance. Besides these are the various state and foreign buildings. New York has a substantial edifice of white marble, erected at a cost of \$375,000, and which will become the permanent home of the Buffalo Historical Society.

Of more than passing interest to visitors will be the Stadium or open arena. It is said that the Coliseum at Rome could accommodate 87,000 spectators. The Pan-American Stadium will be 129 ft. longer and but 10 ft. narrower than the Coliseum, and has seating and standing capacity for 25,000 spectators. This arena will be used during the exposition for amateur and professional athletic sports, etc.

The outdoor floral display occupies the southeastern part of the site, and here will be found exhibits of nursery stock, including orchard and ornamental trees, shrubs and evergreens, by prominent nurserymen from all parts of the country. Florists



LA FAYETTE SQ., BUFFALO.

also will make elaborate and expensive exhibits of the popular flowering plants. At various times during the summer special exhibitions of flowers will be arranged.

The lovers of music attending the fair will find elaborate provisions made for their pleasure. The Temple of Music is one of the most beautiful buildings on the grounds, and contains a magnificent pipe organ embodying all the latest improvements in organ construction. Scattered about the grounds are half a dozen band stands where afternoon and evening concerts, free to all, will be rendered by such bands as Sousa's, the Mexican Government band, and others equally as famous.

Of a somewhat lighter nature, but appealing, perhaps, more directly to the popular taste, are the attractions along the Midway, a street modeled after, but surpassing in variety and novelty, the famous Midway of Chicago's World's Fair. The various features here collected are estimated to have cost \$2,500,000. Among the attractions are the following: Gigantic Seesaw, Trip to the Moon, the Beautiful Orient, Darkness and Dawn, Johnstown Flood, Dreamland, Infant Incubators, Old Nuremberg, Miniature Railway, Scenic Railway, House Upside Down, Mexican, Indian, Venetian, Hawaiian, African and Japanese villages, and many others, all designed to please and amuse, and incidentally to catch the dimes and quarters of the Pan-American visitors, out for a good time.

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## The Street Railways of Buffalo and Vicinity.

**The International Traction Co. and the Various Buffalo and Interurban Lines Controlled by It—Statistics on Operation—Arrangements for Handling Exposition Traffic—Plans for Street Railway Terminals at the Exposition as Finally Decided Upon—Layout of Urban Lines Running to the Fair—Buffalo & Lockport and Lockport & Olcott Roads—Other Interurban Railways Connecting with the International Traction System, Including Descriptions of the Buffalo & Depew Railway and the Recent Improvements on the Gorge Road.**

The entire street railway mileage of the city of Buffalo, together with every interurban road actually entering the city, is owned and controlled by the International Traction Co., a corporation organized in 1899, under laws of New Jersey, as a proprietary company, to acquire certain street railway lines. In addition to these systems in New York, the company owns an extensive street railway property in Canada, along the frontier, and also two connecting bridges across the Niagara River.

The following is a complete list of all the constituent companies controlled by the International Traction Co., with their mileage and the stock and bonds now outstanding:

	Miles of Track.	Underlying Bonds.	Stock.
Buffalo Ry. ....	69.33	\$ 5,999,500	\$ 5,370,500
Crosstown Ry. ....	97.06	2,624,000	2,860,000
Buffalo Traction Co. ....	23.74	675,000	600,000
Buffalo, Bellevue & Lancaster Ry. ....	13.23	215,000	90,000
Buffalo & Niagara Falls Electric Ry. Co. ....	30.00	925,000	1,250,000
Buffalo & Lockport Ry. ....	36.65	500,000	1,000,000
Lockport & Olcott Ry. ....	18.00	700,000	200,000
Elmwood Avenue & Tonawanda Ry. ....			14,125
Buffalo, Tonawanda & Niagara Falls Electric Ry. ....	10.31		1,500,000
Niagara Falls & Suspension Bridge Ry. Co. ....	17.03	518,000	600,000
Niagara Falls, Whirlpool & Northern Ry. ....	1.75	22,500	50,000
Niagara Falls, Park & River Ry. (Canadian) ....	26.36	600,000	600,000
Niagara Falls Suspension Bridge Co. (American) ....		300,000	400,000
Clifton Suspension Bridge Co. (Canadian) ....			
Lewiston Connecting Bridge Co. (American) ....		125,000	400,000
Queenston Heights Bridge Co. (Canadian) ....			
Total .....	345.46	\$13,202,000	\$14,934,625

The Lockport & Olcott Ry. is virtually a continuation of the Buffalo & Lockport Ry. The company has \$200,000 capital stock authorized and issued, and has issued \$700,000 in 5 per cent, 20 year

company, and does no operating whatever. Favorable traffic agreements exist among the allied companies, but all of the underlying companies retain their corporate existence, and as yet there has been no actual merger or lease of the properties, the accounts of each company being kept separate and distinct from all the others.

The following facts concerning the International Traction Co. will be of interest: Capital stock, common, \$10,000,000; 4 per



MAIN ST., BUFFALO.

cent cumulative, preferred, \$5,000,000. Funded debt, collateral trust bonds, authorized, \$30,000,000; due 1949, interest 4 per cent. Of this \$30,000,000 authorized issue of collateral bonds, \$12,285,000 are reserved by the terms of the collateral trust indenture to retire liens of the underlying companies, \$5,000,000 are reserved to be used for betterments at the rate of \$1,000,000 per year, \$11,428,000 have been issued for the stock and bonds of underlying companies and for new construction and betterments, and \$1,287,000 were held in the treasury of the company for similar purposes. Messrs. J. P. Morgan & Co. acted as syndicate managers and financial agents in bringing out the International Traction Co. and are still acting in those capacities.

The accompanying table shows the development of the properties since 1899 when the International Traction Co. acquired control. As the company's fiscal year ends June 30th, the figures are given for 10 months only of each year for the sake of comparison.

Statement for Properties of International Traction Co. for 10 Months Ending April 30, 1899, 1900, 1901.

	1899.	1900.	1901.
Gross receipts .....	\$ 1,945,626	\$ 2,128,243	\$ 2,414,929
Operating expenses .....	1,115,082	1,130,397	1,232,705
Net earnings from operation .....	830,544	997,846	1,182,223
Miscellaneous earnings .....	57,566	67,064	86,402
Total earnings .....	888,110	1,064,910	1,268,625
Fixed charges .....	719,825	753,062	845,650
Surplus .....	\$ 168,285	\$ 310,948	\$ 422,975
Ratio, operating expenses to gross receipts .....	57	53	51
Car mileage .....	10,023,289	11,314,261	11,236,565
Passengers carried .....	48,763,215	54,876,743	60,928,067

For the year ending June 30, 1900, the companies had: Gross receipts, \$2,545,740; operating expenses, \$1,348,728; net earnings from operation, \$1,197,012; miscellaneous earnings, \$75,636; total earnings, \$1,272,648; fixed charges, \$601,337; surplus, \$371,311; car-miles run, 13,560,321; passengers carried, 65,883,773.

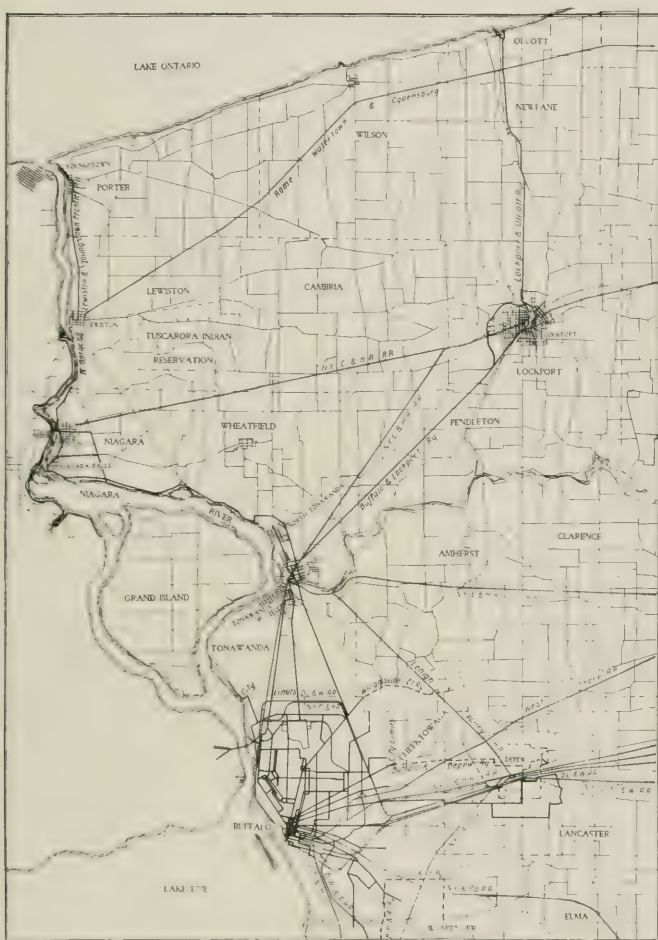


BIRD'S EYE VIEW FROM ELLICOTT SQ.

gold bonds which are guaranteed principal and interest by the International Traction Co.

Some recent extensions not included in the table bring the total track controlled by the International Traction Co. to over 350 miles.

The International Traction Co. is exclusively a stock ownership



ELECTRIC RAILWAYS OF BUFFALO AND VICINITY.

## THE CITY LINES.

Interest will of course at this time center chiefly in the preparations carried out by the company for handling the immense crowds that are expected to attend the Pan-American Exposition during the next five months. That these preparations have necessarily been elaborate will be understood when it is stated that conservative estimates by those well informed as to the conditions, place the probable attendance at the Fair at over 20,000,000, and by far the greater part of this extra traffic will have to be handled by the street railway lines.

As has been stated elsewhere in this issue, the site finally chosen for the exposition is a tract of about 350 acres located in the northern portion of Buffalo, about four miles from Ellicott Sq., the business center of the city.

The grounds have seven entrance gates. The one at the northern extremity is that provided to receive the visitors who will arrive over the steam railroads, all the different lines coming into one central station. This will also be the gate for the electric cars coming from Niagara Falls, the Tonawandas and Lockport.

The Elmwood gate and Amherst gate on the western side will be the principal terminals for the electric cars running to the

center of Buffalo, and connecting by transfer to all the city lines of the International Traction Co.

The Meadow gate, Water gate and the Lincoln Parkway gate, are on the southern side of the exposition grounds, and are the gates for those who drive or walk from the city.

The East Amherst gate, located on the eastern side, will also be the terminal for certain of the city lines, as will be explained later.

Two years ago when confronted with the serious problem of making preparations for transporting several million exposition visitors, the street railway management decided that the necessary extensions and improvements should be made, not only to meet the extra demands occasioned by the Pan-American, but also to serve as far as possible the future needs of the property and accrue to its permanent advantage. This idea has been carefully carried out.

Furthermore, profiting by the experience gained by roads called upon to carry large exposition crowds in other cities, the company has leased or rented much of the extra material and equipment required, and has thus avoided accumulating a large amount of property that would be useless after the close of the fair.

In overhauling the tracks many of the down-town lines have been practically rebuilt with new material, the old rails being largely used in building the exposition terminal loops, prior to their being consigned to the scrap heap. Such new cross-overs and special work as was required was designed to be afterward used to replace worn out sections in permanent tracks.

In planking tracks and building terminal platforms, although 2-in. material would have been ample for the purpose, 3-in. timber was made the standard, in order that it might be later utilized for road crossings, building of docks at the Olcott freight terminals, etc., the company intending to do a large amount of this work after the exposition closes.

The question of additional rolling stock presented a difficult problem and required considerable thought on the part of the

management, the desire being not to make any greater investment than the later needs of the company would justify. In meeting this situation the natural requirements for a period of two years were anticipated, and the company built at its own shops 50 new double-truck closed motor cars, and bought 100 new open motor cars, the latter being particularly needed, as none of the companies was sufficiently supplied with this class of cars at the time of consolidation.

In addition to these, a large number of second-hand four-wheel open trail cars was secured from other companies at very small cost. These were overhauled, and piped for air brakes, and are now being drawn in trains of two and three trailers behind the large closed motor cars, which are each equipped with four G. E. 67 motors. Trains made up in this way are controlled entirely by Christensen air brakes, brake cylinders taking air from the storage reservoir on the first car being placed on each trailer.

There still being a shortage of equipment a number of single truck 22-ft. closed cars, each equipped with one W. P. 50 motor, were rented for the summer at a very low cost. These have been equipped with air brakes and are operated in solid trains of ten cars, with one motor on each car, the trains being elec-





with Christensen air brakes and 150 have the General Electric Co.'s electric brake.

To meet the demand for additional feeder capacity required during the Exposition the railway company, instead of purchasing the wire, rented 55 miles of 500,000-c. m. feeder cables, with the privilege of buying it after the fair, at the market price at the time the contract was made. If the present price of copper is maintained this arrangement will result in a considerable gain to the company.

The large number of fare registers used on the trail cars, together with the air brake equipments required for the trailer service, were rented from the makers on very satisfactory terms.

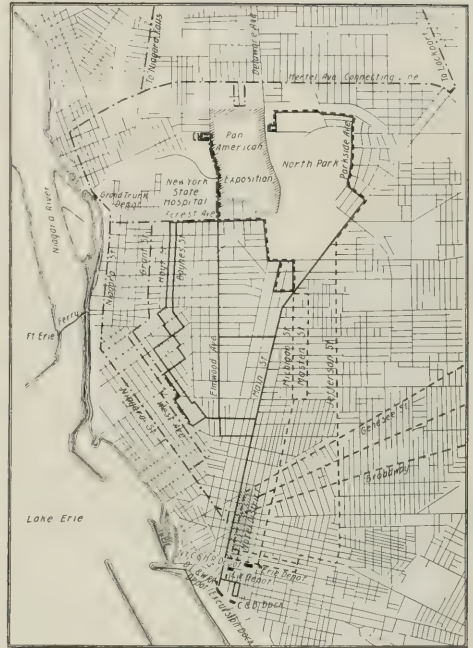
The power required for operating the city lines under ordinary Pan-American conditions will be supplied by underground cables from the transmission line of the Niagara Falls Power Co., but to avoid overloading the transformer stations at times of extremely heavy load, a 2,000-h. p. emergency steam driven plant has been erected near the principal terminal station at the exposition grounds.

It will thus be seen that nothing has been purchased, excepting a few trail cars and the boilers and machinery for the emergency station, that cannot be utilized to good advantage after the need for it has passed.

To properly man the additional rolling stock, it has been necessary to increase the regular force of conductors and motormen from 1,200 men to twice that number for the entire six months. The work of engaging, uniforming and training this large force has entailed a great amount of labor, but the work has been carefully and systematically done, as it was thought inadvisable to provoke accident by handling crowded cars with inexperienced men.

The terminals at the Pan-American grounds have been located in such a manner as to permit the principal regular city lines to reach them to the best advantage. Quite a large proportion of the traffic to the exposition is expected to reach Buffalo on the numerous cheap one-day excursion trains from the neighboring cities, the greater part of this crowd desiring to go directly from the down-town depots to the grounds. Provision has therefore been made so that street railway lines having such down-town terminals as enable them to pass all the principal depots going in both directions, run by different routes direct to the exposition, one to the east, and one to the west entrances. This arrangement has the additional great advantage of diverting the excursion travel from Main St., which thoroughfare will undoubtedly be more or less congested at all times with the regular Pan-American travel.

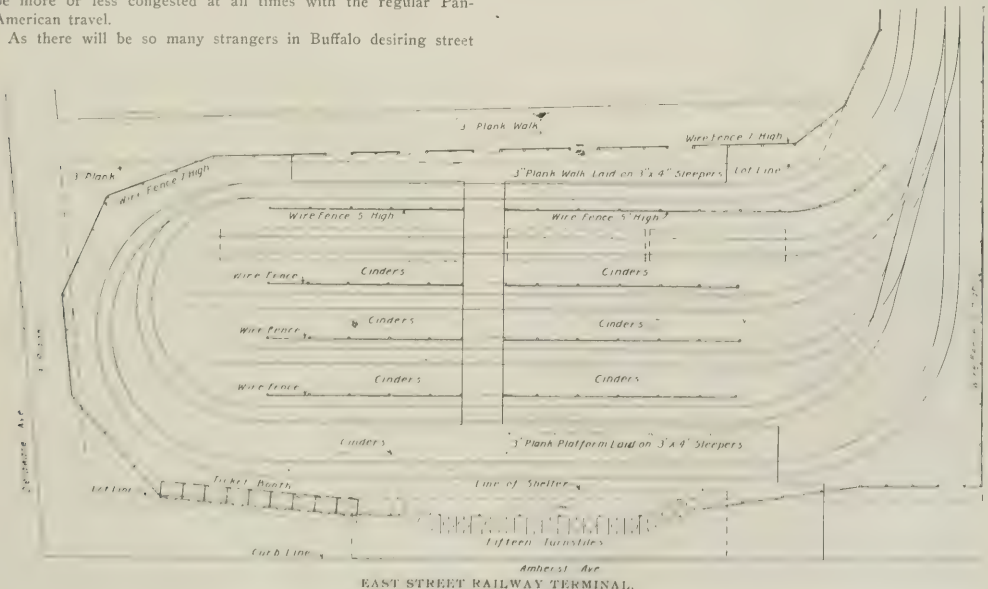
As there will be so many strangers in Buffalo desiring street



MAP OF ROUTES TO THE EXPOSITION.

car accommodations to the exposition grounds, the management, to avoid confusion, has decided to allow no cars on Main St., except such as go direct to the exposition. The less important lines, as well as those taking care of the exclusively depot to hotel travel, have been diverted to the less important streets running parallel to and one block distant from Main St.

A glance at the accompanying city map will show that nearly all



the principal lines after traversing the various residence neighborhoods, terminate at either the east or west Pan-American entrances, thus serving the double purpose of giving Buffalo's visitors a choice of several different routes in going to and from the grounds, as well as enabling the persons living along the various lines to reach the exposition without transfer.

The topography of the city and the layout of the car lines are such that nearly three-quarters of the entire number of cars will be

across the tracks as shown, permitting the crowd to pass from the depot to any of the four loading platforms. Large signs placed in conspicuous positions direct the crowds to the cars for the various routes.

The tracks within the loops will be utilized for storing cars ready for the heavy homeward rush; one set of tracks has capacity for 85, and the other for 80 cars. By a well-devised system of cross-overs, cars can be readily moved from the storage tracks to



WEST AMHERST TERMINAL.

handed at the west terminal station, the arrangement of which is shown in one of the accompanying illustrations.

From this diagram and the city map it will be seen that all the routes using this terminal converge from three directions at the corner of Elmwood and Forest Aves., about two miles below the terminal, there being two sets or four tracks from this central point, on Elmwood Ave. to the main gate at Elmwood and Amherst Sts. Here the two sets of tracks separate, forming two independent but closely adjacent loops, with a set of storage tracks within each loop.

To facilitate the movement of cars the main tracks at the north end of the loops divide into four loading or unloading tracks, the cars of certain routes always switching on to the same track.

Passengers bound for down-town enter the terminal depot through turnstiles. They purchase tickets at ticket booths, immediately before passing through the turnstiles, and these tickets



TWO LOADING TRACKS—WEST AMHERST.

any part of the loops, or vice versa, or they can be run into the temporary barn erected in one of the loops as shown.

On days of very heavy traffic conductors will turn in their cash receipts at the terminal, and thus avoid carrying an excessive amount of small change. For this purpose a receiving station has been erected within one of the loops, this building also serving as an emergency police station, with cells, patrol wagon, etc.

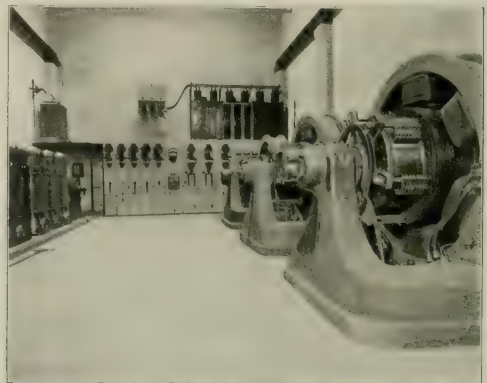
Completely enclosing both loops is a 7-ft. fence of wire-netting, with emergency exit turnstiles along the side nearest the exposition grounds for permitting passengers to leave if cars should become blocked along Elmwood Ave. Under ordinary conditions, however, passengers will alight at the same platforms that are used for loading, this being feasible, as during the greater part of the day



EAST AMHERST TERMINAL.

must be shown, but are not collected, before the passenger is admitted to the depot. The tickets are dated for each day and are not good for any other date. They are collected and registered by the conductors on the cars. By using a ticket system in this way, the company avoids possible loss of revenue, through the inability of conductors to collect all the fares on crowded cars.

The loading tracks are separated from each other by high fences of wire netting, there being, however, a 50-ft. plank foot-way



INTERIOR OF SUB-STATION, BUFFALO RY.

the heavy traffic will all be in one direction, that is, either going or coming. It is also believed that a large portion of the crowd will leave the cars at the Elmwood Ave. gate, which is some distance below the main gate at Elmwood Ave. and Amherst St.

The terminal at the East Amherst gate on the other side of the grounds, as will be seen from the engraving, is laid out on about



the same general plan as the two loops just described, but is much smaller.

The terminal depots in each case are merely well built covered platforms, designed to shield waiting passengers from sun and rain.

There is a third street railway terminal loop, that at the north entrance, which will be used by the cars coming from Niagara Falls and Lockport. Passengers arriving at this station will enter the exposition enclosure through a subway under the steam railroad tracks.

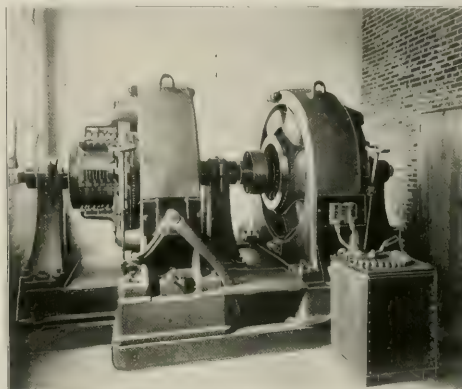
It is believed that with these terminal facilities, in connection with the other preparations that have been made, the street railway lines can receive or discharge at the Pan-American grounds, 60,000

## THE SUBURBAN AND INTERURBAN LINES.

When the many natural attractions of the region about Buffalo and the Niagara River are considered, it is not surprising to find that the city has become the center of an important system of interurban electric lines. These roads have made it easy for one to reach hitherto inaccessible points from which to view the scenic wonders of the Niagara region. A few years ago visitors to the Falls were at the mercy of the rapacious hackmen, and only saw a small part of the beauties of the place, and then at an outrageous expense; today tourists may leave their hotel in Buffalo in an easy-riding, well-appointed electric car, and be carried over a picturesque route to points along the Niagara River from which they may



STORAGE BATTERY AT EAGLE ST.



BOOSTER IN EAGLE ST. SUB-STATION.

passengers per hour, that is, 45,000 at the west terminal; 10,000 at the east entrance; and 5,000 at the north entrance.

The method by which the controlled companies secure power for operating their system has been previously described in the columns of the "Review." Briefly stated, power is taken from the Niagara Falls station of the Niagara Falls Power Co. Three-phase alternating current is transmitted at a potential of 22,000 volts. Just inside the city limits of Buffalo the transmission line enters the terminal house of the Cataract Power & Conduit Co., which is controlled by the Niagara Falls Power Co., and organized to distribute the power in Buffalo. At this station the 22,000-volt current is transformed by six 3,000-h. p. transformers, to 10,000-volt three-phase current, in which form it is distributed by underground cables to the various Buffalo sub-stations.

There are five of these sub-stations for the Buffalo city street railway lines, all designed practically alike and differing mainly in the number of units they contain.

These stations are as follows:

Cold Springs, containing four 500-h. p. rotary converters, static transformers, and a 4,000 ampere-hour storage battery.

Eagle St., containing three 500-h. p. rotary converters, static transformers, and a 4,000-ampere-hour storage battery.

Seneca St., containing two 500-h. p. rotary converters and static transformers.

Walden Ave., containing two 500-h. p. rotary converters and static transformers.

Niagara St., containing four 500-h. p. rotary converters, static transformers, and a 4,800-ampere-hour storage battery.

The converters were supplied by the General Electric Co.; the storage batteries by the Electric Storage Battery Co., of Philadelphia.

At these sub-stations the 10,000-volt current is stepped down to 370 volts alternating, and then converted into 550-volt direct current and delivered to the street railway feeders. The city lines are now taking about 6,000 h. p. from the Cataract company.

see, under the most satisfactory conditions, every feature of beauty and interest.

Anticipating that many Pan-American visitors will desire to spend a portion of their time in viewing the Niagara region, the International Navigation Co., the International Traction Co. and the Niagara Gorge Railroad Co. have arranged a belt route, which will provide an opportunity for visiting the whole Niagara frontier, covering all points of interest from Lake Erie to Lake Ontario on both the American and Canadian shores.

At the foot of Ferry St., Buffalo, the tourist may board one of the company's excellently appointed steamers, and passing down the Niagara River, be landed at Slater's Point, Canada, this river trip affording many delightful glimpses of historic points along the Canadian shore and Grand Island. From Slater's Point the trip is continued along the Frontier in the cars of the Niagara Falls Park & River Ry., which is owned by the International Traction Co. The cars run through the old town of Chippewa, once a prosperous manufacturing city, past the battlefield of Chippewa and Lundy's Lane, across the old Welland Canal, and thence through the Dufferin Islands, along the bank of the upper rapids to Queen Victoria Park, where an excellent view of the Falls of Niagara is had. The route then continues through the Canadian village of Niagara Falls, past the new cantilever bridge connecting the village with the American city of Niagara Falls, and thence to Clifton, the site of the old suspension bridge, recently replaced by a large cantilever structure. From Clifton the line continues along the top of the high river bank, from which the gorge and whirlpool rapids are in constant view, to Queenstown, the scene of a fierce battle during the war of 1812. The route then crosses the new lower suspension bridge to Lewiston, on the American side. Both the upper and lower suspension bridges are owned by the International Traction Co. Lewiston is another village famous in history. Here Daniel Webster at one time practiced law, and the town and the vicinity are mentioned in some of Cooper's novels, the author having lived here for some time. It was at this place that La Salle, the French explorer, built his cabin in 1678, and it is here a mountain railroad, said to have been the first in the

United States, was built in 1678. This road was constructed entirely of wood and the coaches moved on runners instead of wheels.

At Lewiston transfer is made to the cars of the "Gorge" road and the return trip to the American city of Niagara Falls is made over this line, the cars running close to the water's edge and giving a grand opportunity of seeing the lower rapids and the whirlpool. The run back to Buffalo is completed over the Buffalo & Niagara Falls Electric Ry. This whole trip of more than 70 miles by boat and electric railway can be made in about four hours, or if desired stop-over privileges for any point are granted to tourists. The fare for the round trip is \$1.75.

The electric lines comprising this belt route have but few engineering features that have not been fully described in the technical press. In the "Review" for October, 1897, an extended account of the street railway systems of the Niagara region will be found. All of the roads are operated by Niagara power. The lines on the Canadian side take current from a power house owned by the International Traction Co. and located just above the Horseshoe Falls on the west side of the river.

The Buffalo & Niagara Falls Electric Ry. is double track throughout, built in a thoroughly substantial manner, but without unusual or extraordinary features. Power for the section from Niagara Falls to the city line of North Tonawanda is taken from the Falls sub-station of the Niagara Falls Power Co. This sub-station also supplies power for operating the city lines in Niagara Falls and vicinity. It contains three two-phase 500-h. p. rotary converters taking power through step-down transformers and delivering direct current at 500 volts to the railway feeders. The section of the Buffalo & Niagara Falls road from North Tonawanda to the city line of Buffalo is operated by Niagara power from the sub-station at Tonawanda. It is anticipated that this road will carry large crowds from the Pan-American Exposition to the Falls, and a five-minute service will probably be given during heavy periods of the day. The rolling stock consists of long double-truck Brill cars, with motors geared to give speeds as high as 30 and 35 miles per hour.

### THE "GORGE" ROUTE.

The double track electric road running from Niagara Falls, N. Y., along the foot of the cliffs forming the eastern bank of the gorge, to Lewiston, is owned by the Niagara Gorge Railroad Co. This difficult and interesting piece of track construction was described in detail in the "Review" for January, 1900.

The company now owns 21 motor cars and 25 trailers, all of Brill make, and the road has been thoroughly overhauled in anticipation of a heavy traffic during this summer. Long term traffic agreements have recently been made with the International Traction Co. for terminal facilities in the city of Niagara Falls, N. Y., giving the Gorge road connection with other interurban roads converging on Main St. of that city.

Owing to the nature of the debris slope and irregular ledges

since it was first opened, and unless all signs fail, will return a satisfactory income to its owners during the forthcoming season.

We quote from a letter of the engineer, Mr. Geo. A. Ricker, as follows:

"One of the greatest difficulties the company has had to contend with in establishing this line, has been the securing of suitable foot-



THE GORGE ROAD.

ings for the necessary bridges. The company has just completed a new steel trestle near Lewiston, the installation of which marks the completion of the Niagara Gorge R. R. as originally planned. Since 1895 a timber structure has carried the tracks of the road across a short but deep ravine just north of and below the Lewiston escarpment. Excepting in the spring but little water flows

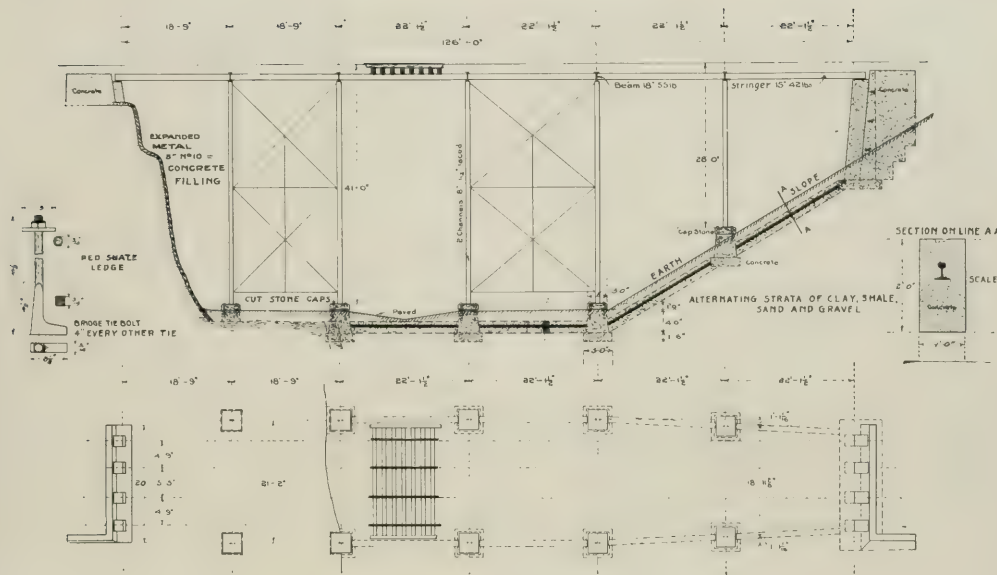


VIEWS FROM LOOKOUT TOWER, NIAGARA FALLS.

upon which the road is founded, problems in maintenance and operation are constantly arising, very different in their nature from those usually met in street railway enterprises. So well have these questions been solved that the road has had no serious accidents

here and obviously a culvert and a fill would be the proper treatment, were it not for the fact that the right of way of the railway company is but 25 ft. wide.

"The structure, shown in the accompanying drawings and photo-

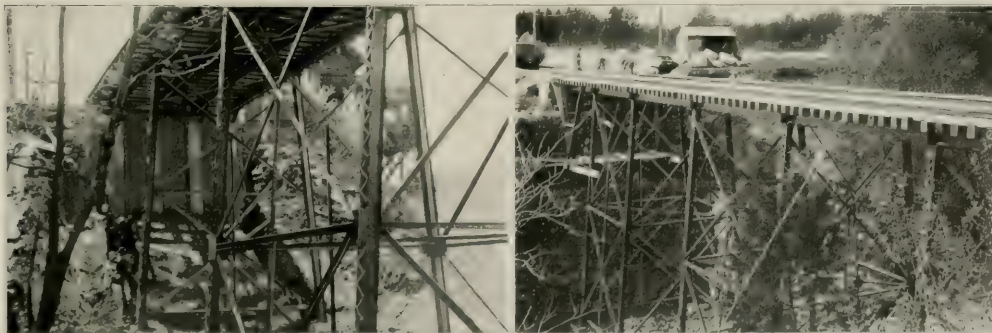


BRIDGE OVER GULLY GORGE ROAD.

graphs, is not unusual, except, perhaps, in the treatment of part of the foundations and in the method of protecting the shale ledge under the north abutment. The steel work consists of two towers of conventional design and one bent, which carry the floor on which the tracks are laid. It is a simple and effective structure, and comparatively inexpensive. The footings are of concrete, consisting of piers as shown in the drawing, with bases designed to distribute 10 tons of combined load, carried by each post. The northerly abutment is a small affair of moulded concrete resting upon a shale ledge, and is little more than a retaining wall, since it carries but one-half of the load of the north shore arms. The

back wall is a height of 20 ft.; the wall is 1 ft. thick on top and has a batter of 1 in. to the foot. The buttresses are 18 in. wide and 2 ft. 8 in. deep. The back wall and buttresses rest upon a floor of concrete 18 in. thick, 9 in. wide and 20 ft. long. The wing wall is returned to meet the foundation wall of a building standing near the top of the bank.

"From the base of this abutment down the slope to the piers supporting the bent, and from thence to the southerly piers of the south tower and continuing in the center line of the piers on each side to the southerly piers of the northerly tower, is built a concrete strut having a cross section of 1 x 2 ft., in which is embedded



VIEWS SHOWING WALLS OF GULLY AND ABUTMENTS.

southerly abutment is somewhat more important, as it retains a large amount of earth and carries one-half the load of the longer southerly shore arms. It is necessarily of greater height and has a much less secure footing in the uncertain soil which constitutes the southerly slope of the valley. The nature of this southerly bank determined the character of the foundations, which as shown upon the plan consist of a lightly moulded concrete abutment with the thinnest possible back wall, strengthened by the use of embedded rails and buttressed in front to carry the track stringers. From the supporting floor course of concrete to the top of the

a rail, as shown, the rail being 3 in. below the top of the section. The last two piers to the north which receive the northerly ends of the concrete struts are founded upon and against a ledge which made it necessary to go no further with the struts. Alternating strata of clay, shale, sand and gravel constitute the bearing on which the southerly two-thirds of the bridge rests, and springs of water keep this slope pretty constantly and pretty thoroughly wet, except in mid-summer, making it always treacherous and unreliable. Through the abutment are placed numerous small tile, providing an outlet for water which may collect back of it. The



filling back of the abutment up to the height of 6 ft. above the base is loose rock, and upon the easterly side the adjoining slope is protected by a dry wall of rubble stone.

"The north side of the valley from top to bottom is a steep bank of red shale, which disintegrates rapidly if not protected. To provide against this disintegration and consequent undermining of the abutment, expanded metal and concrete have been used. The sheet of metal is anchored at the base of the concrete abutment and drawn down closely over the shale, which had first been partially dressed off, and is held in place by wedge bolts let into the ledge. The irregular spaces between the shale and the metal is filled with concrete and the metal covered on the outside with not less than one-half inch of mortar, a fairly good front having first been obtained by the use of forming boards. In the concrete are built drains at frequent intervals.

"So far as the engineer knows this is a new use for expanded metal, and the value of it can only be determined after observation for a reasonable time, but he expects that it will be effective. The cement used in this work is 'Giant' portland, and the proportions of the mixture of concrete are 1, 3 and 5."

The Gorge road is operated by direct current purchased from the Schoelkopf plant, a manufacturing establishment at the top of the cliff just below the falls.

The officers of the Niagara Gorge Railroad Co. are: President, Capt. Joseph T. Jones; vice-president, H. P. Bissell; secretary and treasurer, B. L. Jones; consulting engineer, G. A. Ricker.

#### The Lewiston & Youngstown Frontier Ry.

This is an independent line running from Lewiston to Rumsey Park, on Lake Ontario, a distance of 8 miles. At Lewiston connection is made with the New York Central & Hudson River R. R.;

with the Niagara Gorge R. R.; and with steamers direct to Toronto. From Lewiston the route is through rich fruit lands of the lower Niagara, touching a number of points of historic and scenic interest, and passing through Youngstown, N. Y., formerly an important frontier trading post.

Rumsey Park and Beach on the lake, near old Fort Niagara, is owned by the street railway company. It comprises a white oak grove of nearly 30 acres, the trees being of good size and the ground free from underbrush. The lake front is bordered by a fine bathing beach upon which boat and bath houses have been built. The natural attractions of this resort have been enhanced by the erection of a large dancing hall, kitchen, restaurant, and other buildings. Board walks have been laid through the grove, and benches, tables and swings provided for the pleasure and convenience of picnic parties. Summer cottages furnished or unfurnished, in the immediate vicinity of the park, can be rented or leased.

#### Niagara, St. Catherines & Toronto Street Ry.

This is a new Canadian line built during the past year from Niagara Falls, N. Y., to Port Dalhousie, on Lake Ontario, where connection is made by steamer to Toronto. It promises to become a very popular route for visitors from Canada to the Pan-American Exposition. A map of this road was shown in the "Review" for February, 1901, page 123. The officers and operating staff of the company are: President, Joseph A. Powers; vice-president, John W. Herbert; secretary and treasurer, Addison B. Colvin; general manager, E. F. Seixas; general passenger agent, G. M. Neelon; general freight agent, W. N. Warburton; chief engineer, J. H. Armstrong.

### THE BUFFALO & LOCKPORT AND THE LOCKPORT & OLCOTT RAILWAYS.

BY C. C. LEWIS, CHIEF ENGINEER OF WAY AND BUILDINGS.

The electric line connecting Buffalo with Niagara Falls, and known as the Buffalo & Niagara Falls Electric Ry., was completed and put in operation during the fall of 1895. The desirability of connecting Lockport and Buffalo by means of a trolley service soon after made itself apparent, and this road was built in 1898, the enterprise being comparatively easy to carry out because of the circumstances. The Niagara Falls line passed through

at a very considerable expense, it had never proved to be a paying enterprise. The officials of the Buffalo & Niagara Falls Electric Railway Co. thereupon organized the Buffalo & Lockport Railway Co., which company concluded a long term lease with the Erie whereby upon a certain date it was to assume that company's passenger and freight business over the Lockport branch.

The necessary overhead work and bonding were speedily ac-



North and South Tonawanda on the route from Buffalo to the Falls, as does likewise the Erie railroad, and from North Tonawanda a branch line of the Erie extended 14 miles northeast to Lockport. The Lockport branch of the Erie had been operated for some eighteen years by the Erie Railroad Co., but owing to its lack of terminal facilities in Lockport, and the impossibility of its reaching the manufacturing districts of that city, except

completed, and a converter station operated by Niagara Falls power erected at Lockport which, in conjunction with the transformer station of the Niagara Falls Power Co. at North Tonawanda, furnished the current. The company constructed and now operates its own three-phase transmission line from North Tonawanda to Lockport. Aug. 15, 1898, a regular trolley service between Buffalo and Lockport was inaugurated, the cars running

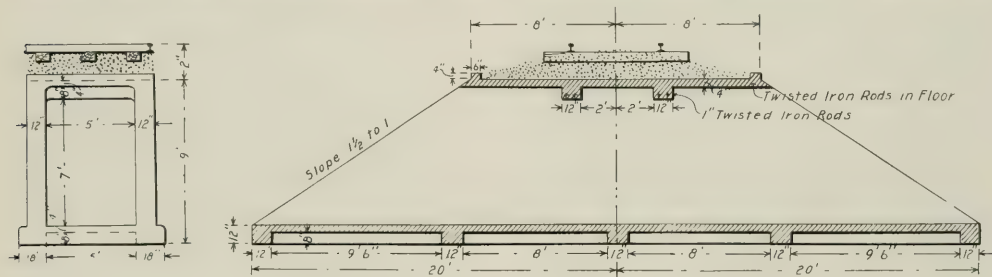
from Lockport to North Tonawanda over the electrically equipped Erie tracks, and from North Tonawanda to Buffalo over the Buffalo & Niagara Falls line.

The freight service formerly given by the steam road suffered no interruption, being handled by two 600-h. p. electric locomotives, of the type made familiar by use in the Baltimore & Ohio tunnel at Baltimore. Freight was not hauled south of North Tonawanda, it being turned over to the Erie R. R. at that point. The new line from North Tonawanda to Lockport was styled the Buffalo & Lockport Ry.

During the season of 1889 other changes were made. In the

the floor very gradual. This construction is necessitated by reason of the great variation in wheel-flanges and treads operated. The treads are from 3 $\frac{3}{4}$  in. on the wheels of the steam freight cars, and 2 in. on the wheels of the electric passenger cars which use the same tracks.

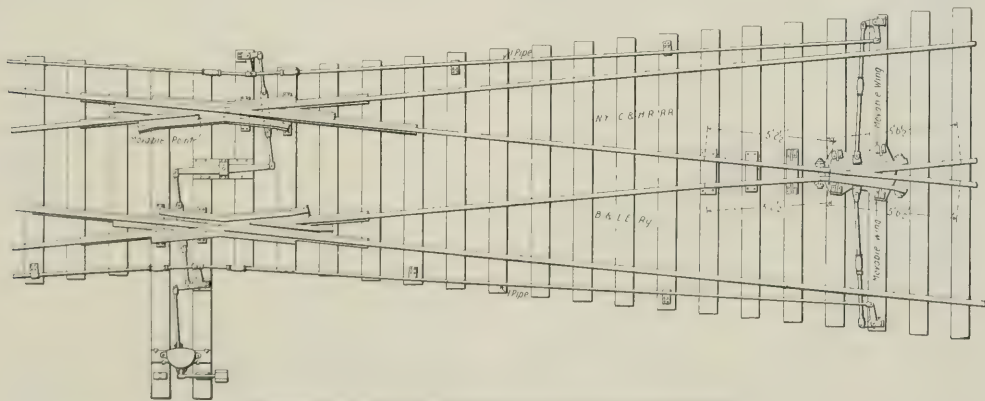
The use of the tongue mate does away with the flanges riding on the floor of the mate, it not being possible to accommodate both  $\frac{3}{8}$ -in. and  $1\frac{1}{8}$ -in. flanges, and the frogs, while not deep enough to allow the small wheels to drop into the frog throat, are yet not shallow enough to injure the large flanges of freight cars operating over them. Curves of 100 ft. radius are in con-



CATTLEWAY MADE OF CEMENT CONCRETE.

spring of that year the Buffalo & Lockport Railway Co. and the Buffalo & Niagara Falls Electric Railway Co. became closely allied with all the electric railway properties in Buffalo. Immediately the right was obtained from the Erie Railroad to build an additional track along the right of way of its Niagara Falls branch, from North Tonawanda to Main St., Buffalo. This track was constructed during the summer of 1899, as a part of the Buffalo & Lockport Ry., and put in operation in the fall of that year. It gave to the Buffalo & Lockport a track on private right of way from Lockport to within five miles of the business center of Buffalo. During the same summer several miles of track were laid in the streets of Lockport, and, the terms of the franchise in

stant use, five or six heavily loaded cars being taken around them in one train. This is too short a radius for patent couplers, such as the Janny, the limit for which is about a 175-ft. radius curve, but no difficulty is experienced when long links are used. Of course it is not attempted to push trains around curves of this radius; they are invariably pulled. Experience has shown in Baltimore that loaded freight cars can be pulled by horses around 40-ft. radius curves, and this is constantly done in that city. But a pull by horses can be so exerted that the least possible derauling tendency is given to the car. The case is somewhat different when a motor car is the motive power. However, a light freight car has been handled, without derauling, around a 45-ft. radius curve



CROSSING OF BUFFALO & LOCKPORT WITH NEW YORK CENTRAL.

that city being such that freight cars can be operated through the streets between midnight and morning, access was given to very considerable more freight than had been reached before.

At this point a few words in reference to this handling of steam freight cars through city streets, and around curves over which it would be entirely out of the question to operate on a steam road, may be of interest to others who are interested in similar enterprises. The tracks in the streets of Lockport, over which freight cars are operated, are of 85-lb. T-rails laid in macadam pavement. Tongue switches and tongue mates are used. Frogs are of the hard center variety, with a throat  $\frac{3}{8}$  in. deep, having the rise of

in Lockport, the guard throats of which curve were designed for street cars instead of steam cars. It is perfectly safe to say that when circumstances demand, single loaded freight cars can be pulled by electricity around a properly designed 45-ft. radius curve without difficulty. Some freight cars, however, have the sills placed so low that the trucks cannot assume the proper angle for such a curve, but such cars are few in number.

One of the features of the track construction of the Buffalo & Lockport line, which is somewhat out of the ordinary, consists of a crossing of that line with the Lockport branch of the New York Central & Hudson River R. R., just east of North Tonawanda.



PIER AT OLCOTT.

The angle of this crossing is about  $11^{\circ}$ , too sharp to permit the use of stiff frogs with the throats usual in steam practice, because of the 2-in. treads in use on certain electric cars operating over the crossing. To overcome this difficulty resort was had to movable wing rails in the single frogs, and movable points in the double frogs, all of the wing rails and points being connected by means of gas pipe and bell cranks, and so made as to be thrown simultaneously from an ordinary switch stand, thus giving a continuous rail head in the electric track when thrown for that track. This crossing has been in use for over two years, and has given excellent satisfaction. So far, it has been operated separately from the semaphore used at the crossing, but it will shortly become part of the interlocking system involving both home and distant signals for the crossing.

During the summer of 1900, an extension under the name of the Lockport & Olcott Ry., was made from Lockport 12 miles directly north to Olcott, which in connection with four miles of track built about the outskirts of Lockport, gives a total length of 16 miles.

Olcott is situated on Lake Ontario, at the mouth of Eighteen Mile Creek. The general government has constructed piers at



RUSTIC THEATER AT OLCOTT.

the mouth of the creek, and a small amount of dredging would afford a harbor for all but the largest boats on Lake Ontario. Upon the banks of the lake, near by, is an unusually fine grove. Involved in the building of the road was the improvement of the grove, and the making of it into a first-class summer resort; and also the improvement of the harbor to give shipping facilities.

The road, as built from Lockport to Olcott during 1900, is almost entirely upon private right of way. It involves no grades heavier than 2 per cent, and those very short, the prevailing grades being little more than one-half of one per cent. The cross section of the roadbed shows the rather unusual width of 16 ft. in fills and 20 ft. in cuts, 2-ft. drain ditches being provided in the cuts. Ties are of white oak, 6 x 9 in. x 8 ft. Rails are the American Society 85-lb. T-section, in 60-ft. lengths, with 30-in. six-bolt joints, bonded with two 10-in. No. 0000 bonds under the plates. In building the roadbed, the track was first tamped with gravel

4 in. under the ties, and the space between the ties was filled with  $2\frac{1}{2}$ -in. crushed stone, the intention being to send men out over the tracks in the spring of 1901 and tamp the broken stone thoroughly under the ties, with crushed stone, thus giving a crushed stone ballast on a gravel bed. This has been done and the combination has been found to work excellently. No unusual amount of tamping has been made necessary as a result of the spring thaws of 1901. Box culverts are of concrete, with the roof strengthened by twisted iron rods. Pipe culverts are of second quality vit-



DEEP CUT ON OLCOTT LINE.

rified pipe laid in a 4-in. ring of concrete. Cattle passes are made of concrete with twisted iron rods in the roof, similarly to the box culverts. Bridge abutments, with one exception, are of concrete. All cement used was of the best brands of American portland.

In order to obtain the very best conditions for operation, a grade crossing with the Rome, Watertown & Ogdensburg tracks at Newfane was avoided by means of an under-crossing. No natural advantages existed at the point where the crossing was made to favor the under-crossing, the excavation required being about 40,000 cu. yd. The grades either way from the crossing were 2 per cent, and the cut extended about 1,000 ft. each way from the crossing.

The material taken from this cut was hauled to the lake front at Olcott, about a mile and a quarter distant, and used in filling in the bank of the lake, which at this point is about 30 ft. high, and was gradually wasting away under the action of the elements.

Along the beach a concrete retaining wall was constructed to hold this earth filling, the wall being of somewhat unusual char-



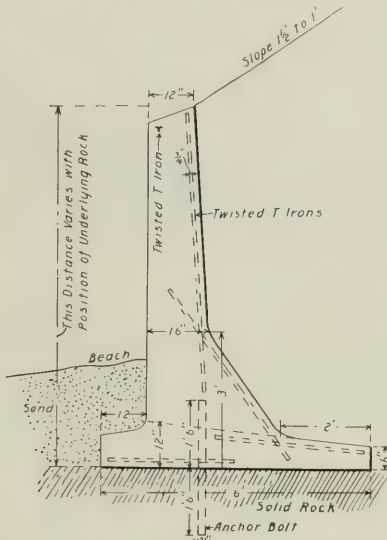
STATION AT OLCOTT.

acter, the details of which are shown in the accompanying illustrations. In building the wall the wooden form was first erected as shown. The concrete cement was then poured into this mold, twisted iron rods being embedded in the concrete every 15 in. as shown in the drawing. The wall sustains a bank of earth some



30 ft. high, and, notwithstanding its very slight proportions, has shown no signs of failure during the year since it was installed.

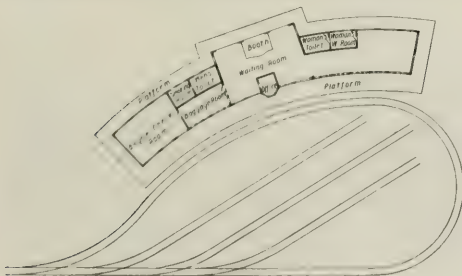
The features which are being added to the park at Olcott consist of a very handsome depot erected at a cost of about \$6,000, an outdoor theater, a casino containing amusement hall and res-



SECTION OF RETAINING WALL.

taurant, and a three-story hotel, the latter building now being in process of erection. All the buildings of the park will be lighted with electricity, and the appointments of the hotel will be equal in every respect with those of summer resorts of the first class. The hotel and restaurant privileges have been leased to experienced parties, who will provide a service equal to that of the best hotels in the large cities. Good bathing facilities along the park front will be secured by the use of concrete jetties, the bed of the lake at this point being of rock. The jetties are made use of to cause a sand bed to be formed along the park front. Other improvements at Olcott embrace the rebuilding of the present piers for about a quarter of a mile along the shores of Eighteen Mile Creek, just within the government piers.

It is expected that a very considerable amount of freight, as



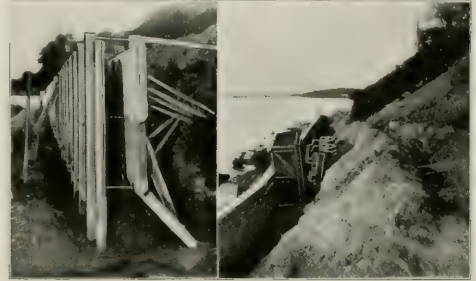
PLAN OF TERMINAL AT OLCOTT.

coal and pulp wood, will be handled at this point, and already preparations have been made to run a line of steamers from Toronto to Olcott to connect with the electric cars to Buffalo.

Power for the line from Lockport to Olcott is furnished partly from the converter station at Lockport, the current for which comes from Niagara Falls, and partly from a power house situated

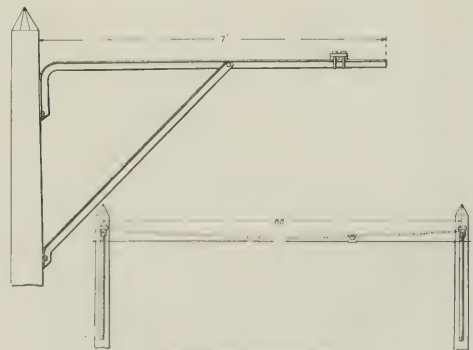
on the line of the road, about a mile and a half from its Olcott terminus. The overhead work is supported on poles 88 ft. apart, intermediate suspension being used for the No. 0000 figure 8 trolley wire.

Four miles of the Lockport & Olcott road were constructed entirely for freight purposes, and form the connection by which the Buffalo & Lockport Ry. reaches the lower town or mill district of Lockport. Lockport is built upon what is known as the Niagara escarpment, a well defined and sharp declivity running generally parallel to the southern shore of Lake Ontario, and from four to twelve miles distant from it. The difference in the upper



RETAINING WALL AT OLCOTT.

and lower level of this escarpment is from 200 to 300 ft. Several surveys had been made by various steam roads with the idea of reaching the mill district of Lockport from the upper level, but with the exception of the switch-back put in by the New York Central, no road had been constructed as a result of them. The main passenger line of the Lockport & Olcott Ry. made the descent through one of the city streets, using a maximum grade of 8 per cent. In order to give an operative line for the freight the road was designed to carry, a detour of four miles, as already stated, was made about the city, enabling the mill district to be reached with a  $1\frac{1}{2}$  per cent grade. The construction of these four miles involved a larger outlay in the roadbed than did the entire 12 miles from Lockport to Olcott. Three miles of the work would have been considered heavy for steam road construction, and at one point a cut of 80 ft. was made. A considerable portion of this section of the road was in solid rock. Track facilities



TROLLEY SUSPENSION.

through the mill district proper were obtained under an agreement with the New York Central, by means of which all the trackage of that company in the mill district was used in common with the Lockport & Olcott, and as a consequence, these tracks were bonded and provided with overhead wires for electric service.

The construction of the Lockport & Olcott road involved no unusual engineering features, but the work was done in a man-

ner common only on steam roads of the best type. Somewhat sharper grades are used in certain portions than would be followed in steam construction, but the materials throughout are such as will give eventually a roadbed as good as can be laid under present practice. Speeds approaching 60 miles an hour, with the four 50-h. p. motors used in the passenger service, are common. The population of Lockport is about 20,000, and its manufacturing interests are large for a city of that size. The country lying immediately to the north, between it and Lake Ontario, comprises some of the very best of the fruit country in New York, Niagara County being famous for its apples, grapes, peaches and small fruits. As the passenger service was placed in operation on September 1st of last year, and the freight service on January 1st of the present year, it is not possible, at this early date, to foresee all of the business which may be developed, but it is perfectly safe to say that the location of the road is such as will insure it a very unusual revenue, both passenger and freight, when compared with other suburban lines.

### THE BUFFALO & DEPEW RAILWAY.

BY GEORGE A. RICKER, MEM. AM. SOC. C. E.

On the morning of Wednesday, the eighth of May last, four handsome olive green cars began running over the new line known as the Buffalo & Depew Railway, connecting the populous city of Buffalo with its young and enterprising manufacturing suburb of Depew. This event marked the completion of the work of a group of Buffalo men,



SCENE IN DEPEW.

who since 1894 have worked earnestly and with never-flagging enthusiasm to connect these important points by a high-grade double-track electric railway, believing that in Depew there is the beginning of a great manufacturing city and that upon the lands lying between it and Buffalo must eventually be located many industrial plants and the overflow of population of the rapidly growing Queen City of the Lakes. Since Buffalo cannot grow to the west and has already extended its limits far to the north and south, it must in the near future expand toward the east. Evidences of such growth are already seen and that the eastward movement will, from this time on, be rapid and constant as the growth of the city itself, is borne out by the action of the great trunk lines, the New York Central and the Lehigh Valley railroads having centered their terminals in Depew. The Central has recently built a double track road from Depew to Blaisdell, a station upon the Lake Shore & Michigan Southern a few miles south of Buffalo, connecting these two points for the more convenient handling of through freight and the transfer of goods without entering the yards in the city of Buffalo. The Lehigh company has in like manner connected its main line by a double track road with Tonawanda, over which pass its trains for Niagara Falls and the West.

It is the opinion of many that this territory occupied by the Buffalo & Depew Ry. is the most valuable for electric street railway purposes in any direction out of Buffalo, as it covers the large district, where of necessity, must be located in the near future, all of the east and west bound through freight and transfer yards of the various trunk lines reaching Buffalo.

In addition to the very interesting features of the Buffalo & Lockport road described by Mr. Lewis, the overhead work is worthy of special mention. All electrical work comes under the department of Mr. C. K. Marshall, and the unique trolley wire suspension shown herewith is his design. As will be seen, where side poles are used the trolley wire is supported from brackets made of angles. The trolley wire, instead of being hung directly from the bracket arm, is suspended from a galvanized iron wire by means of ordinary trolley ears, the iron wire being passed over each arm and held in place by U-bolts.

Cars on the line from Buffalo to Olcott frequently reach a speed of 50 miles an hour for short stretches, the run from Buffalo to Olcott being made in 1 hour and 45 minutes. A half-hour schedule is given, cars leaving Buffalo on the even hour and half-hour, it being the belief of the management that by having cars leave at even periods in this way, the public is better able to remember the schedule.

The tracks of the Buffalo & Depew Railway Co. connect with those of the Buffalo Railway Co. at the terminus of the latter's Genesee St. line in what is known as Pine Hill, an outgrowth of Buffalo's east side. In Genesee St., for a few hundred feet these tracks are laid with 70-lb. girder rails to the private right of way, when the line defects to the right and continues in an almost straight line for a distance of about two miles, this being laid with 6-in. T-rails. At the Union Road in the middle of the town of Cheektowaga is found a little settlement grouped about a mission church or shrine of the Roman Catholic faith, to which many pilgrims direct their steps. Just beyond the Union Road the tracks are elevated upon a substantial timber trestle and cross over the main line of the West Shore R. R. upon a through truss bridge. The high T-rail tracks extend to the eastward until the outskirts of the village of Depew are reached, where a change is made back to girder rail in the village streets.

Entering the village of Depew the line passes under the Depew & Tonawanda branch of the Lehigh Valley R. R. through a subway 80 ft. in width, which is a part of what is known as the Buffalo & Depew Boulevard. The grade of the approaches to this subway is very moderate and owing to the partial elevation of the Lehigh tracks, the depression is but a few feet below the general level. To carry the Lehigh company's tracks a plate girder



POWER HOUSE, BUFFALO & DEPEW RY.

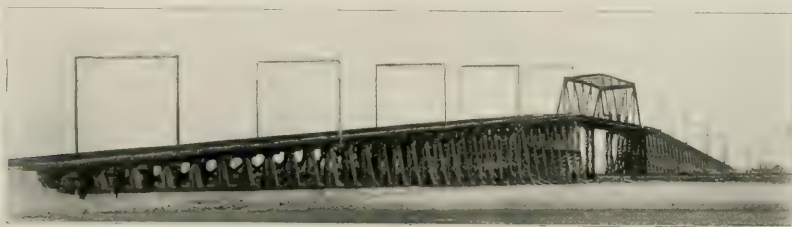
bridge is now being built of three spans; one covering the roadway and two shorter ones the sidewalks. After passing through the subway the tracks continue through the village, passing the handsome hotel called the Depew Inn, which was built by the Depew Improvement Co., the locomotive shops of the New York Central and the several other industrial plants, to the easterly

terminus at the intersection of Burlington Ave. with the Ellicott Road, the east line of the village of Depew and the west line of the village of Lancaster, the distance from Pine Hill to the village terminus being almost exactly seven miles.

As about one-half of the line is laid with girder rails and the other half with the high T section, so is the overhead work carried

cables, as by their use most satisfactory results are obtained at a considerable saving both in cost of material and labor. Two 500,000-c. m. cables feed the line from the power house to the west, and one, 300,000-c. m., to the east.

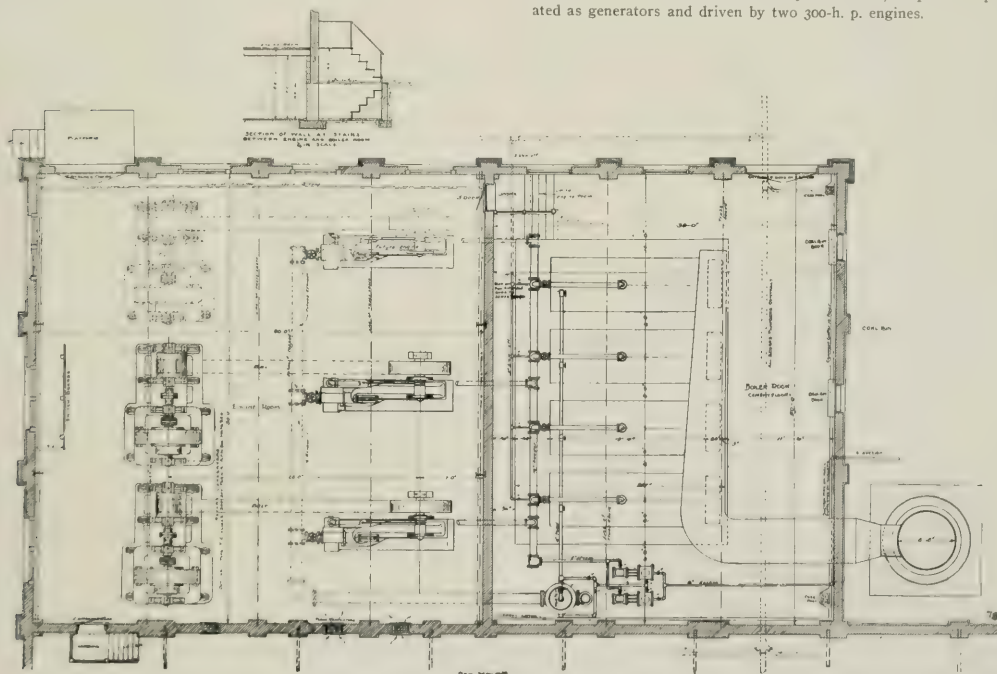
The car and power house, located about two and one half miles from the easterly terminus, is a fireproof brick and steel structure,



BRIDGE OVER WEST SHORE R. R.

upon side poles in streets where the girder is laid and upon center poles through the private right-of-way with the T-rail. The girder tracks in the streets are laid 9 ft. 0½ in. between centers and where the center poles are used the T-rail tracks are 12 ft. between centers. To support the trolley wire, a single pipe is used, passing through the pole with standard fittings. A unique feature of the overhead work is the absence of cross arms and the use of specially designed feeder hangers bolted to the pipe in the center pole

located at an angle in the Depew Boulevard, and is supplied with water from the reservoir of the Depew & Lake Erie Water Co., only one-half mile distant. The plan of the power house is shown in one of the accompanying drawings; the car house is 150x59 ft., with four tracks. The company now owns five cars built by the American Car Co., of St. Louis, but the car house provides track room for the storage of 10 cars; in the car house are a repair pit 85 ft. long and a well equipped office. The engine room contains two 300-k. w. General Electric rotary converters, at present operated as generators and driven by two 300-h. p. engines.



PLAN OF BUFFALO & DEPEW POWER HOUSE.

line and to the sides of the poles where the usual side pole span wire construction is followed. The method of attaching these clamps and the clamps themselves are shown in the accompanying illustrations. The clamps are of cast iron and hold spools made of maple. The writer believes these clamps to be a marked improvement upon the usual appliances for attaching the feeder

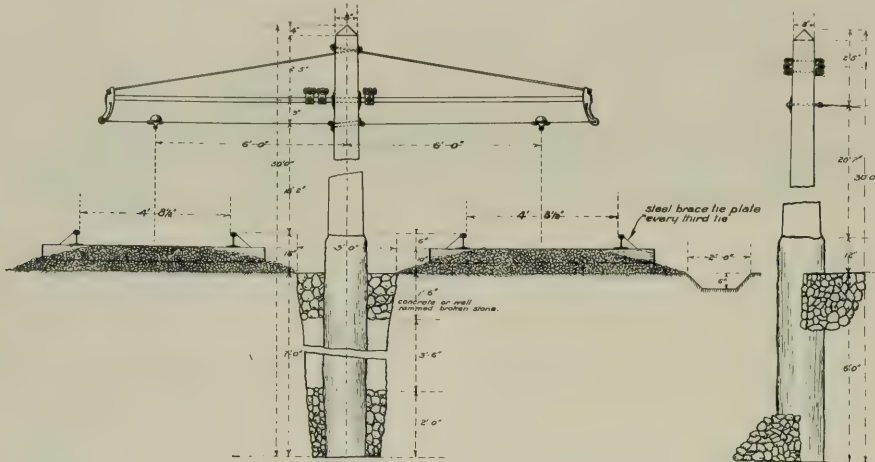
The company expects that in a short time electric energy will be transmitted to Depew from Niagara Falls, when the rotary converters will be used as such and the steam plant will become an auxiliary for emergency use. The engine room is large enough to permit the installation of another rotary or generator and a third engine if such should be required, by reason of any extension of



the line. For the present one machine generates sufficient current for operation of the road.

The most important structures in the line of this road are those made necessary to avoid grade crossings of the steam railroads. The trestle which carries the line over the West Shore R. R. is built of white pine timber, the sills and posts of the bents having a uniform cross section 10x10 in., and are supported, each

the tangent of the bridge by easy curves upon the ground, before reaching the trestle. The structure is, therefore, all built upon a straight line and with grades of but 5 per cent, and the cars may pass over with safety and comfort without materially reducing the speed. No time is lost, therefore, at this crossing and the usual discomfort, so often experienced in the frequent combination of sharp curves and bad grades at overcrossings of steam



TRACK AND LINE CONSTRUCTION.

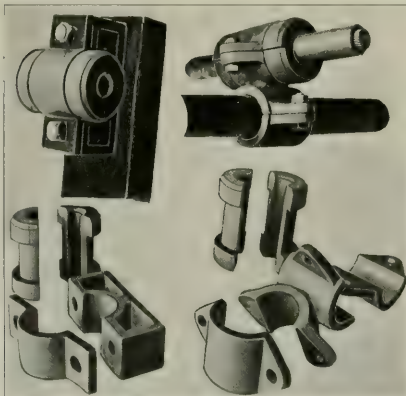
upon rubble masonry piers well founded upon the hard clay subsoil. The bents are spaced 14 ft. center to center and two stringers 6x14 in. are placed under each rail. The floor of ties and the guard rail are of oak; the overhead work on the structure is carried by light oak frames and suspended from the top lateral bracing of the truss. In general the best steam railroad practice has been followed in the construction of this road, except that the material has been adapted to the lighter loads of electric cars. The through truss

railroads, is avoided. The other structure of importance is the undercrossing of the Lehigh Valley R. R. in the village of Depew, where it was necessary to depress the entire street, 80 ft. in width. The Lehigh company, of course, controls the character of the structure, which is to carry its tracks and being in accordance with the company's requirements, it is needless to say that it will be a handsome bridge, designed to carry the heaviest type of modern locomotives. The head room in the subway will be 14 ft. 5 in., the width of the roadway 50 ft. and of the sidewalks on either side 15 ft. This bridge is now being built by the Phoenix Bridge Co., and will be completed in the course of another month. At present the Lehigh company's tracks are supported upon a false-work of piles and timber and the electric cars are being operated through this temporary structure.

The tracks throughout the entire length of the road are rock ballasted and the ties, 15 to each 30-ft. rail, in the open track, are of chestnut and in the covered track of oak. Most of the streets in Depew are macadamized and curbed and present a fine appearance.

It was expected, and in the few days of operation has in some measure been realized, that this line would provide for the people of the east side of Buffalo an appreciated outlet to the country and in the near future there will undoubtedly spring up special facilities for amusement and relaxation of the people in this thickly settled section, who can go in no other direction for their playtime, except at an expense that would seem to be out of proportion to their incomes. These amusement features of this road have been little thought of in comparison with its other advantages, but it now seems certain that many of the well to do German and Polish mechanics and artisans who live in this section will avail themselves in increasing numbers of this means of escape from the noise and smoke of the city to the fields and flowers and good out-of-doors of the country.

The little mission church, the chapel of Maria Hilf, has been for years a sacred shrine much frequented by devout catholics and each day might have been seen many pilgrims plodding wearily along the dusty roads to reach the place of their devotions. On Sundays particularly many thousands have visited the sacred edifice and crowds of devout worshippers throng the little chapel and kneel upon the grass about the building. In the church of St. Anne de Beaupre, near Quebec, is found a parallel to this location



DETAILS OF FEEDER HANGERS.

over the right of way of the West Shore R. R. has a clear span of 126 ft. 6 in., a skew angle of  $43\frac{1}{2}$  degrees, and is supported by steel towers, giving a standard clearance of 21 ft. over the West Shore rail, as required by the railroad laws of New York. This bridge was built by the Phoenix Bridge Co., of Phoenixville, Pa.

The two tangents approaching this crossing are parallel, but fortunately the line to the east is several hundred feet south of the line from the west and it was practicable to connect them with

and it too is reached by an electric railway, which carries thousands of people to that shrine. It is expected that the Buffalo & Depew Ry. will be patronized and greatly appreciated by an increasing number of pilgrims and other visitors to the chapel.

Associated with the Buffalo men who have brought this project to a successful completion are some Philadelphia gentlemen whose names will be recognized as connected with large street railroad enterprises. The officers of the company are: William B. Cutter, president; George A. Ricker, vice-president and engineer; Herbert P. Bissell, secretary and treasurer. The board of directors comprises the officers and the following gentlemen, who are all of Philadelphia: Evans R. Dick, Edward B. Smith, J. Ogden Hoffman, Samuel Welsh, Horatio A. Foster and D. A. Hegarty. Mr. Hegarty is general superintendent, E. W. Alexander, superintendent of operation, and J. T. Mooney, superintendent of construction. The engineer has been most intelligently aided in this work by Mr. Mooney, and by his assistant engineers, G. S. Minniss and C. S. Boardman. In concluding this article, the sentiment expressed by the counsel of the village of Depew upon the day of the opening of the road may be properly repeated \* \* \* \* "that any man or group of men who create new and convenient avenues of transportation where none before existed, between a great city and one of its thriving outposts, is entitled to commendation and earns and deserves such pecuniary advantages as may and should result from such efforts."

### Other Suburban Lines.

In addition to the lines previously mentioned, there are three short independent roads running to small manufacturing towns suburban to Buffalo. These roads serve practically as feeders to the city lines of the International Traction Co. They are as follows: Buffalo, Hamburg & Aurora Ry., with 22 miles of track, running from the southern limits of Buffalo to Hamburg and Orchard Park; the Buffalo, Gardenville & Ebenezzer Ry., with 5 miles of track, running from Buffalo to Ebenezzer; and the Williamsville Electric Ry., with 5 miles of track, running to Williamsville, northeast of Buffalo.

### Rates of Fare.

In conclusion, it may perhaps be of interest to note the rates of fare prevailing over these various suburban and interurban systems. This is a subject that has been given considerable thought by the managements of the different properties, and almost without exception, agreements have been made between connecting lines so that reduced through rates can be quoted, and in a number of cases through cars are operated to the mutual advantage of the tourist and the companies involved. In this connection it is also of interest to notice that the International Traction Co., and the Niagara Gorge Railroad Co., not only sell tickets over connecting lines, but also have agreements with several steam railroad and steamboat companies, whereby through tickets are sold from Buffalo and Niagara Falls to Toronto and other lake points, and even to the Thousand Islands and other St. Lawrence River points. These agreements are so liberal, in some cases, that tourists going to distant points can save considerable over the regular fares by purchasing through tickets from the street railway companies.

The rates over the various electric lines average about one cent per mile. Some of these rates are as follows. Between Buffalo and Niagara Falls, round trip, 50 cents; one way, 35 cents.

Buffalo and Tonawanda, round trip, 25 cents; one way, 15 cents.

Buffalo and North Tonawanda, round trip, 30 cents; one way, 17 cents.

Buffalo and Lockport, round trip, 60 cents; one way, 35 cents.

Saturdays, Sundays and holidays, round trip, 50 cents.

Buffalo and Olcott, round trip, \$1.00; one way, 70 cents.

Buffalo and Queenston, round trip, \$1.00.

Buffalo and Lewiston, round trip, \$1.25.

Buffalo to Niagara Falls, Steel Arch Bridge to Canadian Horseshoe Fall, thence to Queenston, Suspension Bridge to Lewiston, Niagara Gorge Railroad to Niagara Falls, returning to Buffalo, the Great Belt Line trip, \$1.50.

Buffalo to Niagara Falls, Bridge to Canadian side, "Canadian

Scenic Route" to Queenston and Niagara River Line Steamers to Toronto, round trip, \$3.20; one way, \$2.00. Niagara Falls to Toronto, round trip, \$2.25; one way, \$1.50. Lower rates on special excursion dates and public holidays.

Lockport and Niagara Falls, round trip, 75 cents; Saturdays, Sundays and holidays, 50 cents.

Niagara Falls, N. Y., to Queenston and return, 60 cents; one way, 35 cents. Chippewa and return, 35 cents; one way, 25 cents.

Niagara Falls, N. Y., to Canadian Side, and round trip over entire route, 75 cents.

Niagara Falls, N. Y., to Canadian Side, "Canadian Scenic Route" to Horseshoe Fall, thence to Queenston, Suspension Bridge to Lewiston, and Niagara Gorge Railroad to Niagara Falls, Belt Line trip, \$1.

Niagara Gorge Railroad, Niagara Falls and Lewiston, round trip, 75 cents; one way, 50 cents.

Youngstown and Lewiston, round trip, 35 cents; one way, 20 cents.

Buffalo and Youngstown (via L. & Y. F. Ry. and N. Y. C. & H. R. R. R.) round trip, \$1.00; one way, 85 cents.

### ACCOUNTANTS' ASSOCIATION.

Under date of June 1st, President Ham and Secretary Brockway of the Street Railway Accountants' Association of America have issued the following circular:

The fifth annual convention will be held in Madison Square Garden, New York City, Oct. 9, 10, 11, 1901.

Much of our important work done has resulted from the work of committees. This plan has been continued and reports will be presented by the committees appointed to consider:

A Standard Unit of Comparison.

Standard Blanks and Accounting for Material and Supplies.

Standard System of Street Railway Accounting.

Standard System of Accounting for Electric Light Companies.

Papers will be read upon the subjects:

Stockholders' Records.

Car Mileage and How to Arrive at It Easily.

Consumers' Accounts—Electric Lighting Companies.

Capital Accounts from the Viewpoint of the Investor and the Public.

In addition, the Address of Welcome, the Annual Address of the President and the Annual Report of the Executive Committee of the Association will be of prime importance and interest.

The customary one and one-third railroad fare has been obtained on the usual certificate plan.

By a wish of the members, long expressed, this association is to have a separate hotel for headquarters.

Arrangements have been made at the Fifth Avenue Hotel, at the junction of Broadway, Fifth Ave. and 23d St. This is practically at the convention building in the center of the city. The rates are: European plan, \$2 and upwards per day, and American plan, \$5 and upwards per day. It is desired that reservations for rooms be made at once. The pleasure and advantage of the delegates meeting one another at the hotel as well as at the hall is apparent.

The whole convention gives the brightest promise of good work, large attendance and pleasure. The membership of the association has increased 10 per cent since the Kansas City convention, which is a matter of encouragement.

### ROCKFORD-BELVIDERE LINE.

The Rockford & Belvidere Railway Co., which is building a 14-mile line between Rockford, Ill., and Belvidere, is making satisfactory progress; the grading is over half done, two miles of poles are up, all material is on the ground and track-laying has been commenced. The Illinois Interurban Construction Co., in which Messrs. R. N. Baylies, W. H. Woodruff and John Farson are interested, has the contract for constructing the road and let the grading, overhead construction and track work to Kahler Bros., 1804 Fisher Bldg., Chicago. Weber rail joints and Ohio Brass Co. overhead material will be used.

The officers of the Rockford & Belvidere are O. S. Baylies, president, and F. A. Poor, secretary.





used, and no quotations are considered unless made on these forms. All quotations must be f. o. b. Buffalo. A blue paper is used for this form in order that the supply company may easily recognize our request for prices and give it prompt attention.

Fig. 4 (size of original,  $13\frac{1}{2} \times 8\frac{1}{4}$  in.) shows the order blank. Particular attention is called to the acknowledgment form at the lower part of this blank; this portion is  $2\frac{3}{4} \times 8\frac{1}{4}$  in., and is torn off at the perforated line and returned to the purchasing agent. As the acknowledgment blanks are received they are pasted in a scrap book, the order numbers being arranged in sequence. This scrap book is often referred to and proves a valuable record when after waiting several weeks the supply house writes that it never received the order. In one instance last fall a company which had taken a large order attempted to repudiate the action of its representative on the ground that the price was too low, but the acknowledgment over the general manager's signature being on file in our books, we were obliged to insist on the order being filled. Three copies of the order are made, carbons being used; the duplicate is  $\frac{3}{4}$ -in. wider than the original, to provide an edge for binding, and is kept in the office of the purchasing agent; the triplicate is sent to the general manager. No order is placed without a price being given for each item.

The duplicate order differs from the original (Fig. 4) in that the acknowledgment stub is omitted, its place being taken by a ruled form on which are entered the date the invoice was received, the date of the invoice, to whom sent to check, date so sent, date returned, number of list in which it is sent to the auditor, amount of freight or express, and the date of each letter written or received in relation to the order, showing what has been done to hurry material or delay shipment. The duplicate orders are carried in a loose folder and after being filled are bound in book form. An index book gives the order number under the name of the firm, but each order has on it the number of the last order to the same firm and of the succeeding order also, so that when the orders are bound one may find all the orders to a given firm without more than one reference to the index.

We do not allow invoices to be rendered until the order is completed. An exception to this rule is made when a large order is filled save as to a few items, so as not to handicap the storekeeper. This is understood between the supply companies receiving the most of our orders and ourselves. The plan is satisfactory; the auditor rarely complains and the storekeeper never.

Fig. 5 (size of original  $7 \times 8\frac{1}{2}$  in.) is the form of invoice. Two of these invoices, one on white and one on yellow paper, are sent

against the order and puts his initial in the space provided therefor at the upper right hand corner of the invoice (Fig. 5); it then goes to the receiving clerk to be checked with the shipping memorandum which we insist shall be sent with each shipment. The duplicate is placed in an invoice cabinet in the office of the purchasing department. This cabinet has a pocket for each letter of the alphabet and several special pockets for local hardware firms and others with whom we deal to a great extent; each

FIG. 5

**NOTICE** ALL GOODS MUST BE RETURNED TO PURCHASER ON THIS FORM. IF NOT RETURNED, BUYER WILL BE RESPONSIBLE FOR LOSS.

**BUFFALO RAILWAY COMPANY.**

PURCHASING DEPARTMENT  
MAIN AND MICHIGAN STREETS  
ORIGINAL INVOICE

FROM: M. Address: Date: 1

Material delivered to: Requisition No.

Order No.

Checklist vs. Order  
Material Received (date)  
Checked by  
Bills Certified (date)

Quantity	ARTICLE AND DESCRIPTION	AMOUNT
ALL GOODS BOUGHT F. O. B. BUFFALO, N. Y. UNLESS OTHERWISE SPECIFIED ON ORDER		

I certify that the above was collected for by the one that the charges and terms are correct.

I certify that the material (or work) above charged has been received for use, thoroughly inspected and is in every way good for the Company's use for the purpose ordered.

FIG. 5—INVOICE.

pocket or pigeon hole is divided into two unequal divisions, the smaller being at the top and this is used to hold the duplicate invoices while the original is being checked. By this arrangement one can tell at a glance if there are many invoices being held by the receiving clerk, and if such is the case a list can be forwarded to him and an explanation demanded. When the invoice is returned to the bill clerk it shows the date the material was received and checked and by whom, and the bill clerk then makes the duplicate agree with the original as per the checking. The invoices are then listed and after lists (which are in duplicate) have been checked by the storekeeper and purchasing agent, they are sent to the auditor, who signs one copy and returns it to the purchasing agent thus showing the invoices have been received. Upon the return of this list the duplicate invoices are sent to the bookkeeper for posting to the ledger. Goods purchased which are not stock articles, and hence are not carried in our ledger, are entered in a special ledger and they are checked and charged out as soon as the requisition is entered on the distribution sheet.

We have used this system of checking for a year and have never let a duplicate invoice slip through; in fact no weak points have been developed and we can always give the auditor or the supply companies any information they desire, as we have followed the invoice in writing from the time it is received until delivered to the auditor.

In the receiving clerk's office there are two cabinets, one for shipping memoranda and one for invoices. When a memorandum is received the clerk turns to his invoice cabinet and if the invoice has not yet arrived the memorandum is filed. All freight is paid by this department, the freight bill being attached to the shipping memorandum by the receiving clerk and filed until the invoice arrives when it is returned with the invoice to the bill clerk. In this way no mistake is made by applying the freight on the wrong invoice.

We have a subject index—card system—which gives the order number for all material, which is convenient when the master mechanic wishes to know where his No. 4 wire is, and saves hunting up the order to find its number. We always refer to this index before placing orders to see if the previous order for similar material has been delivered, thus saving many duplicate orders.

I have a blotter on my desk for my own convenience. This is simply a list giving the order number, name of firm and list of material. The receiving clerk checks this list daily and I am thus able to keep in touch with the unfilled orders and know what houses to push. The blotter is rewritten each month and is thus kept down to a convenient and compact size.

FIG. 4

ORDER NUMBER 8327

REQUISITION NUMBER 3224

**BUFFALO RAILWAY COMPANY.**

PURCHASING AND SUPPLY DEPARTMENT  
OFFICE: Main and Michigan Streets  
Buffalo, N. Y.

Messrs. Please supply this Company with the following Material.

LOTS AND QUANTITIES	PRICE.
All goods bought F. O. B. Buffalo	
Bills must be rendered to Auditor at Buffalo, N. Y. before material enters company	
To close bill be accepted such order is required	

Mail bills direct to Purchasing Agent  
Send Memorandum Invoice with each shipment  
Terms: 30 days unless otherwise agreed

In Correspondence and Billing refer to Order Numbers  
Proper freight, express, charges and mark all Billages with this Order Number

Order Number: 8327 Date:

Accepted—accepted as fully understood, and delivery will be made at time designated on order. If no time designated prompt delivery will be made.

Signature

Return this bill to Auditor on receipt of order

FIG. 4—ORDER—ORIGINAL.

with each order, and all firms are required to make their invoices in duplicate on our forms. In a few cases it has been necessary to return invoices with notice that this company would not pay any attention to invoices unless made out on our forms. Both the form of invoice and original order are copied after those of the Brooklyn Rapid Transit Co., thanks to the kindness of Mr. Van Cott.

When the invoices are received a bill clerk checks the original

At present we place orders on Tuesdays and Fridays, asking prices on the off days. After construction work is over orders will be placed once a week. All bills with the exception of the large contracts must be approved by the purchasing department before the auditor will pass them.

A confirming order is always placed to cover bills that do not show our order number. Cases often arise where the president or general manager authorizes heads of certain departments to purchase material, but only for construction work. Unless the purchasing department is notified in advance no formal order can be placed, and when the invoice arrives it is returned with a request for the order number which usually brings forth a satisfactory explanation. An invoice is never O. K. without an order number, and this rule is strictly enforced.

Track material, sand, cement, and oil for headlights and motors

at 1. We carry an index sheet under each letter, hence if you wish to look up bolts you turn to letter index sheet B and run down the folio column until you find bolts. As the folio numbers never change, a bookkeeper in a short while becomes able to carry the numbers in his head. It is also a great convenience as it is never necessary to transfer an account nor to carry blank sheets in the ledger for such emergencies.

#### STOREROOM—CHARGING OUT.

Returning to the foremen's requisition, Fig. 1, when goods are delivered on this order, the delivery clerk places the number of the bin in the fourth column of the order. The number of the bin is marked on the card that is on each bin and agrees with the folio number of the ledger—machine bolts would be B-10. This order is held until late in the afternoon by the delivery clerk,

PAGE 1		ARTICLE <i>Contact Rings A 10</i>										FOLIO									
RECEIVED										DISTRIBUTED						ON HAND					
Date	Order No.	FROM	Description	Quantity	Last	Unit	Amount	Sp. A	Sp. B	Total	Date	2nd No.	Description	Quantity	Amount	Date	Period	Description	Quantity	Amount	
<i>1920</i>																					
<i>Nov 5</i>		<i>Steel Elec Co</i>	<i>19410</i>	<i>50</i>	<i>35</i>	<i>50</i>	<i>8.75</i>	<i>11</i>		<i>9.19</i>	<i>Nov 30</i>	<i>25</i>		<i>25</i>	<i>5.00</i>						
			<i>16428</i>	<i>50</i>	<i>16</i>	<i>50</i>				<i>2.00</i>				<i>2.00</i>	<i>4.50</i>						

FIG. 6—PAGE OF LEDGER.

are handled in the following manner: Contracts are made by the year or month, sand by the year, oil by the month, and at the end of each month the company sends receipts for material delivered. These are checked against the foreman's requisitions and his receipts for material which come direct to this department and an order is then placed covering the material delivered. By this means numerous orders for the same material are avoided and a large stock need not be carried. In the case of oil, not even a barrel need be carried in stock; when a requisition is received we notify the oil company by telephone to deliver so many barrels of oil at the barn where it is needed.

#### STOREROOM—RECEIVING DEPARTMENT.

In connection with the descriptions of the order and invoice blanks the method of checking invoices against the shipping memoranda has been given. As the material arrives at the storeroom the receiving clerk checks it against the shipping memorandum, which is then filed, and the goods placed in the racks. The receiving clerk also writes the quantity of goods received on

when it is turned over to the requisition clerk. He sees that the orders are classified correctly according to the State Classification, and then files each order under the road that the material was to be used on. (We buy our material in the name of the Buffalo Railway Co., but are still operating 10 or 12 different lines, so of course the material has to be charged to the different corporations.) The next morning these orders are written by the requisition clerk onto our distribution sheet. This sheet is 8½ x 14 in. and the column headings are shown in Fig. 7. The heading is marked "Job No." This is practically the same as the state classification, but we operate under job numbers instead of state classification; the number is the same in both cases. The ledger folio number is entered in the first column; the next two columns "Quantity" and "Amount" are left blank; the name of the article is put in the next column. The price column is also left blank. The amount of the material delivered is placed under the numbers 1 to 31; these are the days of the month. The idea of this sheet is to do away with the repetition of work. If machine bolts are delivered on the 1st of the month and also on the 2d,

Job No.				190																															
Folio	QUANTITY	AMOUNT	ARTICLES	PRICE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

FIG. 7—DISTRIBUTION SHEET.

a card which hangs in front of the bin. Before putting new material in the bin he counts what is already there and sees that it agrees with the card. In this way we are able to keep a continuous inventory and also know that our stock agrees with our books. In case an error is found the matter is reported to the bookkeeper and at once corrected.

Fig. 6 shows the ruling of one of our ledger pages (the page is 14 x 17½ in.). It will be noted that we use the loose leaf ledger, the debit and credit and also the recapitulation columns being all on one sheet. As soon as this sheet is filled it is carried over the page, the other side of the page is then used. When this also has become filled it is then taken out of the ledger and filed in a special file; the page taking its place would be page No. 2, the folio remaining the same. Our ledgers are folioed commencing at 1 under each letter; A will run from 1 to 60, B will also start

the clerk has simply to write the number under the date of the month. It will be observed that his work is lessened to a great extent towards the end of the month instead of being increased as under other systems. During the last week of the month our bookkeeper corrects our price cards if any changes are to be made owing to new invoices being received. These price cards simply show the name of the goods and the folio number. On the last of the month the bookkeeper and distribution clerk take these distribution sheets and put the price on them. This is done entirely under folio numbers and not under the name of the goods. I wish to make a point of this, as it does away with any mistake in pricing, for often the orders on the storeroom call for material that might not be clearly understood by the bookkeeper. As an example take alcohol; the storeroom order might read alcohol and wood alcohol is given out on this order and the

bookkeeper by mistake puts the price of grain alcohol. By using the folio number, as we do (it will be remembered that each store-room order has the folio number on it) such mistakes cannot occur. As soon as these distribution sheets are all priced the totals are carried forward and the two columns of quantities and amount filled out. These are totaled and a recapitulation sheet sent to the auditor, who then gives the storeroom credit for the amount of goods delivered by the storeroom for that month. If any material on the distribution sheet is not given a folio the bookkeeper knows that it is in his special bill book which was referred to before. He can get his price from this book and check it, showing that it has been charged out. These distribution sheets are sent to the auditor with the recapitulation sheet. This allows the auditor to see exactly what material was delivered on each account. If any account is very high for the month he can immediately tell what is the cause. As soon as he looks over these sheets they are returned to the storeroom, the bookkeeper posting the items on the credit side of his ledger.

We do not pretend to make detail postings of our bolts or small supplies that are used in large quantities. We simply draw off from the distribution sheet the total amount of bolts and total amount of money and make one posting on our ledgers. Neither do we carry separate accounts on our ledgers for each size of bolts, screws, etc., but have one account for each type of bolt, which includes all sizes, and average the price.

As soon as the bookkeeper finishes his posting of the distribution sheets, he balances each account, and the amount of money shown on the ledger for each account is drawn off on a sheet and sent to me. This sheet is simply a list of the ledger accounts. The amount each month is placed in a column behind each account. This sheet was started last June and it is most interesting now to look at an account such as machine bolts and see how it is running. This is of great assistance in ordering material, as at a glance one can tell the amount of goods that have been used in the past for each month and so not order too large a stock.

We send our auditor and general manager a synopsis of this list making it up under 15 different heads, such as hardware, electrical supplies, etc. Both these officials are then in a position to know the amount of stock carried in the storeroom and how it is running from month to month. The storeroom and auditor balance once a month. If an account on our ledgers shows an over or under charge we post these to what we call the auditor's account. As is very often the case, gasoline, naphtha and even lumber will vary. If there is a shortage we balance the account by posting from the auditor's account. If on the other hand it shows a certain amount of goods on hand when they are not really there, we post this to the auditor's account. In this way we are always able to keep our different accounts perfectly straight.

Our bookkeeper will generally finish his work for the month on the 25th or 26th of the month. This gives him practically a week to see that his ledger accounts agree with the cards that are on the bins. He will start in at the first page of the ledger and work through the book. In this way we always have our ledgers agree with the material on hand and as I have previously explained that our material in the bins agrees with our cards, a statement of our ledgers will be a true inventory.

I wish to make these points: we are running no risk of pricing wrong material; that there is no repetition of clerical work on our distribution sheets under the same job; one pricing for one line of material under one job covers the entire month; our goods agree with our cards on the bins and they agree with our ledgers, and our ledgers agree with the auditor's books.

—♦♦♦—  
The contractors for the Rockford (Ill.)-Belvidere Ry. have experienced great difficulty in securing teams enough for continuing the construction work.

—♦♦♦—  
The Savannah (Ga.), Thunderbolt & Isle of Hope Electric Railway Co. recently installed a 1,000-h. p. engine at its Savannah power house. The improvements at this plant were made under the supervision of W. A. McWhorter, chief electrical engineer for the company.

## OFFICERS OF THE BUFFALO RAILWAYS.

Mr. W. Caryl Ely is president of the Buffalo Railway Co. and of a number of the companies allied with it. Mr. Ely is a native of Middleford, N. Y., where he was born Feb. 25, 1856. His education was completed at Cornell University, and after graduating from this institution he read law at East Worcester, and was admitted to the bar in 1882. Mr. Ely served in the Board of Supervisors of Otsego County and in 1883, 1884 and 1885 was elected



W. CARYL ELY.

to the Assembly. He removed to Niagara Falls in 1885 and the firm of Ely, Dudley & Cohn, which has perhaps a more extensive law practice than any firm in Niagara County, was organized by him. Later he became interested in the Niagara Falls Power Co., being one of the five original promoters of that concern, and in is owing to his executive ability that the company's projects were successfully carried out. Mr. Ely was also the principal promoter of the Buffalo & Niagara Falls Railway Co., and he has been prominently concerned in promoting the enterprises of the Niagara



HURL VAN HORN.

Falls & Suspension Bridge Railway Co. Mr. Ely was very actively interested in the organization of the International Traction Co., and to him is given the credit of bringing this extensive deal to successful consummation. He was one of the first to appreciate the benefits to the people of North and South America of a Pan-American Exposition, and he has been one of the staunchest friends of this great enterprise and one of the hardest workers for its success. Mr. Ely enjoys a wide reputation as an able financier and



has the respect and confidence of all with whom he comes in contact as well as of the public at large in his home city.

Mr. Burt Van Horn is a business man of unusual attainments. From 1889 to 1895 he was engaged in the management of a fruit farm on the family homestead of 350 acres, situated in Niagara County, this property having been in the family for over 100 years, with only three transfers. After the death of an only and well beloved son, he went into more active business, and soon built and successfully operated the Buffalo & Niagara Falls Electric Ry. He next built the Buffalo & Lockport line and inaugurated the

traveling engineer for the Pennsylvania Steel Co., which position he resigned in 1899 to accept the office of engineer with the street railway system of Buffalo. In his present position Mr. Lewis has had charge of all the new track work and building construction made necessary in anticipation of the extra Pan-American travel, this work including the rebuilding of about 50 miles of track with concrete beam construction.

Mr. C. K. Marshall, electrical engineer and master mechanic of the companies controlled by the International Traction Co., was born at Niagara Falls, N. Y., May 24, 1858. He was educated



T. E. MITTEN.



R. F. RANKINE.



C. C. LEWIS.



C. K. MARSHALL.

heavy freight haulage as described elsewhere in this issue. After seeing this road in successful operation he next conceived the idea of extending the line to Olcott on the lake and at this place he has established one of the most elaborate and successful pleasure and outing resorts in the country. Here he has built a fine hotel with appointments equal to the best, and a summer theater; he has provided numerous attractions and amusements that make the place a popular center for the population from miles around.

Mr. Van Horn took a prominent share in the work of uniting the properties controlled by the International Traction Co. and now holds the office of general manager of the allied companies. Under his management the extensive preparations for transporting the anticipated Pan-American crowds have been planned and successfully carried to completion.

Mr. T. E. Mitten, general superintendent of the properties controlled by the International Traction Co., was reared on a farm in Indiana. He took up steam railroad work and while connected with the Denver & Rio Grande R. R. at Denver, he gradually became interested in street railways. In 1893 he equipped one of the suburban steam lines running out of Denver, for electrical operation. In 1895 he went to Milwaukee and became associated with the Milwaukee Electric Railway & Light Co., severing his connection with that road in March of this year to take up his present duties. Mr. Mitten has made a name for himself as a street railway man of marked ability and has had peculiar success in the handling of men. Although he was largely instrumental in defeating the strike at Milwaukee several years ago, he gained and held the good will of his employees, to a degree remarkable under the circumstances. When he left Milwaukee he did so with the expressed regret of the entire operating force of the road.

Mr. R. F. Rankine, secretary and treasurer of the Buffalo Railway Co., and all the allied companies, and treasurer of the International Traction Co. has charge of all the accounts and records and financial affairs of the properties. He was born in Geneva, N. Y., Feb. 4, 1862, graduating from Hobart College in 1882. He was associated with the Omaha National Bank from 1883 to 1894. He was treasurer of the Niagara Falls Paper Co. from 1894 to 1899. Mr. Rankine went to Buffalo in 1899.

Mr. C. C. Lewis, engineer of way and buildings, is a native of Ohio, and received his technical education at Case School of Applied Science and at Cornell University. In 1894 he formed a business connection with Mr. A. N. Connette, then engineer for J. G. White & Co. at Baltimore. Here Mr. Lewis had charge of cable construction work. He remained three years in Baltimore and then went to Cleveland with the Brown Hoisting & Conveying Co. After being with this company for a year and a half he went to Washington for a period of nine months. In 1896 he became

at Otsego University and obtained his first employment in the city engineer's office, at Buffalo, where he served for two years, after which he was on the engineer's corps of the Atchison, Topeka & Santa Fe extensions for a period of three years. Mr. Marshall returned to Buffalo in 1878 to engage in electrical work in the interests of the Thomson-Houston Electric Co., of Boston. He was employed by this company in the construction department of central station work until 1880, when he accepted an advanced position in the railway department of the Thomson-Houston company. After the consolidation with the General Electric Co., Mr. Marshall still remained at the head of his department, but severed his connection at last to become superintendent of the Buffalo & Niagara Falls Electric Railway Co. In his capacity of electrical engineer for the consolidated companies at Buffalo and Niagara Falls Mr. Marshall has had charge of the extensive electrical work made necessary by the arrangements for carrying the Pan-American visitors.

### NOTES FROM BIRMINGHAM, ALA.

The Birmingham Railway, Light & Power Co. is making a number of improvements and is pushing the work on an extension of the Ensley line to Wylan, a small place about a mile from Ensley, and hopes to have its cars running to that point soon.

The company has almost recovered from the losses it recently sustained by a fire on April 17th, which destroyed its principal barn and shop with 38 cars. Ten new 28-ft. closed, double truck, vestibuled cars with all the modern appliances and equipped with G. E. 57 motors have just been put into service and other cars are to be purchased as soon as insurance matters are adjusted.

Some 700 tons of 60-lb. rails have just been received and will be used to re-lay some short interurban lines now laid with 40-lb. rail. The work is to be done by local contractors.

Lakeview Park, a delightful summer resort, up in the mountains and conveniently adjacent to the lines of the company is being improved and beautified and a professional opera company under local management will present light opera during the heated season, which means increased travel on the car line.

The company has recently adopted an ingenious device to prevent the falling of fare registers, which happens so unexpectedly and with sometimes disastrous effect. The device consists of two straps on each side of the register; one end of each is securely fastened to the car and the other provided with a snap hook which goes in a ring on the register and in case the fastenings should suddenly break these straps keep it from falling. All the cars of the system have been provided with this contrivance.

### THE ALBANY STRIKE.

The strike on the system of the United Traction Co., of Albany, N. Y., which involved the street car lines in Albany, Troy, Cohoes, Rensselaer and Watervliet was the most serious of the year. The employees made three demands on the company as follows: 1. Complete recognition of the union and the discharge of seven non-union men employed by the company. 2. Extra men to be paid at the same rate per hour as regular men. 3. A modification of the duties of conductors in regard to registering inspectors.

On these demands being refused the men quit work on the morning of May 7th. The company made no attempt to run cars but at once proceeded to secure non-union men. With the arrival of the new men at Albany rioting developed, the cars were attacked, trolley wire cut and tracks torn up. Adequate protection not being provided by the local police, 3,000 state troops were called out, and May 14th cars were started in Albany under military guard. There was much disorder during the next four days, many of the non-union men were injured by the rioters and on May 16th two bystanders were killed by a volley fired by the militia.

May 17th the strikers abandoned their demand for the discharge of the seven non-union employees and an agreement was reached with the company in substance as follows:

The company agrees to receive representatives regarding grievances from any committee of its employees, representing organized or unorganized labor; that men suspended or discharged by the superintendents shall be entitled to appeal to the executive committee of the company; that in case employees can disprove charges under which they were suspended or discharged they shall be entitled to pay for the time they were idle during such suspension or discharge, and that there will be no discrimination against any of the men who engaged in the strike except those guilty of unlawful or riotous acts.

The company reserves the right to employ union or non-union men and to discharge employees for cause.

The wages of all the motormen, conductors, linemen, and pitmen is to be 20 cents per hour, and of pitmen helpers 17½ cents per hour.

The men agree that no proposition for a strike shall be acted upon by any division at the same meeting at which it is introduced, but that at least 48 hours shall elapse before such proposition shall be voted upon, and that if a strike shall be ordered it shall not take effect until at least six days have elapsed after notice to the company during which time the employees shall continue their work.

The position of the men brought to take the place of strikers was not touched upon in the formal agreement.

### BALTIMORE-WASHINGTON LINE.

On May 28th the promoters of the Washington & Annapolis Electric Railway Co. effected a permanent organization with the election of the following board of directors: Messrs. W. H. Lamprecht, Otto Miller, F. N. Wilcox, F. T. Pomeroy and E. W. Morre of Cleveland, O.; James Christy, jr., of Akron, O., and Mr. Marbury, of Washington, D. C. The officers elected are: President, Mr. Lamprecht; vice-president, Mr. Christy, and secretary-treasurer, Mr. Miller. Cleveland capital is back of the road. A working office will be opened this month in the Bond Building, Washington, D. C.

The company proposes to build a road from Baltimore to Washington, with a branch to Annapolis, and considerable progress has been made on the surveys. The road will be built on a private right of way, part of which has been secured, and it has not yet been decided whether the trolley or third-rail system will be used. About a year will be required to complete the line after ground has been broken.

Two bills, passed by the Pennsylvania Legislature making general provisions for overhead and underground railways in Philadelphia and other cities, were signed by Governor Stone on June 7th and the next morning over 100 applications for charters were filed. According to the charters asked for Pittsburgh and Allegheny are to be covered with elevated and tunnel roads, and Philadelphia will have 15 new elevated, surface and tunnel roads.

### OHIO NOTES.

The Cleveland, Wadsworth & Southern Electric Ry. has just been incorporated, with a capital stock of \$10,000. The headquarters of the new road are to be in Cleveland.

It is stated that the Cincinnati Traction Co. has purchased property on the corner of Fifth and Walnut Sts., just off of Fountain Sq., and will erect thereon a fine office building. The price paid for the lot is said to be \$350,000.

The work of grading the line for the Urbana, Mechanicsburg & Columbus Electric Ry. was begun last week. This line extends along the Scioto River from Columbus to Dublin, and then takes in the towns of Plain City, Resaca, Rosedale, Mechanicsburg, Mutual and Urbana, a distance of about 45 miles. Its president, Gen. H. A. Axline, promises to have cars in operation by Thanksgiving Day.

Pres. James M. Loren, of the Columbus, Delaware & Northern Traction Co., has purchased the historic old mill property on the Olentangy, at Stratford, two miles south of Delaware, with the intention of converting it into a summer resort. The tract covers over twenty acres of land, including the old mill dam and water power, and has two beautiful groves, affording an elegant place for boating, fishing and picnicking. It is Mr. Loren's intention to put in improvements enough to make it one of the ideal summer outing places.

The people of Columbus are awaiting the entrance of the first interurban car of the Columbus, London & Springfield Ry. with considerable impatience. The Board of Trade will soon take formal action respecting a suitable demonstration in honor of the entrance of the first car over the interurban loop. Cars on the Dayton, Springfield & Urbana are numbered from 1 to 30; on the Columbus, London & Springfield from 30 to 70; on the Grove City Columbus line from 70 to 90; on the Buckeye Lake line from 90 to 120; and on the Delaware & Northern from 120 to 150.

The Columbus, Winchester & Lancaster Traction Co. has secured the entire right of way to the latter city and work is to be begun at once. Of the \$700,000 guaranteed, \$500,000 was raised in Columbus and the balance in Chicago. This company is the only one that has a complete right of way so far, though another company will likely parallel this line. Thos. A. Simons, H. C. Park and David C. Begg, who are the chief factors in this enterprise, are also interested in the Columbus, Delaware & Marion line, which is now graded to within about eight miles of Delaware, or about 17 miles of the entire distance. The officials of the latter road have experienced great difficulty in getting their rails.

The Toledo Traction Co., at the solicitation of an organization of ladies of the city, has established a special rate of fare for children under 12 years of age for special excursions. The society has undertaken to rally children of all ages and conditions into groups to give them outings at the parks and playgrounds during the summer, in which cases the railway company has agreed to make a rate of 1 cent each to groups of 25 or more. President Lang of the traction company, states that in some cases the company will doubtless make no charge. This is an educational work in which the ladies have great faith, and it will be the policy of the company to aid in the work as much as possible.

### NEW ENGLAND STREET RAILWAY CLUB.

The regular monthly meeting of the New England Street Railway Club was held at the Pathfinder meeting room, 67 Federal St., Boston, on May 23d. The only paper read was that of Mr. Percy Hodges, of Boston, on "Aluminum", which was quite fully discussed. At this meeting six applications for membership were received.

Cars will be running on the Sycamore (Ill.) & De Kalb Electric R. R. before summer is ended. The construction of the line was commenced May 13th and is rapidly progressing.



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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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In this issue of the "Review" considerable space has been given to the Pan-American Exposition and details concerning the arrangements made by the street railways of Buffalo and vicinity for handling the increased traffic. Electricity has naturally been one of the features of this exposition, first, because of the remarkable progress in this field, and secondly, by reason of the nearness to the great electric power stations of Niagara Falls. All those who have already visited the "Rainbow City" agree that never before have such magnificent lighting effects been secured, and that to see the exposition grounds at night is well worth a trip to Buffalo.

Our readers will be more interested in the exhibits of street railway apparatus, equipment and supplies, which are quite comprehensive, and for the most part installed in the Electricity, and the Machinery and Transportation buildings, though the heavier exhibits, such as cars and sweepers, are located in the Railway Terminal building.

In a suit against the street railway company operating in Duluth, Minn., the question as to whether the company was not guilty of negligence in attempting to operate its cars during a strike was injected by the trial judge in his charge to the jury. This novel question proved to be the point on which the case turned when an appeal was taken and last month the Supreme Court of Minnesota held that as to its passengers the company is not liable for negligence in attempting to operate cars during a strike "unless the conditions are such that it ought reasonably to anticipate that it cannot do so and at the same time guard from violence those who accept its implied invitation to become passengers."

It is difficult to understand on what principle a railway company can be held liable for violence done its passengers by a mob, when it is the duty of municipal and state governments to maintain order. When a street railway strike occurs and the company is compelled to suspend service there is always a demand by at least a portion of the public that the franchises be declared forfeited unless the company shall fulfil its undertaking to operate cars, and

if in addition the company be liable for negligence in trying to operate its way will be hard indeed. Fortunately, however, the decision of such questions lies with the courts and not with the general public.

The people of Indiana fully appreciate the advantages which will result from a further development of electric interurban lines, as is shown by the act conferring additional powers on street railway companies passed at the last session of the Legislature. This act confers power to acquire real estate by purchase or gift for use for roadway, stations, depots, etc., and in case the company is unable to agree for the purchase it is given the right to acquire title by special proceedings. Authority for crossing the tracks of other roads either steam or electric is conferred, the junior road installing the crossing and each company thereafter maintaining its own track. By another act passed at the same session there is conferred broad authority for a street railway to lease and operate street or electric railways, whether within or without the state, provided the tracks leased connect with the tracks of the lessee company.

Since the last issue of the "Review" there have been important improvements in the transportation lines of two eastern cities—the last cable road has been abandoned in New York and the elevated road in Boston has been put in operation. Several years ago the New York street railways began experimenting with electric conduit system on the up-town lines and have been steadily extending it to the down-town lines, leaving the Broadway cable line until the last. The cable was stopped the evening of Saturday, May 23<sup>rd</sup>, and by Tuesday morning the electric conduit system was in full operation.

The elevated lines in Boston have been practically completed for several weeks, and were formally opened last month, when the company entertained a party of state and city officials and other guests. The road was not opened to the public until June 10th, however.

Every improvement in the street railways of our large cities seems merely to give rise to an opportunity for further advance in the same direction, and a striking example of this is seen in Boston. Long before the elevated lines were ready for operation the matter of a new subway was under discussion, and at the present time a bill providing for a subway under Washington St. is pending in the Massachusetts Legislature.

An eastern banking house has recently published in pamphlet form, under the title "What Shall We Buy?", a study in investments from the pen of Mr. Guy Morrison Walker, of Cleveland. Mr. Walker points out that since 1893 the balance of trade in favor of this country amounts to over 2,670 millions of dollars, and that this balance has not all been paid by the return of securities held abroad, because during the same period the resources of our national banks have also increased nearly 2,000 millions of dollars, and the deposits in savings banks, state banks and trust companies have also increased about 2,000 millions of dollars. This enormous sum seeking profitable investment has provided a market which the government and municipal bonds issued during recent years have been wholly inadequate to supply, and it is believed that the reorganization and consolidation of the leading industrial enterprises of the country in the last two years has really been only an effort to create securities to satisfy the demand for investments. Investors have turned to railroad securities but have to a great extent neglected the stocks and bonds of street railways, lighting and telephone companies and other public service or so-called quasi-public corporations. Street railways are placed next to the railroads in respect to the receipts per capita of population served, but require a smaller capital in proportion to population than do railroads and are largely relieved from the effects of depressing times by the manner of collecting their receipts.

In connection with this it is interesting to note that the London Financial Times has announced its intention to investigate desirable urban transportation properties in the United States with a view to their substitution for steam railways, which have long been held in high favor by English investors. The belief is growing abroad that the limit of profits from American trunk lines will soon be reached and that the time to buy electric railway securities is while they are cheap. Among the securities in the list of "recommended purchases," published by the Financial Times on June 5th, were



bonds of the street railways in New York, Cleveland, Milwaukee, Kansas City and New Orleans.

The attitude so commonly assumed by municipalities, particularly in the middle and western states, whenever questions pertaining to street railways are under consideration, is apparently the result of regarding a public service corporation a convenient agent for the collection of taxes. Unfortunately the taxes thus collected in the guise of license fees, street paving and compensation for the use of the streets, are paid by the passengers, who as a class are far less able to bear this charge than are the property owners who are thus relieved of it. Though the city may apparently lose revenue that might easily be collected, in fact its indirect gain is far greater if the company be permitted to expend the sum otherwise paid to the city, in extending its system and improving the service.

At this time the street railway franchise question is a live one in Chicago, and to judge from the harsh things said by members of the council and the press one might think that the public believed that the street railways had been a source of loss to the city. It would appear that the increase in real estate values due to the development of the railways had been forgotten.

The use of storage batteries in central station work has, in the last few years only, ceased to be of an experimental character and has now come to be regarded as an almost essential feature of any complete and well designed station. The change in the aspect in which the storage battery is held is only in a small measure due to any improvement in the battery itself, but has been caused chiefly by the improvements in the methods of using storage batteries. With the exception of the new Edison nickel-iron cell, which promises well, but which has not as yet advanced beyond the laboratory state, the storage battery of today is practically the same as when first invented, all of the improvements being of a mechanical nature in the direction of strengthening the plates, designing the grids to hold more active material or to hold the active material more securely, improving the circulation of the electrolyte and other mechanical improvements which have resulted in the production of cells which will withstand considerably harder usage than those of former days, but which are otherwise identical with the old ones.

In the method of using batteries, however, there has been a gradual improvement until at the present time it is possible to install a battery plant which will operate under the very best conditions for the life of the battery and will at the same time permit the installation of a much smaller power plant that could possibly be used alone. The character of the load on any railway power plant will vary considerably with local conditions, but except the system be a very large one, its load line will show numerous small peaks and valleys at all times of day due to stopping and starting of cars, as well as larger peaks which may occur at certain periods during the day due to extra cars and heavy traffic. The mean load curve, however, will probably be a nearly horizontal line for the greater portion of the day for a road of average size. Under these conditions it is obvious that the most economical size of power units to install is just enough to carry this average load, if the engines are to run during the whole number of hours the cars are operating. The function of a storage battery will be, in this case, to take care of the peaks on the load curve and in doing this it acts as a governor on the engines, making their load practically constant during the whole run, which lends to their maximum economy of operations. In addition to the economy of operation a properly proportioned battery will also enable a considerably smaller plant to be used than would be required if used alone, especially where the variations in load are great. In this case the engine must have sufficient capacity to carry the highest peaks which, although possibly lasting for but a few minutes, may rise to several times the value of the average load. The battery, therefore, not only enables an engine of smaller size to operate at its most efficient load, but permits a considerable saving in the cost of the installations which is measured by the difference in the cost of an engine plant large enough for the average load or one large enough to take care of the maximum load.

Another way in which storage batteries have grown to be almost indispensable in traction work, is in maintaining the voltage on different feeders or on distant points on a system where, sometimes, owing to extensions of track or unbusiness amount of travel at

certain times, the drop in voltage is so great as to make the operation of cars almost impossible. Batteries have been installed under these conditions at a considerably lower cost than that would be necessary to accomplish the same effect by means of supplying additional copper for the feeders.

In order that storage batteries may operate successfully under any conditions of railroad work, it is necessary that some means of regulating their charge and discharge be adopted and for this purpose boosters of various designs have been found to be admirably adapted. There may be certain conditions of load where a battery connected across the line without means of regulation may operate successfully, but such cases are probably rare and it has been undoubtedly the use of batteries under such uncertain conditions that has often caused their denunciation by central station managers. In order to operate batteries without the chance of undue and rapid deterioration, means must be provided to limit their charge and discharge, as nothing is more detrimental to a battery than to run it down or discharge it too low. To operate under the most favorable conditions the battery should do its work at a pressure as near as possible to its highest voltage.

An excellent system of battery regulation has been worked out by Mr. Highfield, which was described at a recent meeting of the Institution of Electrical Engineers and which varies somewhat from the methods in general use. This system includes the use of a reversible motor driven booster, which is put in series with the cells across the bus bars. The field of the booster is in series with a small exciter dynamo and with the battery, the two latter being opposed to one another in polarity. When the battery pressure is equal to the voltage of the exciter the booster is neutral and does not operate. When the battery pressure falls the exciter causes the booster to raise the voltage and when the battery pressure rises above that of the exciter the booster field is reversed and its pressure opposes that of the battery. The line pressure is thus kept constant whether the battery is charging or discharging.

While it is hard to determine the economy of a storage battery plant insofar as the saving of coal is concerned, it certainly operates as economically as an equivalent power in steam plant and although it handles only a small proportion of the total output, the whole plant shows the effect of the improvement in regulation which the battery accomplishes.

The remarkable extent to which electric interurban lines have encroached upon the traffic of the steam railways where the two systems are competitors has frequently been mentioned in the "Review." In New England there are instances where the steam lines threatened with trolley competition have solved the question effectively by building their own electric roads. The New York, New Haven & Hartford Railroad years ago adopted the policy of purchasing electric lines at those points in Connecticut where they would prove most embarrassing as competitors. A more recent example of the application of a similar policy is mentioned in the report of the New Hampshire railroad commission for last year; the Boston & Maine built an electric road 16½ miles long paralleling its own main line and during the year the net receipts were so satisfactory that the company has decided to parallel its tracks from Nashua to Concord, N. H., by an electric line.

About four years ago the steam railroads were very much interested in securing a practicable motor, preferably steam or gas, which could be installed on one truck of a car, thus enabling the company to dispense with the locomotive and crew for its light trains on branch lines. Quite a number of motors were designed for this service, but so far as we know none of them has proved to be efficacious in overcoming trolley competition.

Within the past month announcements have been made by two steam railroads that they would attempt to keep their local passenger traffic by reducing the rates of fare; the Philadelphia & Reading between certain stations near Philadelphia, has reduced its rates on commutation tickets below the rates charged on the trolley cars, and more recently, the Big Four has put on a large number of extra trains between Indianapolis and Muncie, Ind., and reduced the fare to about one-half cent per mile in order to compete with the Union Traction Co. of Indiana, whose rates are about one cent per mile between these points.

This comparatively new policy of the steam roads is interesting, but we seriously doubt whether it will be successful. The electric lines can far surpass the steam roads in the matter of frequent service, and having lower operating expenses are certainly better prepared to give battle on the question of tariff.

## THE FRANCHISE QUESTION IN CHICAGO.

Most of our readers are doubtless aware that for several years the question of extending the franchises of the street railway companies operating in Chicago has been made a political issue, the present mayor of the city having been thrice elected to that office because of this opposition to the street railway companies. In 1865 the Legislature of Illinois passed what is commonly known as the "99-year act," which extended the franchises of the three street railways then operating in the city from 25 to 99 years, the term expiring in 1958.

In the early 80's the city was advised by its counsel that it could not successfully attack the validity of the 99-year act, and in 1883 the companies agreed to accept an ordinance extending their franchise terms 20 years, or until 1903, without prejudice to their rights under the 99-year act. This period of 20 years being soon to expire, the city is again questioning the validity of the 99-year act and the daily press of the city is devoting a great deal of space to the subjects.

Erroneous conclusions having been drawn from a statement concerning the 99-year act made by Mr. James H. Eckles, president of the Commercial National Bank and a director and treasurer of the Chicago Union Traction Co., Mr. Eckles on May 31st published a statement in the Chicago Tribune, a portion of which we reprint as follows:

"I have never hesitated in my declaration that for any rights the company enjoyed of a public character the public should be properly recompensed. Such is my position today. I do not believe in municipal ownership as something which would benefit the public in any manner. On the other hand, I think it would work out much loss and harm. The interest which the public has in utilities such as street car franchises is to gain through them, not direct money compensation, but indirect benefits, which far outrun any money tax collected of the company granted the franchise and expended for the maintenance of the city government.

"These indirect benefits find fruition in the highest character of railway service, the best possible equipment known, the affording of every comfort and ease in travel, the utmost frequency of single cars, the extension of the transfer system, the maintenance of needed street improvements on which tracks are laid, and the granting of a rate of fare consistent with a proper profit to the operating organization. In short, I believe the general public fares better by gaining for itself, day in and day out, the profit which comes to individual patrons by such a conducted system as I have suggested than by having paid into the treasury moneys to be disbursed in an enlargement of the city's pay roll.

"I stand for such compensation, made direct to the public, as against a compensation made to the tax gatherer for the benefit of those who live on tax disbursements.

"It is evident that there cannot be extraordinary disbursements made for equipment and, at the same time, extraordinary cash payment into the city treasury. The patronage of the road does not now, and will not until Chicago is a far larger city, justify such a course, even on an invested capital far less than the present.

"Under such conditions, therefore, it must strike any thoughtful and investigating person who has neither political ambition to serve nor personal ends to gain that just at present it means more to every citizen and property owner to have the better service and the better equipment than to lay a burden on the companies to gain a money compensation that makes impossible the greater thing.

"One of the embarrassing features in the railway situation of Chicago arises from the patent fact that the city authorities, and, to an extent, the press, in discussing whatever pertains to it, lose sight of the fact that those interested as shareholders in the companies are a part of the public, and have rights just as sacred and legal as the governing powers. It must be evident that no adjustment can ever be brought about which works fairness to all until a policy of mere denunciation is given up and one of business equity and sense intervenes.

"Thus far we have had nothing but a studied attempt to discredit those in control of the roads and an evident determination to have the public believe that the shareholders of the corporation are handed together for the common purpose of plundering the public upon the one hand and discommoding it on the other.

"The result of all this is that those in control of these properties are threatened and harassed with every kind of suggested legislation at every meeting of the city council and every utterance of the city authorities. It is assumed in all these propositions looking to a multiplicity of regulations and control that those whose life business has been conducting railways know nothing of the business in which they are engaged, and the management has in mind only how to drive away patrons instead of gaining them.

"The thoughtful part of the public may well make the inquiry as to the reason why so much railway legislation is needed, and why, whenever a suggestion comes from those who know about the railway business, it receives such scant attention. The city has a right to object to being clubbed into doing something harmful to the public interest, but the companies have an equal right to complain at measures constantly suggested which do not design to gain any purpose other than increasing agitation and creating greater prejudice. It is unfortunate for every business interest in the city of Chicago that property rights as great as those of the surface railways, in which so many citizens have so much invested, are a subject of so much discussion and uncertainty. Other things ought to be given some attention which mean much to the growth and attractiveness of the city. They cannot be dealt with as long as demagogism finds an issue which is regarded as better for denunciatory and prejudicial purposes. If we are to judge by all this denunciation the public must believe that the street railway lines have been a source of loss to Chicago.

"The important view is now wholly lost sight of that, through their development and extension, a great deal of waste property has been made of value and a large increase in high taxable land added to the city's and county's revenue lists.

"If it had not been for the risking of much capital in building lines out into new territory contiguous to a smaller Chicago than we now see, the population, wealth, and comforts of Chicago would be vastly different to those at the present day. The street railway early investments by venturesome capitalists have done for city property and suburban just what the steam railways have done for farm lands—namely: made them highly valuable by affording means of transportation.

"And, like every other investment in transportation undertakings, the profits returned to the investor have been insignificant as compared with the benefits which have accrued to the great body of the public. No manufacturing or commercial undertaking pays so small a return on the capital invested as transportation investments. Beyond this, no investment is becoming so precarious, because in every legislative body, city and state, we find the growing tendency to insist on regulating legislation formulated by men who not only have no practical experience in the matter dealt with, but who will not study the subject with any intention of arriving at a basis of action resting on merit and equity.

"The encouraged notion that property held in a corporate name, though owned by private individuals, must be treated differently from other property held by the same individuals, is the thing that is working out the worst fruits of socialism in this country, encouraging corruption, and making manifest that 'sandbagging' is to be regarded as a legitimate avocation in life. In all this the public gets no benefit, but suffers the injury that follows in the wake of a corrupt and vitiated system of political and legislative life.

"I am certain that the press of this city cannot do a better public service than by insisting that the so-called traction question be brought to a settlement upon lines of absolute regard for the rights of all concerned, mindful of the fact that these rights are not all on one side nor all on the other, but that there are two parties involved, the public and the companies. The things for the public ought to go to the public in a manner which will mean the most to the citizen daily and not remotely and indirectly. There ought not to be a standing on technicalities nor threats and denunciation.

"I am confident the traction companies will give the public the best service and equipment if the question of their future relation to the city is taken up and dealt with in a manner that warrants an expenditure of such an amount as will gain to the traveling public all that the best system can gain for them. Such a system of quick, comfortable, thoroughly modern, and efficient service, freed from constantly menacing legislation and safeguarded by only such regulations by the city authorities as are necessary and

consistent with the public's rights and the patron's needs, means more to the future welfare of this city than anything of which I know.

"If opportunity is afforded the company, by a fair adjustment of rights, to give to the public such a railway line on the part of the Union Traction Co., more will be gained in legitimate increase of property tax for the public fund by reason of it than in standing out for some preconceived, uninvestigated, and unreasoning view, based largely upon political advantage to be gained by creating a new campaign issue.

"As one of the directors of the Chicago Union Traction Co., I stand ready to assist to this end, and I am confident my fellow-directors and the shareholders we represent are ready to cordially co-operate.

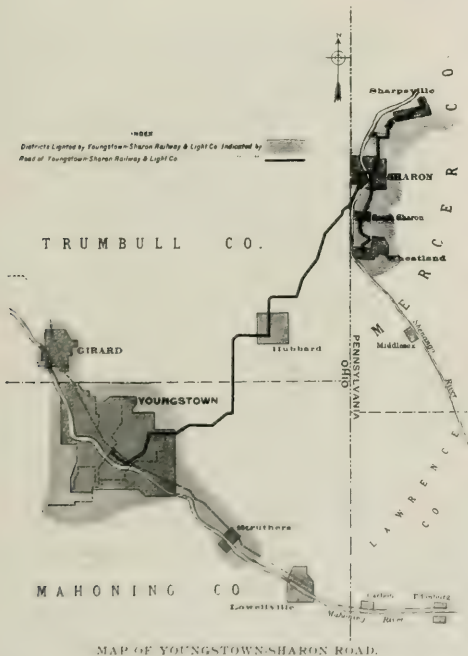
"It is not a question of technical rights. It is a question of broader policy and more far-reaching effect. It ought to be above the satisfaction of gaining some personal triumph and winning some political applause. It means gaining for the public a public benefit in a wholesome and proper way. It goes to the well-being of Chicago from the viewpoint of all its interests, and not the narrowed one of a single class or set of men.

"To this end I think I may safely say the directors and shareholders of the traction company are none the less upright citizens than some of their critics, and possibly equally patriotic.

"They do not wish to rob Chicago. They wish to see it advance, and stand ready to aid in all that works towards progress."

### YOUNGSTOWN-SHARON RAILWAY & LIGHT CO.

The accompanying map shows the territory covered by the lines of the Youngstown-Sharon Railway & Light Co., which owns and controls the Youngstown Consolidated Gas & Electric Co., the



Shenango Electric Light Co., the Sharon Gas & Water Co., and the Sharpsville Electric Co. These companies own all the lighting franchises of Youngstown, Sharon, Sharpsville and South Sharon. Its street railway properties comprise the Valley Street Railroad

Co., the Sharon & Wheatland Street R. R. and the Youngstown & Sharon Street Ry. The two latter lines are in course of construction and it is expected will be in complete operating order by June 30th.

The company is at present operating five power houses on its various properties, all of which are to be replaced by one generating plant in Youngstown, which is at present under construction and which will effect considerable saving in operating expenses.

To cover the additions and improvements being made the company is putting on the market \$1,000,000 of bonds of a total authorized issue of \$2,500,000. The total stock and bond issues of the consolidated companies aggregates \$3,157,000. These securities, with the exception of \$56,000 in bonds and \$33,000 stock, have been deposited as a trust fund to secure the bond issue of the Youngstown-Sharon Railway & Light Co., which with the small exceptions noted is practically a first mortgage on all the properties.

### NEW HAMPSHIRE ELECTRIC RAILWAYS.

The report of the New Hampshire Railroad Commissioners has been issued for 1900, which also includes returns from the electric railways in that state. Although there is but one new company reported for last year, street railway development has proceeded on account of material additions to the mileage previously reported. One of the most important roads, because it was an experiment out of which there promises to come most of the construction of the future, is one built by the Boston & Maine through the streets of Portsmouth and through the towns of Rye and North Hampton to a connection with the Exeter, Hampton & Amesbury, a distance of 16½ miles. This line parallels the tracks of the Boston & Maine, and its success as a dividend earner was considered very problematical, but its business greatly exceeded expectations and its net receipts were such that the road is to be considerably extended. The Boston & Maine is also preparing to parallel its own tracks from Concord to Nashua and is contemplating the equipment of its Portsmouth & Dover branch with electricity.

If these roads are as successful as they promise to be, these enterprises by the steam road will be the forerunners of others which will afford street car facilities in steam railroad territory without dividing the business between two or more corporations.

The total length of the street railways of the state and the amounts of their stock and debts are as follows:

	Miles.	Amt. Stock and Debts.
Chester & Derry.....	7.75	\$ 100,000
Concord .....	12.05	216,000
Exeter, Hampton & Amesbury.....	22.50	437,000
Laconia .....	8.30	191,000
Manchester .....	21.70	629,000
Nashua .....	13.98	400,000
Union .....	7.20	230,000
Springfield .....	1.50	12,000
Portsmouth .....	10.50	387,735
Totals .....	111.24	2,612,735

To this must be added the mileage of a short road in Keene, making the total mileage about 120 and the capitalization about 2½ million dollars.

The business of the lines has grown, as will be shown in the following table of passengers carried in 1899 and 1900:

	1899	1900
Chester & Derry.....	186,200	208,124
Concord .....	1,069,622	1,210,100
Exeter, Hampton & Amesbury .....	900,180	1,001,982
Laconia .....	278,175	494,240
Manchester .....	3,872,330	4,038,662
Nashua .....	1,209,000	1,298,411
Union .....	693,430	816,000

The only dividends declared during the year were 4 per cent by the Exeter, Hampton & Amesbury and 8 per cent by the Manchester, but interest on all outstanding bonds was promptly paid. All the roads show a surplus above operating expenses and fixed charges.

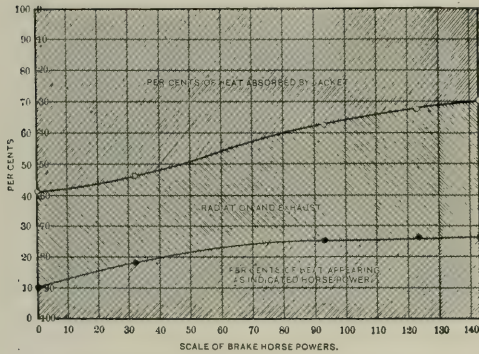


# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

In the "Review" for January, 1900, page 9, we published an abstract of a paper read by Mr. C. H. Robertson, of Purdue University, before the American Society of Mechanical Engineers, describing the results of an efficiency test of a 125-h. p. gas engine in an electric-lighting plant at LaFayette, Ind. In that test no attempt was made to have the engine in particularly good condition, it being desired to find the results of every-day practice. In another paper read before the same society at its meeting in Milwaukee last month, Mr. Robertson presented results of further tests on the same engine after it had been thoroughly overhauled by the builders and some details changed.

In the first tests the lowest consumption was about 12 cu. ft. of gas per indicated horse power per hour when the engine was de-



veloping 50 h. p. In the later tests the gas consumption was in one case as low as 9.7 cu. ft. per i. h. p. per hour with the load of 135 h. p.

In connection with the tests determinations of the calorific value of natural gas used were made, the average of four experiments giving 969.80 B. t. u. per cu. ft. of gas at 62 degrees F., and a pressure of 14.7 lb. per sq. in. The highest value was 981 and the lowest 961 B. t. u.

The accompanying diagram shows the distribution of the heat among the three items: Work done in the cylinder, radiation and exhaust, and heat absorbed by the water jacket.

## TWO USEFUL CIRCUIT BREAKER ATTACHMENTS.

Although a switchboard circuit breaker usually makes a fairly lively report when it breaks a 550-volt current, it often happens that the engineer is in some distant part of the station when a breaker goes out and he may not discover for several seconds that the current has been broken.

A simple signaling arrangement for warning the attendant in emergencies of this kind has been devised by Mr. D. Valentine, chief engineer of the Brockton station of the Massachusetts Electric Companies.

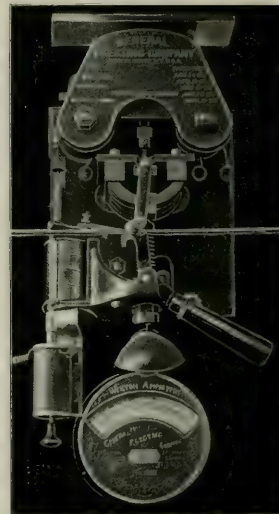
Two No. 12 rubber insulated wires are stretched side by side, about an inch apart, along the face of the switchboard, and at a height to bring them close to the hinge of the toggle arms

of all the circuit breakers on the board, which are of the G. E. type, Form K. The wires are connected to a six-cell battery and constitute a normally open circuit.

At a point near the toggle arm of each breaker, the insulation of the two wires has been cut away for the distance of an inch, and to the toggle arm is attached a small metal pin, 5-16 in. in diameter, and 1½ in. long, in such a way that when the breaker goes out, the arm will carry the pin over onto the bare portions of the two wires, thereby closing the battery circuit and causing a signal bell to ring. The bell may be placed at any desired point in the station, and it will continue to ring until the offending breaker has been reset. The attachment is shown in the accompanying half-tone.

The engines at the Brockton station are equipped with the Monarch engine stop for shutting off steam when the speed increases to a dangerous point, and Mr. Valentine has devised an ingenious arrangement for throwing the circuit breaker whenever an engine slows down and there is a chance of the generator reversing and running as a motor.

To accomplish this, the regular tripping rod found on the G. E. Form K circuit breaker is continued down through a solenoid coil, which is supported by a metal bracket attached to the nut of the pin that passes through the regular tripping sole-



VALENTINE CIRCUIT BREAKER ATTACHMENTS.

noid, as is also shown in the half-tone engraving herewith. One end of this added solenoid is connected through the breaker to the ground. The other leads to an insulated block placed at some convenient point on the engine governor, so that when the governor begins to shut off, the arms will make contact with the block, closing a local circuit through the solenoid and thereby at once tripping the breaker.

The device is in the service of the Haverhill station, where it is used for protecting a booster.

## WEIGHT OF FLY-WHEELS FOR COMPOUND ENGINES AS AFFECTED BY THE ANGLE BETWEEN CRANKS.

At the Milwaukee meeting of the American Society of Mechanical Engineers Mr. J. J. Astrom presented a paper upon the "Determination of Fly-Wheels to Keep the Angular Variation of an Engine within a Fixed Limit." The greater part of the paper consisted of a discussion of the mathematical and graphical work necessary to determine the variation in the speed of rotation of the crank during one revolution, and this would be closely read only by a designer or engineer who had to undertake a similar task. The conclusion showing how the weight of fly-wheels on compound engines may generally be greatly reduced

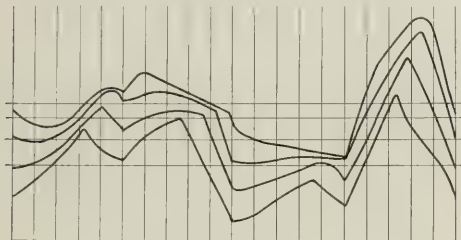


FIG. 1.

by placing the cranks of the two engines at an angle other than  $90^\circ$  or  $180^\circ$  is, however, of general interest.

It is quite important in many cases, particularly where alternating current generators are worked in multiple, that not only should the number of revolutions per unit of time be as nearly constant as possible but also that the variation in speed during one revolution should be within a narrow limit. In the case of an alternator the variation in speed during a single revolution is usually given in terms of the angle by which the center of the crank pin diverges from the position it would have were the speed constant. However, this angle is not given in degrees of arc, but in degrees of phase departure, which may be called "pole-degrees," a pole degree being in each case the angle corresponding to two poles on the machine divided into 360 parts. Thus on a 40-pole generator 1 degree of arc is equal to 20 degrees of phase departure or 20 pole-degrees.

After deriving curves showing the crank displacement for certain engines having the high and low pressure cranks  $90^\circ$  apart,

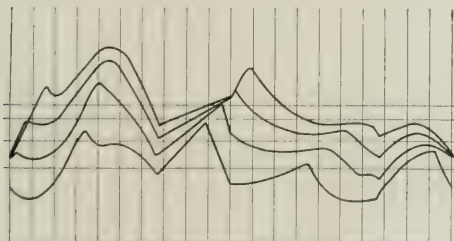


FIG. 2.

it was shown that the displacement could be greatly reduced by choosing a different crank angle.

We reproduce two diagrams from Mr. Astrom's paper. Fig. 1 shows the curves of tangential crank effort of a 44 in. and 86 in. by 60 in. vertical cross compound condensing engine developing 3,650, 5,050, 6,070 and 6,820 h. p., respectively, at a speed of 75 r. p. m. The cranks are set at  $90^\circ$ , the high pressure engine leading.

Fig. 2 shows corresponding curves of crank effort under the same conditions of load, but with the low pressure crank  $120^\circ$  in the lead.

In both diagrams the ordinates show the tangential crank effort and the abscissae the position of the crank pin in its path, the four horizontal lines corresponding to the four uniform loads.

In conclusion, the author says that by using the crank angle which gives the most uniform rotative effect, the displacement of crank pin has been found to get reduced by 15 to 30 per cent. Then the engine has not the greatest possible starting power, but this is not as a rule essential with engines requiring a very close regulation. In large engines, the reduced cost of the fly-wheel will cut some figure, but the greatest advantage is gained in those cases where, in order to obtain a high degree of regulation, the speed of the fly-wheel rim approaches the allowable limit, when the required regulation can be obtained with a wheel of the same weight but of a considerably reduced diameter.

This paper was discussed by Mr. W. L. Abbot, chief operating engineer of the Chicago Edison Co., who briefly explained the method used by him in determining the speed variation during a revolution. Mr. Abbot's plan requires less numerical calculation as he uses graphical methods to a greater extent. The Technograph for 1900-1901, published by the Engineering Societies of the University of Illinois, contains an article by Mr. Abbot on the "Theoretical Estimation of the Internal Speed Variation of a 3,500-h. p. Vertical Cross-Compound Engine," the engine considered being one with 30 and 80 by 60-in. cylinders built for the Chicago Edison Co. by the E. P. Allis Co., and to be direct connected to a 40-pole General Electric alternator to run at 75 r. p. m. The cranks on this engine were  $90^\circ$  apart. To get the steam distribution of a corliss engine under moderate load indicator diagrams were taken from one of the units in the power station of the South Side Elevated Ry., and these diagrams corrected for the higher steam pressure to be used in the engine under consideration. The calculations showed that the displacement of the crank varied from  $-1.376$  to  $+1.898$  pole-degrees. The maximum amount of angular variation consistent with the satisfactory operation of alternators in parallel is given by Mr. Abbot as  $\pm 2$  pole-degrees.

It is interesting to note that some of the latest engines designed will have the cranks at an angle other than  $90^\circ$ , which has been the common practice heretofore. The double horizontal-vertical cross-compound engines now building by the Allis Company for the Manhattan Elevated have the cranks at the opposite ends of the shaft  $135^\circ$  apart; there are two engines at each end which act at the same point on the crank circle, but as the high pressure cylinder is horizontal and the low pressure cylinder vertical, the cranks for the two are in effect  $90^\circ$  apart. Thus the four cylinders give eight impulses; no fly-wheel is used. Two large cross-compound engines now building for the Chicago Edison Co. are also to have the cranks at  $135^\circ$ .

## DESIGN AND CONSTRUCTION OF ELECTRIC PLANTS.

An illustrated lecture on this subject was recently delivered by Mr. Bion J. Arnold before the Engineering College, University of Illinois, in which the lecturer stated and discussed the constantly recurring questions which confront the engineer in this field.

The first items in the design and erection of an electric power plant are: Kind and cost of fuel, and its accessibility; water, the quality and quantity required; the location so as to have a good water supply; the character of the soil on which the building is to be erected should be good uniform hard clay or sand; and the kind of building required, when erected would be a firm and substantial structure. Other features of almost equal vital importance are the cost of the real estate on which the power plant is to be erected, and the character of the electric supply service which it is to render.

The location of the power house should be, in general, as near the center of distribution as possible. High potential alternating current generating plants may be located at almost any convenient point for fuel and water supply, with transmission at high voltage to sub-stations. If the soil is all clay or all sand it may be made entirely satisfactory, and piles are used with alluvial soil. In many cases the location of the power house is a problem of real estate

values and reduces to the question of how to build with the least amount of money.

The kind of service required may be direct current, alternating current or both. Central stations for electric supply to immediate neighborhood are chiefly required to supply direct current, at 110-220 volt or 250-500 volts for lighting, power and traction service. Earlier difficulties with arc and incandescent lamps on the same direct-current circuit have been largely overcome. An auxiliary storage battery plant is now almost universally used in the United States for equalizing and balancing the direct current supply by the three-wire system as well as to carry the load peaks.

The development of sub-station electric supply has made possible the extensive introduction of alternating current generating plants, located on a water front for fuel and water supply and condensation. The question of direct or alternating current distribution from the sub-station is one of great importance and can only be answered after most thorough examination of all service required. For general supply in the heart of a city the direct current has many advantages. For transmission to outlying districts and inter-urban traction work the alternating current has shown itself to be the most suited. Whether for direct or for alternating current supply, the use of direct connected generating units is to be preferred in plants of considerable magnitude.

Coal and ash-handling devices and accessories are necessary in large steam generating plants, depending somewhat upon the kind of electric service supplied. They soon pay for themselves and are to be recommended if more than four boilers are used.

From 15 to 25 per cent in fuel may be saved by the condensing of the exhaust steam which is now practicable even with a limited supply of water by the pond and self-cooling condensing systems, and cooling towers. With a surface condenser it is important to extract the oil from the condensed steam by some of the well-known devices, as the water is to be used over and over again. The surface condensing system is especially recommended with impure supply. Steam separators are required in every plant where satisfactory arrangement of steam piping is sought. Further economy in fuel, of from 8 to 10 per cent, may be effected by an economizer, for heating the feed water by the escaping chimney gases, which may be reduced in temperature from 700 to 380 degrees. Economizers should not be installed with a low chimney stack. Mechanical draft is advised for variable load service, as in railway power stations. Condensing systems, economizers and mechanical draft must be carefully planned to meet the specific requirements of each given case, and in no case are they to be introduced and used indiscriminately.

The efficiencies of the several parts of the steam-power plant may be generally stated as follows: Steam boilers, with Illinois coal, from 58 to 65 per cent, and with Pennsylvania coal, from 70 to 72 per cent; mechanical efficiency of steam engines, from 85 to 92 per cent, according to type and manufacture. The auxiliary machinery will require from 12 to 18 per cent in steam of the total horse power load on the plant, but this in many large plants may be reduced by electric driven auxiliaries which are to be preferred as being most efficient, in large installations. Electric driven mechanical draft fans have not been uniformly satisfactory owing to the difficulty of speed regulation.

The planning of switchboards is now an intricate problem in large central stations. Modern switchboards have attained to great perfection of design and of detail, and in the best types of installations they leave little to be desired. In some installations they are arranged so that the main switches are controlled by pilot motors and small switches from one small centrally located board. The control of engines is best accomplished by an electric governor manipulated from the switchboard for slowing or speeding the engine when throwing generators into or out of service.

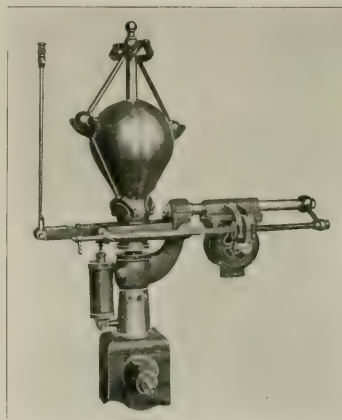
The specifications for all installations should cover the condition under which the parts of the plant are to be operated. Specifications must state exactly and concisely the character and amount of the work required to be done, the limitations to be placed upon the electric machinery installed, such as the heating limits and overload conditions; and should have accompanying guarantees from the builder for specific performance. In general, the supervisory engineer should allow the manufacturer to conform to his standard designs and construct the machines according to the best experience he can command rather than to design the boilers, engines,

dynamos, etc. Specifications should be sent out to all manufacturers at the same time and all bids required to be in by a certain day to give each manufacturer a fair chance. In the preparation of contracts it should be borne in mind that the contract should preferably be a separate document from the specifications, but should have the specifications attached to it, and so both become legally binding.

### ELECTRICAL GOVERNOR CONTROLLER FOR ENGINES.

In order to facilitate the adjustment of the steam engines in the new polyphase plant of the Chicago Edison Co. and the Commonwealth Electric Co., of Chicago, either for synchronizing purposes or for distributing the load between two engines already in operation, a special electrical attachment for the governors has been adopted which was invented by Mr. C. G. King, mechanical engineer of the two companies.

The accompanying engraving shows this invention as applied to a Porter-Allen governor. The weighted lever arm is fulcrumed to the fixed bracket, one end of the lever arm being connected by a rod to the valve controlling mechanism of the engine. In the usual construction of this type of governor it has been the prac-



KING GOVERNOR CONTROLLER.

tice to mount a suitable weight upon the free end of the lever arm and to provide this weight with means whereby its position might be manually shifted in order to regulate the operation of the governor. This necessitates the attendance of the engineer at the governor, and Mr. King's invention consists in substituting an electric motor for the movable weight and so arranging it that its position along the lever arm can be regulated by the switchboard attendant by means of a suitable switch located at any desired point.

The motor is provided with a hanger plate through which the lever arm of the governor passes, and this hanger plate is provided with friction rolls and springs, the former being provided to insure the easy motion of the motor along the lever and the latter to steady the motor under the vibrations to which the governor is subjected.

The motor shaft terminates in a worm which meshes with a worm wheel, the latter being mounted upon a sleeve which travels along the threaded rod parallel to the lever arm. The worm wheel and sleeve are placed between the bifurcated ends of a bracket bolted to the hanger plate of the motor. A handle is provided on the end of this threaded rod so that the motor may be moved manually if desired, and a pin which passes through the bearing of this rod locks it against turning when the motor is to be moved electrically. This is done by means of a double throw 3-pole switch.

It will be seen that when the attendant at the switchboard, for example, desires to shift the motor upon the lever arm he will



pass a current through the motor in such manner as to revolve its shaft in either a forward or backward direction, according as the motor is to be moved in or out upon the governor arm. As the shaft and the worm are revolved like revolution will be imparted to the worm-wheel and threaded sleeve, thereby causing the sleeve to move along the threaded rod and consequently to shift the motor in forward or backward direction along the lever arm. It will be understood that normally the motor will be out of circuit, being thrown into circuit only at such times as the switchboard attendant desires to modify the speed of the engine. If it is desired to shift the motor by hand, the engineer will remove the pin and then turn the hand-wheel in the usual manner.

Another adaptation of the same invention has also been designed in which the motor acts upon the lever arm by means of a spring instead of by its own weight. In this second form of governor regulator a weight is carried upon the lever arm in the usual way, and to the end of this arm is attached one end of a coiled spring. The opposite end of the spring which lies vertically is attached to a threaded rod used in connection with a motor in the same way as described, except that the motor remains stationary and the rod moves up and down through the threaded sleeve. This motion of the rod puts more or less tension on the spring and has the same effect on the lever arm as the horizontal motion of the weight does. As in the case described at first the adjustment is made by means of a switch located at any convenient point.

### REQUIREMENTS OF ELECTRICITY IN MANUFACTURING WORK.

A paper on this subject was read by Wm. S. Aldrich, of the University of Illinois, at the May meeting of the American Society of Mechanical Engineers, in which the essential factors in power transmission in factories are considered. The author states that the resulting economy of production and the ability to fill orders promptly are all in favor of the electric system. It may be compared to skilled labor—high priced, but very desirable from the standpoint of the economies of production. Few manufacturers still hesitate to employ high-priced skilled labor. Many more cling to antiquated methods of driving modern machinery operated by most skillful workmen. The question of the use of electricity has been shifted to the field of manufacturing economies, involving considerations of maximum output with given equipment, floor space and working force. It is a question of accepting and filling orders or of losing the business to those manufacturers who can take them.

The general considerations regarding the method of electric power distribution in factories are given as follows:

**Electric Transmission in Manufacturing Work Is a Means to an End**—Centralized power generation for light and manufacturing purposes; subdivision of the transmission system and the motive power equipment; execution of all classes of work, irrespective of its location; maximum efficiency of workmen, machines and labor involved; intensified production at best speeds and at the power limit of machines, with improved quality, maximum output and reduced cost.

**Sanitary Considerations**—It is healthful, clean, and free from dirt, dust and dripping oil; it affords accommodations and facilities for proper lighting and ventilation; it removes dangers from overhead machinery shafting and belts; it reduces the sick list to a minimum; it insures quietness from absence of much unnecessary noise with older systems, and develops cheerfulness in workmen.

**Disciplinary Value**—It improves the morale and the personnel of workmen; it conduces to shop order and discipline, with the most economic use of the workman's time, quick handling of material and maximum efficiency of labor.

**Flexibility of the System**—Accessibility of all parts, adaptability to various uses, and portability of tools are inherent advantages.

**Reliability of Service**—It is free from any general breakdown, localizing casualties and stopping least machinery for repairs; no accident can affect the whole plant in any case of a modern electrical installation properly designed, equipped, and operated; it is more to be depended upon than any other system.

The author then discusses the various methods of distribution and electrical machine driving at some length.

### W. M. MCFARLAND.

Mr. Walter Martin McFarland, the acting vice-president of the Westinghouse Electric and Manufacturing Co., is the subject of a biographical sketch in the current issue of Cassier's Magazine, written by Rear-Admiral Melville, Engineer-in-Chief, U. S. N. From Admiral Melville's article we extract the following:

"McFarland was born in Washington, D. C., in 1859. He is of Scotch-Irish descent, and shows the able and virile qualities of that race. His early education was received in the public schools of Washington, from which he passed to the preparatory department of the Columbia University, winning the Kendall Scholarship of 1874 by competitive examination. In 1875 he entered the United States Naval Academy as a cadet engineer, and was graduated in 1879, second in his class. His sea service comprises duty on the North Atlantic and European Stations, 1879-81; in the U. S. S. Michigan, on the Lakes, 1882-83; on the Pacific station, 1886-88; and again, on the European station, 1894-96. He was commissioned as assistant engineer in 1881; as passed assistant engineer in 1891; and as chief engineer in 1898, being then the youngest officer, for more than twenty years, to reach that grade, and receiving the highest examination mark ever given in promotion to the latter. In 1899, after the passage of the Personnel Bill, he was commissioned a lieutenant; but in that year, resigned to enter the Westinghouse Electric & Manufacturing Co., of which he is, at this time, an acting vice-president.

"While I cannot but congratulate my good friend, George Westinghouse—whose name is a synonym for engineering genius and business enterprise—on McFarland's entrance into his official corps, I cannot but regret the loss to the fleet of one of its brightest men, and to myself of a most talented and loyal assistant, who passed from the navy to serve his country, doubtless some day as 'Captain of Industry' in the ever-widening field of American manufactures.

"McFarland's shore duty, while in the navy, was as varied as his ability is versatile and his energy is untiring. His first service at the Bureau of Steam Engineering was in 1882. From 1883 to 1885 he was detailed from the navy as assistant professor of mechanical engineering at Cornell University, Ithaca, N. Y. \* \* \* The years 1885-86 were occupied with the inspection of machinery then building and with work on preliminary designs for proposed vessels. From 1889 to 1894 he was again attached to the bureau, serving, during the greater part of that period, practically as the private secretary and confidential assistant of the engineer-in-chief. During the years 1897-98 these duties were resumed, after a truce at sea.

"McFarland's only opportunity, while in the navy, to fight for his country, to feel the shock of conflict on the sea, and to put to the crucial test theories formed from the study and research of his strenuous life in peace, came with the outbreak of the Spanish-American war. He was; at that time, practically my principal assistant; and I take it as part of my duty, in writing now, to record the fact that I compelled him to stick to his post at the bureau. Like every worthy naval officer whose services on shore were such that he could not be spared for sea duty, McFarland was most eager to be on a battleship 'at the front,' off Santiago or elsewhere; but his readiness, resource, and knowledge of bureau work all combined to make his aid, during that period of exceptional activity and stress, invaluable to me, and his request for sea duty was, perforce, denied. \* \* \* As a matter of fact, his war duty was most important, and of the highest value to his country; for, while aiding me so greatly, he was also of much service to the Assistant Secretary of the Navy in the matter of the purchase of vessels for the auxiliary fleet, in which extensive work his professional knowledge and business sagacity helped the Secretary to save large sums of money for the Government."

An officer of the Cincinnati (O.) Traction Co. is quoted as stating that its track gage will not be changed to correspond with that of interurban companies in order that the cars of the latter may reach Fountain Sq. If this were done traffic would be seriously impeded, the cars of the Traction company would require to be equipped with new trucks and the roadbed for miles outside Cincinnati would have to be changed.

## FRANCHISES.—II.

BY H. S. COOPER.

As a preliminary in considering franchises it must be understood that the public officials who grant or permit must do so primarily on the basis of a necessary and remunerative public utility and not simply as a gift to a friend, a bribe to an opponent, a blow to an enemy, or a profitable arrangement for themselves. All these considerations are liable to come up in matters of this kind, and—sad to say—a large proportion of the franchises and permissions that are "on the market" at this time, bear the earmarks of one or the other of these four cases. That they do so, and that franchises and consents are in the very unsatisfactory condition that they are today, is very largely the fault of the very public and people who are crying out against this state of affairs at this time. It not only takes two to make a bargain, but it takes two rogues to make a dishonest bargain, and the greater rogue of the two in a matter of this kind is the man in office, who does not honestly look after the interests of the people that he swears to represent, and, as there is said to be a fool to every knave, the complement in this case is probably the citizen who calmly sits quiet while the deed is being done, and then, after it is irreparable, raises his voice in a yelp.

The first requisite to be considered in the granting of any franchise or consent for any public service, is whether the enterprise will be a commercial success without any adventitious aid. While many, in fact, most communities would be well pleased to have all the modern conveniences at almost any cost—to others; and while it would probably be a nice thing if there were an electric railway from every spot in this great country to every other spot in it, and while it would be equally nice to have electric light and power and gas, and running water and sewers, in every house in the country, there are at the present time certain economical, commercial and physical conditions that forbid this state of affairs in many places, and in those places any such enterprise is doomed to failure. As a rule, an unsuccessful or unprofitable business enterprise is more unprofitable and often more disastrous to the community in which it is located than if it had not been started at all, and while this is probably less true of public service corporations than of almost any other enterprises, it is still true to a very large extent, especially as preventing their proper present operation, and the more especially as discouraging the further investment of capital at this later time when the results of a new and more modern enterprise would give assured successful results.

Many a community is enduring a broken-down, inadequate, inefficient and unsuccessful public service simply because it had been "too previous" in the past, had permitted some one to undertake an enterprise that was premature and therefore unprofitable, a regular Sinbad's "Old Man of the Sea," whose senile grasp on their financial throat threatened to throttle the investors and the carrying of which sapped their energies at a later time when they would have been able to carry a moderate burden with ease and profit.

This fact has been very fully proved to the writer in the line in which he is engaged, for in the course of his work he has found that one of the most fertile causes of the non-success of most of the unsuccessful small and medium-sized electric roads and plants has been that they were premature in a commercial way; that there was not in the past—and often is not now—any reason for their existence except the rosy hopes of the projectors and a long-felt want—both of which are very poor dividend earners! This state of things is very little better at the present time; from an examination of several hundred franchises and prospectuses within the last year it is apparent that hope still springs eternal in the urban—and especially in the suburban and interurban breast, for the number of these projected, or, at least, hoped-for and tried-for enterprises, is as great as ever. Many of them are purely speculative, the scheme of some franchise shark or professional promoter whose only desire and intention is to unload the easily and cheaply obtained franchise on some one at an unreasonable and dishonest profit. Many of them are the schemes of holders of unproductive real estate, the exploiters of somebody's "addition" to a town, or the promoters of "booms" in bogus or chimerical manufacturing or mining projects. . . . Many of them are, however,

the bona-fide enterprises of hopeful and public-spirited residents whose local pride and lack of technical transportation and broad commercial knowledge blinds them to the utter hopelessness of their enterprise as a commercial success.

This is, at the present time, especially the case with interurban railway schemes; there is no hamlet so small that it is not big enough in its own eyes to make an electric railroad to it or through it a brilliant commercial success, and it is on these lines that our friend the franchise "shark" gets in his best work. Much evil has been done in this direction within the last two or three years by the exploitation of the wonderful success of certain interurbans, whose real value lies partly in their being feeders to certain other lines, but mainly in their occupying strategic positions in the great game of "Grab" that is now so popular among syndicates and large capitalists.

The granting of franchises for any of the foregoing reasons is not only unwise; it is an injury and a detriment to the community that does it, to every one honestly interested in it, and to all classes of public-service enterprises, projected or existing.

The next requisite in regard to the granting of any franchise or consent should be that it is not granted for speculative or promotive purposes; that it is in no way to be sold or speculated in, or in any way made profitable until the object for which it is granted has been put into full and satisfactory public operation. This should be so clearly understood and expressed in the granting or permission that any attempt to speculate in them should render it null and void. At the same time, as the original grantees often find unforeseen conditions which prevent their completing what they undertook in perfect good faith, it should be arranged so that they may—if the chance presents itself—turn such franchise or consent over to other parties who will, also in good faith, complete the project, and who will reasonably reimburse them for the time and outlay that they have expended upon it. If the matter has been undertaken by them in good faith, and with the intention of completing the project as an investment, such a reimbursement is all that, as reasonable business men, they can ask. If, however, they have taken the matter up on purely speculative basis, and simply as a matter of "promotion," this arrangement really gives them more than they deserve. The only way to prevent this undesirable end is to make it a part of the conditions on which the grant is made or the permission given, that no change of ownership or of interest in the grant or permission will be allowed without the full consent of the grantor or permittor, and then only on a full and sworn exhibit of the prices, terms and conditions which accompany the change of ownership or interest. If there is good faith upon the part of the two contracting parties this will work no hardship to either, and if it is simply a matter of using the privileges granted as the basis of a speculative scheme, then the sooner the grantor stops it the better for it, the public at large, and those in the public-service business who are trying to do that business in a legitimate business way.

All persons legitimately engaged in the obtaining of, or operating under, franchises are interested in the prevention of this evil—the granting of franchises to persons or corporations for purely speculative and promoting purposes. That it is done openly, under the law, by respectable people and concerns, and with the knowledge, consent or inettiness of all those concerned or interested in it does not make it any the more wise or proper. That the very citizens who protest against its being done by the other fellow are only too glad to take advantage of the opportunity when it comes their way, simply shows that public feeling in regard to this matter is not in concord with the public ownership principle; that the average citizen is only a mortal like the rest of us, or that to him, as to the most of us, it makes a great difference whose ox is gored.

The trouble is, that it seems difficult to prove to the average citizen and civil official that whether the goring is done by him, or a friend, or a foe, it is the same old ox, and one in which he always has an interest. To drop metaphor, unless the granting of the franchise affects him or his directly—either favorably or unfavorably—it seems almost impossible under ordinary circumstances to arouse individual—and, therefore, general—interest in the matter. Let that matter interest him favorably, however, and he will move heaven and earth, give away any and all privileges, and call every one who opposes it an obstructionist and declare

such persons to be totally lacking in public spirit and progress. On the other hand, let the case be one that tends to injure or incommode him in the slightest degree, or let it be an occasion where politics enter unfavorably to his ideas, where an outcry has been raised by the public-ownership advocates, or where the persons or corporations are obnoxious to him, or have his ill-will, then there is a different side to the story! In that case the priceless privileges and the heritage of posterity and the grasping corporation phrases are on his lips at once and he will move heaven and earth in the other direction. But let it be a matter of purely general interest, one that affects him only generally or abstractly as a citizen, and those privileges and heritages may be given, sold, wasted or allowed to decay in innocuous desuetude for all the action he will take.

In the one case it is more than likely that the privileges are a matter of interest, speculation or promotion; in the other it is a case where a needful public service and benefit is being delayed—at least that is the way it has seemed to most persons who are trying to obtain such privileges in good faith.

This is a matter, therefore, that at the present time vitally affects those who are actually trying as a matter of that good faith to obtain such privileges and complete and operate them as an investment and to the direct or indirect advantage of the public, and it behooves such parties to lend every aid in the right, equitable and honest direction. The promoter was never busier than at the present time, and—notwithstanding the efforts of the public-ownership advocates—there never was a time when franchises and privileges have so generally and recklessly granted to irresponsible and speculative persons as just now, and at the same time there never has been a time when such ridiculous and unreasonable conditions and provisions are likely to be incorporated in them.

To the person whose only desire is to get rid of them at an unreasonable profit to some one else, these conditions are immaterial. Not on him will fall the burden of their being carried out; his end is achieved when he has unloaded the thing at an extortionate profit, and to the short-sighted, deceived or ill-informed parties who have been his victims, and the equally short-sighted ones who put or allowed those conditions in, will come the costly untangling of the mess that he has made.

Therefore it is a wise provision, and one that may be taken as a positive, general, public and private necessity at this time, that one very important thing to be considered in the granting of a franchise, is that it is not to be used by any one as a matter of speculation or for speculative profit. By many it will be urged that if this prospect of profit be taken away from this branch of commercial undertakings, capital will at once wholly or partly abandon this field and that many needed and remunerative public improvements will be greatly delayed or entirely abandoned. This is the cry of the promoter and speculator, and needs to be given no attention at all; there never was a time when capital was looking for safe and remunerative investment as eagerly as it is now, and the three things that are making it very conservative in investing in public-service corporations are that it has, on the one hand, to obtain the necessary franchises through promoters at an exorbitant cost, that it has to obtain them at first hand only at the price of unreasonable and harassing conditions, and that when obtained in either way these franchises are later liable to be made inoperative or unremunerative by the action of interested politicians or irresponsible agitators.

Much has been heard in recent years in regard to "the enormous profits of public-service corporations on heavily watered stock." This is one of the things that sounds well when it is desired to capture the ignorant or careless or interested voter. It is an easy thing so say if one is a demagogue and "handles the exact truth carelessly," but that it is not generally true is so easily proved that it has hardly seemed worth while to do so in the past. That there are very patent and flagrant instances of this in the case of a few—and it is only a few when the whole number of this class of corporations is considered—large companies of this character, has been made a handle on which to hang the same accusation in regard to all such. That it is not true, even of a small minority, is shown by the reports of that class of corporations in all those states where such reports are caused to be publicly made. Until within the last two years the number and proportion of these companies that were not only not making large profits, but

were actually not paying expenses, was very great; in fact, at one time only a few years ago not ten per cent of all the street railway companies in the United States were paying a dividend on the stock. Of course some of this was due to overbonding, some to mismanagement, some to recklessness in operation and kindred causes, but the most of the cases were due to the fact that under the local commercial and other conditions at that time they could not possibly be made to pay, and the matter of franchises, taxes, and the absolute necessity of continuous operation and adequate service to the public, were grave factors in their operation under a loss. Yet all this time the public were reaping the benefit of their operation in the matter of better facilities for transportation, health, comfort and pleasure; towns and cities were built and expanded solely by their means; the owners of real estate reaped fortunes, and the municipalities received increased tax valuation to an extent that could have been done in no other way and by no other thing.

This is an unwritten page of financial enterprise that the public scarcely seem to realize or to have heard of, and to those hardy pioneers in the field of street railway transportation there is both honor and profit due that will hardly be theirs in this world of promoters and public ownership. This, of course, has no bearing on the subject at the present time except as a proof that the cry as to "extortionate and unreasonable profits" in the past was not true, otherwise it is a case of "has-beens" and a fitting opportunity to let the dead bury the dead.

### SAFEGUARD FOR FIRE BUCKETS.

One trouble with water pails for fire has always been that, while they may be provided abundantly in positions where they are likely to be of service, the water is apt to be wanting at a critical time either because of its evaporation or its use by some borrower. An ingenious device for making known when any pail is not full is described in a recent issue of *Cassier's Magazine*. This device was adopted in a large mill and entirely overcame all difficulty of empty or partly filled pails.

The hooks from which the pails were suspended were fitted up with pieces of spring steel strong enough to lift the pail when nearly empty, but not sufficiently so to lift a full pail. Just over each spring, in such a position as to be out of the way of the handle of the pail, was set a metal point, connected with a wire from an open-circuit electric battery. So long as the pails were full, their weight, when hung on their hooks, kept the springs down, but as soon as one was removed, or lost a considerable portion of its contents by evaporation or otherwise, the spring on its hook would rise, come in contact with the metal point, thus close the battery circuit and ring a bell in the manager's office, at the same time showing on an annunciator where the trouble was. As the bell continued to ring until the weight of the delinquent pail was restored, it was impossible to disregard the summons, and no further reason was found in that establishment to complain of the condition of the fire buckets.

### ENGLISH TRAMWAY REGULATIONS.

An amendment has just been made in the Standing Orders of both Houses of Parliament in regard to the construction and ownership of tramways. Discretionary power is vested in a committee to substitute a period of 42 years instead of 21 years as the time when local authorities may purchase the tramways at their "then value." This amendment only applies where franchises are granted to a local authority to construct, lease or operate a tramway outside its own area, or in other words, the external authority will not, if the committee so determines, be able to purchase for 42 years tramways which may be constructed in its territory by a neighboring authority acting under Parliamentary power. This amendment is due to the introduction of electric railways and it is hoped to induce local authorities by this means to construct lines outside their own boundaries. Railway promoters have always held this repurchasing clause at the "then value" has been exceedingly detrimental to tramway construction, as the "then value" has been interpreted to mean the appraisal valuation at the end of 21 years without any regard to capital, expenditure or good will.

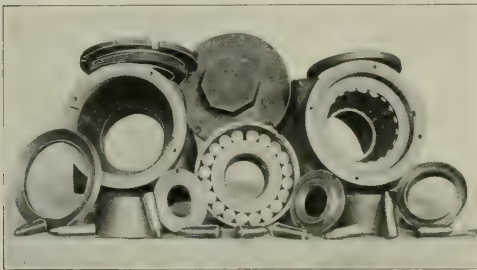


# MECHANICAL DEPARTMENT

## ROLLER BEARINGS FOR CARS.

Mr. J. B. Ingersoll, superintendent of rolling stock for the Montreal Street Railway Co., has just concluded an interesting series of tests of the "Wright Taper Rolling Bearing" as compared with the standard street railway bearings now used by street railways throughout the country, and with most gratifying results. Mr. Ingersoll says that there is no doubt but that the Wright bearing effects a great saving in power.

The two cars tested were mounted on Peckham trucks equipped with Westinghouse No. 49 motors, the only difference being that for the standard bearings on one car roller bearings were substi-



WRIGHT ROLLER BEARING.

tuted. The cars were each loaded with sand and people equivalent to 42 passengers weighing 142 lb. each.

Thompson-Houston recording wattmeters were used, and after a run of 10.6 miles, making 52 stops each, the readings were as follows: Standard car, 15,200 watt-hours; car equipped with the Wright bearings, 10,120 watt-hours; the difference is 50 per cent of the smaller number.

The bearings, which have been also tested on vehicles of other kinds, motor carriages, line shafting, bicycles, etc., are easily put in place, and easily removed from axle when new wheels are applied. On the roads in England and Ireland on which these bearings are being used, a saving of power of from 40 to 50 per cent is reported.

The main points claimed for this roller bearing are: full series, free face and self-contained, constant change of line contact, rollers form a double ellipse every revolution, absence of friction, saving of power, oil and waste.

## SOME CHARACTERISTICS OF WASTE PACKING.

Read by T. H. Symington, Baltimore, Md., before the Western Railway Club, Chicago, May 21, 1901.

With the strict economies practiced in the use of all other materials, and careful specifications covering their quality, waste cannot be overlooked.

A large amount of money is expended annually on waste for packing journal boxes, the price of this waste ranging through the various grades of cotton and mixtures of wool and cotton from 3½ cents for cheap cotton to 12 and 15 cents for the best wool.

The present method of grading waste is by the "feel" and its general appearance and freedom from dirt. This very crude method of grading, and the desire to cheapen this item of expense, led the writer to some investigations which were interesting in their results as giving a more exact method of determining the value of various wastes for this purpose.

The qualities in the waste that are to be considered are:

1. Its capacity for holding oil, or its absorbing qualities.
2. Its elasticity when saturated with oil to the normal condition of packing for journal boxes.
3. Its capacity for lifting oil by capillary attraction, or wick action.
4. The height to which this capillary attraction will raise the oil.
5. The length of fibre and the amount of twist in strands.
6. Freedom from dirt and shoddy material that is liable to pulverize.

For this investigation, twenty-nine samples of various qualities of wool waste and seventeen samples of cotton waste were collected from manufacturers and railroad companies and tested in the following manner.

**Absorption Test.** One pound of each kind of waste was soaked in ordinary Galena car oil, at a temperature of about 65 degrees Fahrenheit for 30 hours, and allowed to freely drain for 10 hours, after which the samples were weighed and the increase in weight in pounds of each sample represented the absorption in per cent of that sample.

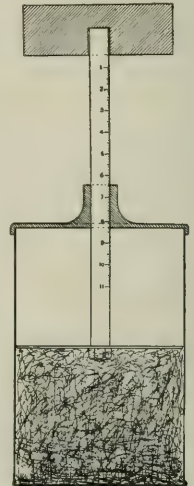
For the wool waste the per cent of absorption varied from 237 to 575 per cent, with an average of 325 per cent. For the cotton waste the per cent of absorption varied from 403 to 575 per cent, with an average of 491 per cent.

**Expansion Test.** In this test, each sample of waste, soaked and drained from the absorption test, was placed in a tin bucket (shown in figure), eight inches in diameter, and compressed by the use of a dasher and constant weight to about the tension of waste in a journal box, and allowed to stand for two hours. The height of the dasher from the bottom of the bucket was measured, and when the weight was removed from the dasher, the amount of rise of the dasher represented the expansion of the waste.

For the wool waste this expansion varied from 8 per cent to 39 per cent, or an average of 22 per cent. For the cotton the expansion varied from 8 per cent to 26 per cent, or an average of 15 per cent.

**Capillary Tests.** Fresh samples of each kind were compressed in a similar bucket to that used in previous test, with the bottom of the bucket perforated with a number of holes. The waste was compressed by the use of the dasher and weight, and the bottom of the bucket placed just below the surface of a large tank of oil, and allowed to stand for 10 hours. The waste was then removed and weighed, and the increase in weight in pounds for each sample represented what might be termed the capillarity of the waste in per cent.

For the wool waste this capillarity varied from 25 per cent to 137 per cent, with an average of 88 per cent. For the cotton the



WASTE PRESS.

capillarity varied from 37 to 215 per cent, with an average of 131 per cent.

To determine the vertical height to which oil would rise in the various wastes, a small sample was placed in a glass tube of about two inches in diameter, with an open bottom. The waste was compressed in this tube uniformly, and the bottom of the tube allowed to come in contact with oil in a large tank. After standing for ten hours it could readily be seen through the glass how high the oil had risen by capillarity in the waste.

With the wool waste this height varied from  $\frac{3}{4}$  inch to  $2\frac{1}{2}$  inches, with an average of 1.28 inches. For the cotton it varied from  $\frac{3}{8}$  inch to  $2\frac{3}{4}$  inches, with an average of 1.72 inches.

Summarizing these results, we have:

Waste	Absorption.			Expansion.			Capillarity Per cent.			Height of Capillarity.		
	Max.	Min.	Aver.	Max.	Min.	Aver.	Max.	Min.	Aver.	Max.	Min.	Aver.
Wool.....	555	297	325	39	8	22	137	25	88	2.50	.75	1.28
Cotton.....	573	409	491	36	8	15	215	37	131	2.37	.59	1.72

It will be noted that the absorption, per cent of capillarity, and height of capillarity of the cotton waste is considerably in excess of the wool. The expansion of the wool, however, is considerably higher than the cotton. This elasticity has been considered so essential that the expensive wool has been used almost universally instead of cotton in American railroad practice.

Practically, the principal trouble with cheap waste seems to be that it goes to pieces in the boxes on account of being of very short fibre and shoddy material, resulting after a year's service in a pulpy, inert mass.

The long fibre pure wool does not go to pieces, but retains its form and elasticity, and is therefore much superior to the shoddy material.

The capillarity of the waste seems also dependent upon the length of fibre, as the oil feeds the length of separate fibres, but will not jump from one fibre to another.

One practical trouble with cotton waste has been that it would roll up in the box, leaving parts of the journal entirely.

The logical conclusion from these tests is, that if the cotton waste is held mechanically up to the journal, independent of its own elasticity, and is also held in the box so that it cannot roll up in knots, it would be as efficient packing as wool; and as the cost of the cotton is so very much less than the wool, this would seem to open a field for large saving in the operation of cars.

Several large roads have recently realized that with the ordinary boxes there is not a sufficient difference in the results obtained from wool over cotton, to make it desirable from an economical standpoint to use wool at all.

The elasticity of the various wastes depends principally upon the tightness to which the strands are twisted and on account of the variation in the elasticity of various kinds of cotton waste it would be well in ordering such waste to specify that the expansion be not less than twenty per cent in a test similar to the one outlined above.

In connection with the foregoing paper it will be interesting to note some results of experience in street railway practice.

Very good results have been obtained by mixing one part of curled felt with three parts of cotton waste, the hair acting to keep the waste from packing hard.

Felt has at times been used for packing the boxes on street railway cars, the plan being to rivet two pieces of felt between thin metal plates, the plates having a less depth than the felt, so that the latter could be spread, making the end view of the packing Y-shaped. The stem of the Y was supported between lugs cast in the bottom of the box and the branches were in contact with the lower part of the journal. The theory was that the felt would conduct the oil from the bottom of the box to the bearing, but it was found that the top surfaces of the felt quickly became clogged with dust and the metal worn from the journal and bearings so that oil could not reach the journal surface.

## JOURNAL BEARING METALS AND METHODS OF CASTING.

Lead in its pure form possesses greater anti-friction properties than any of the other softer metals, and if it were possible to cast it into the recesses of the journal boxes and make it remain in place under service conditions, it would be the ideal bearing metal. But pure lead is not elastic and flows under very slight stress, this quality forbidding its use under any but the lightest conditions. However, antimony has the property of combining with lead, greatly hardening the latter without injuring its wearing qualities, and according to some authorities when mixed in the proportions of 80 parts lead by weight with 20 parts antimony, no other known composition of metals possess greater anti-friction characteristics, or will stand a higher speed without heat or abrasion. It is easily cast but care should be taken that it is never heated beyond a temperature which will scorch a dry pine stick.

The development of the electric railway motor has brought forth many different alloys and compositions for this specific service. A number of these, though differing widely in ingredients and proportions, are sold under the name of babbitt metal, and some modification of the original babbitt formula is now probably more widely used by street railway companies for armature bearings than any other composition.

Babbitt, the inventor of the recessed journal box, was the first to use the alloy which bears his name, the composition as made by him being formed of tin, copper and antimony. The exact proportions of his formula are not positively known, but are given by C. R. Tompkins as follows:

50 parts tin .....	89.3 per cent.
2 " copper .....	3.0 " "
4 " antimony .....	7.1 " "

Tompkins gives the following instructions for making the alloy: The copper is first melted. Add the antimony and then about 10 or

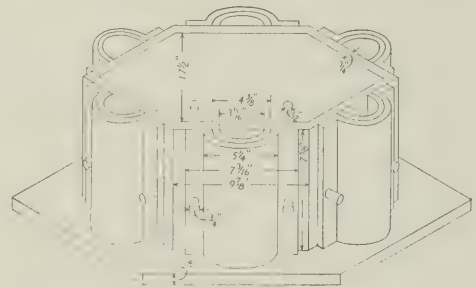


FIG. 1.

15 lb. of tin. Keep the whole at a dull red heat and stir constantly until the metals are thoroughly incorporated, after which add the rest of the tin; stir again and cast into ingots. When the copper is thoroughly melted and before the antimony is added a handful of powdered charcoal should be thrown into the crucible to form a flux in order to exclude the air and prevent the antimony from vaporizing; otherwise much of it will escape in the form of a vapor and consequently be wasted.

This metal when carefully prepared is one of the best metals in use for lining boxes that are subjected to a heavy pressure and wear, but it is quite expensive and therefore some modification of genuine babbitt is more commonly used.

A good metal is obtained by substituting lead for a portion of the tin, and as pig tin costs nearly seven times as much as pig lead a considerable saving is thereby made. One of the largest street railway companies in the East is using the following formula with satisfaction:

Copper .....	4 " per cent.
Lead .....	25.2 " "
Antimony .....	8.5 " "
Tin .....	62.7 " "

This composition costs between 22 and 25 cents per lb. and in Westinghouse No. 49 motors usually runs from 15,000 to 20,000 miles without renewing.

For casting babbit armature bearings the Union Traction Co., of Philadelphia, uses a hexagonal shaped iron frame (Fig. 1) having rigidly fastened on each face a half-cylindrical mandrel or core, around which is placed the bearing shell to be poured, the shell being held by an iron piece conforming closely to the contour of the shell, and fastened to the frame by two pins, so shaped that when

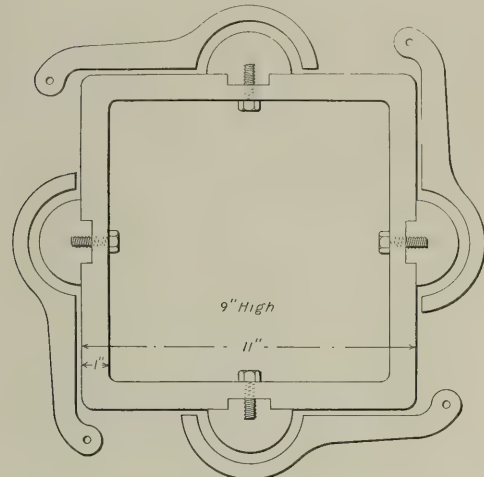


FIG. 2.

they are driven home they will hold the shell at a distance from the core mold, corresponding with the thickness of the babbit lining desired.

To facilitate pouring the iron frame is placed on a revolving table enabling the founder to pour each bearing in rotation without moving his position. With this device one man pours all the bearings needed on 3,000 equipments. The company does not bore its babbit linings.

A frame (Fig. 2) somewhat similar to this is in use at the shops of the Capital Traction Co., of Washington, D. C. The frame is square instead of hexagonal and the outside piece for holding the shell is on a swinging arm pivoted at the nearest right-hand corner of the frame, the pivot pin being tapered to insure a perfect fit. The core mold is fastened in place by a dowel pin which passes through the frame and receives a nut on the inside of the frame. As will be seen from the sketch, the core mold has a projection sinking a short distance into the side of the frame, bringing its center into the same plane as the frame side, so that, should the

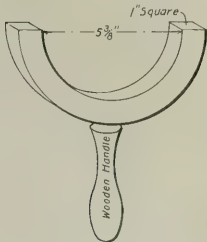


FIG. 3.

surface of the core mold become roughened, the piece can be unbolted, placed in a lathe and turned true.

As the best metal in a casting is always found at the bottom the bearings are poured with the shoulder end down, giving the better grade of metal at the end where it is most needed. When the arm is swung into place for the pouring, it is held there by a small hand clamp placed over the top. An iron half-ring (Fig. 3) attached to a handle is placed at the bottom of the shell to raise it and give the proper depth to the shoulder.

With this frame two men have poured 75 boxes in eight hours. Up to a short time ago this company did not bore its babbit bearings, but as armature shafts are beginning to show signs of wear

it was thought best to commence boring the bearings to insure a more accurate fit. On placing some of the bearings in the lathe Mr. H. P. Clark, the master mechanic, discovered that owing to the successive cooling and heating to which they had been subjected in service and when pouring the babbit linings, there was considerable variation in the diameter, some of the shells having spread 1-32 in. out of true, and in order to obtain an accurate bore it would be necessary to have a different sized chuck for nearly every shell on the road. He therefore devised a practically universal chuck with screw adjustment by which he can bore any of the bearings, regardless of the variation in diameters.

A sketch of this jig is shown in Fig. 4. Its interior diameter is slightly larger than that of the bearing boxes, and the box to be bored is supported on the points of eight micrometer set-

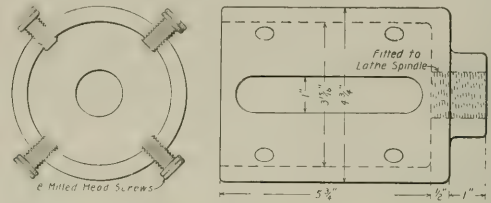
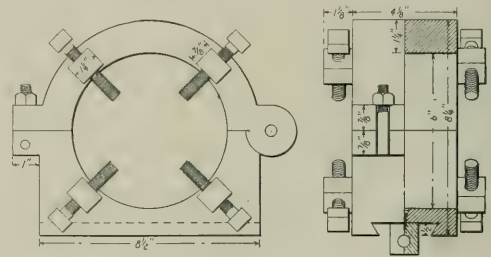


FIG. 4.

screws and does not touch the inside walls of the jig. By adjusting the screws, which can be done by hand in a few seconds, any box can be held in perfect alignment on the lathe. The cutting tool is attached to a rigid bar, and under these conditions high speed of feed is practicable. After the jig has been centered on the lathe spindle, and the cutting tool placed in position, one man can adjust and bore from 10 to 12 split bearings, or 20 to 25 solid bearings in an hour.

In Fig. 5 is shown another form of jig or chuck for holding bearing boxes on a lathe carriage for boring. This device is the design of Mr. William Pestell, formerly electrical engineer of the Lynn & Boston R. R., and is used with excellent results in the shops of that system. The holding device is made of cast iron and takes the place of the ordinary slide rest on the lathe carriage. The boxes in this case are also carried on the points of screws, which are adjusted with the use of a wrench. The lathe carriage should have vertical adjustment attachment, so that after the bearing box has been centered in the holding device, the device itself can be centered with relation to the cutting tool. As will be seen, the jig is in two halves, hinged together and held by a bolt and





## NEW SHOPS FOR ROCHESTER RAILWAYS.

Plans are being submitted for new car shops for the Rochester Railway Co., which is at present badly hampered for shop facilities for the construction and repair of cars. The company owns a tract of land 175 x 250 ft. in Rochester, and the new buildings will probably be erected on this site. One set of plans which has been submitted calls for a one-story building 175 ft. wide and 200 ft. deep. On one side are the carpenter shop and the paint shop, and on the other side the motor repair and the machine shop. Through the center runs a store room 200 ft. deep. There is a basement under the carpenter shop, and the belts run up through the floor to the woodworking machinery. Hence pieces of work can be shifted from one machine to another without the belts interfering. In the rear is the blacksmith shop, and to the right a space 50 x 103 ft. for storage of car wheels, etc. This will be inclosed by a high fence.

The estimated cost of removing the present building and erecting the new shops is in the neighborhood of \$200,000. It is only a question of a short time before the plans will be acted upon and the work commenced.

## ELECTRICITY IN MUSIC.

The following item was clipped from Music Trades of Feb. 16, 1901. It appeared on the page devoted to improvements in instruments and notices of new inventions in the music line.

### HE INVENTED A TROLLEY HARP.

(Special to Music Trades.)

Pittsfield, Mass., February 11, 1901.—Henry Heno, a motor-man on the street railroad here, has been granted a patent on a trolley harp. H. G. Avery, of Albany, N. Y., is manufacturing a dozen of these harps for Mr. Heno, and a company is being talked of to make them in Pittsfield. A number of street railway companies in various parts of the country have made inquiries regarding the invention.

Verily the enterprise of some special correspondents is past the average understanding! Perhaps this one imagined a trolley harp is used only on special occasions—trolley parties, for example? We give it up.—Journal of Electricity, Power and Gas.

## SOME REMARKS ON CAR SERVICE.

BY G. J. A. P.

The most important items in the management of a street railway are those which pertain to the growth of its patronage, as the number of passengers carried daily determines the amount of the road's revenue. In order to secure the greatest returns, especially on a road operating cars on a 15 or 20 minute schedule, two things must be specially taken into consideration. These are regularity of car service and accommodations for special occasions. Both of these are essential to secure the goodwill of patrons.

Regularity of car service is the surest means of stimulating riding. In order to maintain this regularity two things are obviously necessary, viz., proper car equipment and rigid watch on carmen. Where a road is poorly equipped it is a difficult matter to keep a regular schedule in effect, yet it is better to operate fewer cars and run them regularly on schedule time than to operate more cars irregularly.

It is also necessary to keep a constant watch on the cars to see that they are all running according to the schedule. This is of special importance during the evening hours and more particularly towards "coming in" time. Occasionally motormen will "lose time" in order to come in on the time of another car and will be, perhaps, 5 to 15 minutes earlier than if they had kept on their own time. An easy remedy for this is to oblige the crew to make another half trip when they start for the barn ahead of their regular time. This method of correction invariably has the desired effect upon a man who does not wish to lose his job, if administered promptly for the first offence. It is also very important to see that crews do not "lay over" at the end of the line and then make up the time by fast running. Where cars are delayed for

any cause and are off time, they should be put on schedule time again as promptly as possible. In case there is only 10, 15 or 20 minutes headway on a line it is sometimes necessary to have the cars "lose" a few minutes either en route or at the end of the line in order to return to schedule time. This is better than allowing them to continue running on off time, as this disappoints the public and causes a feeling of uncertainty as to the cars being on time when wanted, which results in many people walking who would otherwise ride.

The matter of accommodation for special occasions is one that will often puzzle every railway manager, as there will sometimes be a large crowd at some one point on the line which cannot be accommodated at once. It is a very simple matter to take a large crowd to a park or other place of attraction, as the passengers go out gradually, covering a space of perhaps two or three hours; but when it comes time to go home everybody wants to go at the same time.

I have noticed a park not containing any special attraction fill up with people during several hours on a Sunday afternoon, while comparatively few people would be leaving. At a certain time, however, a sort of stampede to the cars would commence as though everyone present had simultaneously decided to return home. Under these conditions if cars are taken off other lines and placed on the park line the service of the other lines is crippled, which will cause complaints. I have found it the best policy to use all the extra cars necessary on the lines where the crowds were visiting some attraction, keeping the regular service intact. Then when people are returning home they are not obliged to wait at transfer points for cars any longer than on other days, knowing which they seldom find fault. Passengers are not so apt to complain if they cannot all leave a park at once, as they are if left for a long time at a transfer point part way home with no cars to continue their journey. Always avoid leaving a passenger at a transfer point at the close of a busy evening. It is far more to the interest of a railway company to have cars make an extra trip or two, even for a few people, than to bring passengers to a transfer point and leave them there to get home as best they may.

Every superintendent should keep himself posted as to any events which are liable to collect even a small crowd, and extra cars should be sent out if, in his judgment, the regular service would not provide sufficient accommodation. In order for a street railway to attain success it must obtain the good-will of the public, and this is best done by accommodating the public to the greatest extent. Of course there will always be complaints no matter how good the service of a railway. There will always be a few people with imaginary or unreasonable complaints and it is in these cases that a superintendent must show his diplomacy. No matter how unreasonable, he must listen patiently to all such complaints and endeavor as far as possible to appease the anger of the complainant. Complaints frequently arise in regard to holding cars for a few minutes at a theater or other attraction where a crowd is about to be dismissed, if there are a few passengers in the cars when they are held. To let the car proceed would mean to keep the largest number of passengers waiting until the next car arrives, and in this case complaints are liable to be heard from either side.

Politeness of motormen and conductors is imperative to the success of a railway, and a superintendent cannot impress this too strongly upon his men. Impolite trainmen are as much of a detriment to the company employing them as they are an annoyance to the company's patrons.

## SERVICE STARS IN KANSAS CITY.

The Metropolitan Street Railway Co., of Kansas City, has decided upon gold stars on the collar of the uniform coat as the service badges to be worn by its trainmen. For five years of continuous service one star will be used on the left side of the coat collar; 10 years' service, two stars, one on each side; 15 years' service, three stars; 20 years, four stars; 25 years, five stars, and so up the scale, one star for each additional five years.

There is only one man who is now entitled to wear four stars; four are entitled to three, 43 to two, and 175 to one star.

A notice has been issued that on May 1st or November 1st, as the men may elect, a uniform will be given to each trainman who has been 10 years in the service.

## INGENIOUS SCHEME TO DEFRAUD AT NEW ORLEANS.

Last month the officials of the New Orleans & Carrollton Railroad Co. learned of a scheme to defraud the company by means of counterfeit receipts, and by a most ingenious plan detected all of the forged receipts and the employees who were attempting to make use of them. For the following information we are indebted to Mr. W. B. Brockway, assistant secretary of the company:

In Carrollton the company has a transfer station where cars on the belt line, both going in Tulane Ave. or down St. Charles Ave., are checked up. The transfer agent there takes cognizance of the amount of fares registered and gives the conductor a receipt or quittance for the number of belt passengers who remain in the car. Thus, if there are 10 passengers taking a belt ride, the conductor's register for the trip is set back to "0", and he is given a printed slip (similar in design to a transfer slip), which is punched at the figure 10, showing that he started the down trip with ten passengers.

The plan was to counterfeit these slips so that a dishonest conductor, as soon as his car leaves the transfer station, could destroy this quittance receipt or slip, and substitute therefor an unpunched counterfeit slip. Then if he got 5 or 10 cash passengers on his down trip, instead of 10 he punches as many fares in excess of 10 as he may desire to appropriate, ringing up each cash fare, as required by the rules of the company.

It is quite evident serious loss to the company might have resulted, but fortunately the officers learned of the intention of the parties to work the scheme before even they got ready to use the counterfeit slips; in fact, before they even had any of them printed. The whole scheme was concocted, and several parties were said to have been implicated in it. One of them, who had been sought as a confederate, but who declined, gave the information to the officials, and they laid plans to frustrate the efforts of the counterfeiters, and at the same time trap those who were implicated.

It was obvious that a counterfeit would have to be excellently well executed, as far as copying the original slips was concerned, and taking it for granted that the operators would be supplied with excellent counterfeits, which would be so perfect as to defy detection, the railroad company treated all its genuine slips with a chemical preparation. The liquid, in which only the corners were dipped, was colorless, and after being absorbed by the slips the latter could not be picked out from those which had not been subjected to this treatment. The chemical preparation in the corners of the genuine tickets possessed the property that when it was dipped in another chemical preparation it would turn black, while the tickets not treated thus, as the counterfeits would naturally be, would not be discolored by the application of the second chemical.

The schemers commenced operations about two weeks ago and were allowed to go on in fancied security. Every night the conductors placed all their receipts for the day in an envelope, together with the transfer slips, or any other evidence of the number of passengers carried on their respective cars during the day. These envelopes were sealed by the conductors themselves, and were handed in and sent down to the main office of the company, where they were locked up in a safe. The following day these envelopes were opened and the cash fares, transfers, etc., checked up. Then the slips were tested by the chemicals, and, of course, such of the conductors as had used the counterfeit slips were detected. This was the method by which the identity of the men was discovered, and not, as was stated, by the greed of some of the conductors, who overreached themselves by taking nearly all the cash fares and turning in nothing but transfers. According to these statements, the system had been going on for two or three years, but such is not the case, for the company had knowledge of the matter before the first counterfeit ticket was issued, and the genuine tickets had been treated chemically for some days before a counterfeit finally appeared.

Information was laid before the grand jury and indictments were returned against the men shown to be implicated. The police found a printing outfit, including two presses, at a house in a remote part of the city.

The officials of the company are to be congratulated upon their success in so effectually blocking this very ingenious scheme.

## CHICAGO "L" ROADS COMBINE.

The first step in the consolidation of the Chicago Elevated roads, which is generally conceded to be only a matter of time, has been taken in the purchase of the Union Loop by the Northwestern Elevated. This purchase was virtually completed on May 28 on the basis of \$125 per share for the \$5,000,000 capital stock of the loop, which in addition to the bonded indebtedness of \$4,387,000 makes the total cost of the loop \$10,637,000.

The ratification of the purchase must be made by the stockholders of the two companies and calls for special meetings to be held August 1st have been issued.

Over two-thirds of the stockholders of the Northwestern are represented in the syndicate controlling the road and have assented to the consolidation, while four-fifths of the stockholders of the Union Elevated consented to the sale in advance of the meeting.

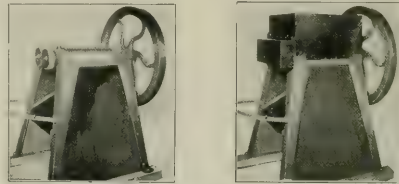
To finance the purchase the Northwestern company will issue \$15,000,000 of refunding 4 per cent gold bonds, convertible into preferred stock at any time by the holders. Ten million dollars of these bonds are offered to the stockholders of the Northwestern road at 90 cents on the dollar, in the proportion of one bond of par value of \$1,000 for every ten shares of preferred or common or mixed preferred and common stocks. The other \$5,000,000 has been taken by a syndicate at the same price. The sum of \$1,250,000 of the proceeds of the bonds will be used for the improvement of the road.

The merging of the Lake Street Elevated road will be taken up as soon as the legal formalities of transferring the Union loop to the Northwestern company are completed. The Northwestern company's directors have decided to guarantee the entire bonded indebtedness of the Lake Street road, which is considered the initial step in taking over the road.

With the Lake Street problem out of the way, it is said, there will be very little trouble in proceeding with the absorption of the Metropolitan, and after that the South Side line.

## TICKET DESTROYER.

In our issue for May there was described the ticket frauds which had been practiced upon the Washington (D. C.) Traction & Electric Co. by some of its employees by means of rescuing from the furnace tickets which had been placed there to be burned. A machine designed for destroying tickets so as to leave no chance for fraud is herewith illustrated and is known as the Patten ticket destroyer. This machine can be set up in the auditor's department and the tickets destroyed under his immediate supervision.



PATTEN TICKET DESTROYER.

After passing through the machine the cuttings can be sold for paper stock or be otherwise disposed of without fear of their being further presented for use. The construction of the machine is very simple and will be readily understood by reference to the illustrations; the principal elements are two V-thread screws which mesh. It may be conveniently run by a 1-h. p. motor belted to its driving wheel. These machines are made by Paul B. Patten, Salem, Mass.

These machines have been in practical operation on a number of street railways, including the Brockton Street Ry., Waterbury (Conn.) Electric Co., Bridgeport Traction Co., Buffalo Railway Co., Lynn & Boston Street Railway Co., Brooklyn Queen's County Street Ry., North Jersey Street Railway Co. and others.

## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### DUTY OF COUNTRY BOY IN CITY TO LOOK OUT FOR STREET CARS.

*Wills v. Ashland Light, Power & Street Railway Co. (Wis.), 84 N. W. Rep. 998. Dec. 7, 1900.*

The youth of a boy lacking 2 months of being 14 years of age, and the fact that he lived in the country and was not familiar with the movements of street railway cars, as well as the fact that he was looking at an ore train which had no necessary connection with his movements, the supreme court of Wisconsin holds, were not excuses from contributory negligence on his part. Such a boy, who had been in the city three or four times a year, it holds, was bound to know and comprehend all the dangers which were open and obvious to a boy of ordinary understanding of his age and experience, was required to look in both directions for a street car before going upon the track, and was guilty of contributory negligence in a failure to use his senses at a time when the law required him to do so.

### BOARDING CAR AT FRONT END.

*Townsend v. Binghampton Railroad Co. (N. Y. Sup.), 68 N. Y. Supp. 121. Jan. 9, 1901.*

The plaintiff boarded an electric street car at the front platform. He claimed that he tried to enter the front door, and take a seat inside, but could not open it. At a sharp curve he was thrown off and seriously injured. The jury was instructed: "Under the circumstances disclosed by the evidence in the case, it was the duty of the plaintiff to get on the car by the rear platform, and seat himself inside, if he could do so by reasonable effort, and his failure so to do was negligence on his part." This instruction, however, the third appellate division of the supreme court of New York holds was erroneous, in that the jury was substantially told by it that the question of the plaintiff's contributory negligence depended upon whether he, by reasonable effort, could have boarded the car at the rear end, which there was no real claim during the trial that he could not have done. Clearly, it declares, it could not be said, as matter of law, that it was negligence for him to board the car at the front end, even though he might have easily got on the rear end. Both entrances to the car were alike, and there was no reason why the front one should not have been used as well as the rear one. There was no notice to the plaintiff forbidding him to do so—no reason apparent to him why he could not safely enter in that way.

### THE DUTY OF LOOKING AND LISTENING EMPHASIZED.

*Dummer v. Milwaukee Electric Railway & Light Co. (Wis.), 84 N. W. Rep. 853. Jan. 8, 1901.*

Whatever difference of opinion there may be upon the subject as an original proposition, the supreme court of Wisconsin says that it is now firmly settled as a part of the law of that state that it is the duty of a person approaching the track of an electric street railway, whether he be walking, or riding in a vehicle, to look and listen for approaching cars; and that, if he fails to do so, and is injured by a car while crossing the track, he is guilty of contributory negligence as matter of law. This conclusion seems also, the court thinks, to have the weight of judicial opinion in other states in its favor. And it holds that this legal proposition necessitated a reversal of this case, because it was admitted upon the trial and found by the jury that neither the plaintiff nor the driver of the wagon upon which the plaintiff was riding seated on a long timber, looked before they started to cross the track. True, the jury found, in answer to the questions of a special verdict, that neither the plaintiff nor the driver was guilty of contributory negligence; but, the court says, the fact that they failed to look and listen having been admitted and previously found, contributory negligence was thereby established as matter of law, and the question was no longer open. Furthermore, it holds that manifest

error was committed in charging, in substance, that even if they did not look, still they were not guilty of contributory negligence if a person exercising ordinary care who had looked would have considered it safe to cross the track because the car was so far away, as also that, if the plaintiff and the driver were placed in a situation of danger by the company's negligence, and were compelled to choose one of several lines of action in the presence of imminent danger, the fact that they did not choose the best means of escape did not charge them with negligence. Both of these propositions, the court holds, were erroneous; the first, because it emasculated the rule requiring a person about to cross a railway track to look and listen, and the second because it was not applicable to a case where the plaintiff, by his own negligence, had placed himself in a position of danger.

### ORDINANCE MUST BE DULY PUBLISHED BEFORE LAW CHANGES AND NOT DISCRIMINATE AS TO FARES.

*State ex rel. Bump v. Omaha & Council Bluffs Railway & Bridge Co. (Ia.), 84 N. W. Rep. 983. Jan. 19, 1901.*

Where it is required that "all by-laws of a general or permanent nature" shall be published in some newspaper of general circulation, the supreme court of Iowa holds that this includes ordinances granting franchises. And where it is further provided that such by-laws "shall take effect and be in force at the expiration of 5 days after they have been published," the court is of the opinion that publication is essential to the validity of such by-laws and ordinances, and that it cannot be maintained that such an ordinance is valid, although not published, a subsequent publication being merely a condition to its enforcement. In other words, it holds that the provision about publication is not directory only, but compliance with it is essential to the validity of an ordinance. Hence, it holds that where this step has not been taken as required by law, and during the time when such an ordinance might be enacted, the ordinance fails. Consequently, it holds invalid an ordinance passed under a certain law authorizing it while that law was still in effect, but which was not published until after a different law superseded that one, when the old law required publication as above.

A publication in an extra edition of 50 or 100 copies issued at 11 o'clock at night, and not mailed to subscribers or otherwise distributed, except as sold by parties directly interested, the court holds is not an official publication and therefore is not sufficient to give validity to such an ordinance.

Again, the court says that there can be no question but that the defendant, whose business, under this franchise, included the transportation of persons between Council Bluffs and Omaha, was engaged in interstate commerce, and any regulation of rates discriminating in favor of the citizens of Iowa as against those of another state, as that commutation tickets should be for sale to residents of Council Bluffs at not to exceed a certain price, must necessarily be invalid. Besides, it holds that an ordinance giving a privilege in this respect to citizens of Council Bluffs not enjoyed by other citizens of the state of Iowa is invalid under the provision of the constitution of Iowa which requires that laws of a general nature shall have uniform operation.

### RIGHTS AND DUTIES OF A PERSON IN CROSSING A TRACK—CONTRIBUTORY NEGLIGENCE.

*Tesch v. Milwaukee Electric Railway & Light Co. (Wis.), 84 N. W. Rep. 823. Jan. 8, 1901.*

The supreme court of Wisconsin holds that before crossing a railway track, regardless of whether it be a steam or electric street railroad, a person should look both ways and listen for a coming car and perform that duty when and where it will be reasonably certain to effect its purpose; and diversion of attention, generally speaking, will not excuse the performance of such duty; neither will misconduct on the part of the railway company.

An ordinary traveler upon a public street where a street car



line is located and operated under a public franchise having no restrictions or regulations as to the manner of operating cars, but has not the same right to go upon the track and compel the stopping of a car to enable him to pass over the track as the operator of the car has to delay his passage to enable the car to pass. The ordinary traveler has the right of way in crossing a street car track in advance of an approaching car, if, calculating reasonably from the standpoint of a person of ordinary care and intelligence so circumstanced, he has sufficient time, proceeding reasonably, to clear the track without retarding the movement of the car if its rate of speed is lawful, and if it turns out that he has miscalculated, he is not chargeable with want or ordinary care or with violating any rights of the railroad company if it is compelled to retard the motion or the car or even stop it to enable such person to cross the track; and in no event is such a person a wrongdoer so as to excuse the operator of the car from not exercising ordinary care to avoid injuring such person, though the fault of such person may preclude him from recovering damages for any injury that may result in part from his conduct.

If a person about to cross a street car track in the circumstances above stated, observes a car that is coming towards him at an unreasonable rate of speed, or if in the exercise of ordinary care he ought to observe it, such care requires him to take that into consideration in determining the probability of his being able, proceeding reasonably under the circumstances, to clear the track and avoid being injured by a collision with the car.

The Wisconsin doctrine, the court further says, is that contributory negligence of the plaintiff, however slight, precludes his recovering of the defendant on the ground of negligence, regardless of the degree thereof, speaking of conduct characterized by inadvertence, not that misconduct known in the Wisconsin decisions as gross negligence.

#### VALIDITY OF CONTRACTS OF PURCHASE OF CONSENTS.

*Montclair Military Academy v. North Jersey Street Railway Co.* (N. J. Sup.), 47 Atl. Rep. 890. Dec. 29, 1900.

A good cause of action for breach of contract is stated, the supreme court of New Jersey holds, where an abutter alleges that an agreement was made to pay for a consent to the construction of an electric street railway, which consent was in consequence given, and was used to help meet the requirements of the statute, but was not paid for as per the agreement, the alleged consideration in this case being an option at a certain price on a certain amount of bonds and stock. It does not consider that such a contract is inoperative and void as against public policy. Independently of any legislative authority, it says that it seems to be quite clear that, if a company should contract with abutting owners for the privilege of laying its tracks in front of their premises, such a contract would have sufficient consideration, and would be valid and enforceable at law. And in a statute which makes the consent of the owners of a certain proportion of abutting land necessary to authorize the local governing body to grant the use of the street or highway it sees no warrant for an assumption that these consents are to be influenced solely by the consideration whether such a use of the street is promotive of public policy. The landowners are not vested with the jurisdiction to determine whether such an improvement will be for the public benefit or not. They have no power to license or to prohibit. That jurisdiction is vested in the local public authorities. The privilege conferred upon the owners of lands fronting on the street on which a street railway is proposed to be built is conferred upon them solely for the protection of their own property rights. Then, the court says that if these consents as a condition precedent to the action of the local authorities be injudicious, or even obnoxious to public policy, the fault is with the legislature. The terms on which the consents should be given being left to be adjusted between the owners of the land and the company, the local authorities would not be justified in rejecting a consent for the reason that it was obtained for a consideration, or in refusing to consider the company's application for a license on the ground that it had made compensation to the owners of lands abutting on the street for the inconvenience they might suffer by reason of the construction of the railway, the erection of poles and wires, and the operation of the road. Nor does the

court perceive on what ground a bargain of this character with one landowner can be said to be a fraud on other landowners or upon the public in general.

#### PASSENGER RIDING ON SIDE STEP OF OPEN SUMMER CAR—MOTORMAN'S DUTY.

*Bumbcar v. United Traction Co. (Pa.)*, 47 Atl. Rep. 961. Jan. 7, 1901.

The supreme court of Pennsylvania says that, generally, it is the duty of a passenger to go inside the car. In the use of the cars of steam railroads the rule admits of no exception which does not rest on necessity. While it is not per se or in and of itself negligent for a passenger on a car of a horse railway to stand on the platform or steps, it is his duty to go inside the car if there is room. As to the danger of riding on platforms or steps, electric trolley cars occupy an intermediate position, and the established rules in regard to steam and horse cars do not apply to them without modification. The side steps of an open summer car are not intended for the use of passengers except as a means of ingress. Their use for riding differs, in point of danger, but slightly from the use of the bumper, which is per se negligent. And it is so manifestly dangerous as generally to defeat any claim for injuries. A passenger who rides on them when it is reasonably practicable for him to go inside the car assumes all the risks of his position, and in all cases he assumes the risk incident to the usual swaying and jolting of the car, and from collision with passing vehicles, and with obstructions, of whatever nature, which unexpectedly appear. These are dangers which cannot be guarded against by the careful and prudent management of the car. But when the passenger, by invitation of the conductor or with his knowledge and assent, and from necessity, because of the want of sitting or standing room inside the car, rides on the side steps, he is entitled to the same degree of diligence to protect him from dangers which are known and may readily be guarded against as other passengers.

In this case, a man going to his work one morning got on the side step of an open car, which car, as usual at that time of the day, was full so that there was no standing room inside or on the platform. The conductor received his fare, and made no objection to his standing on the step. At a place where the street curved and there was barely room for a wagon to stand between the track and the walls of a hotel building and ice wagons were accustomed to stand while delivering ice mornings, he was injured by the hub of a wheel of an ice wagon striking him. Moreover, the motorman could have seen the position of the wagon when a square from it, and was even signaled by the man in charge of the wagon to stop, but went on without slackening the speed of the car. Under these circumstances, the court holds that it was error to grant a compulsory nonsuit. It holds that as the man was received as a passenger when the car was so full that he could not go inside, and stood on the step with the knowledge and assent of the conductor, he could assume that reasonable precautions would be taken to protect him from such dangers as could be readily seen and guarded against, and, as the presence of ice wagons in the narrow space between the track and the building was to be expected at about the same time every morning, it was a known danger, against which it was the duty of the motorman to guard.

#### LIABILITY FOR INJURY IN COLLISION OF TRACK-LAYER RIDING HOME ON TICKET.

*Peterson v. Seattle Traction Co. (Wash.)*, 63 Pac. Rep. 539. Dec. 27, 1900.

This was an action brought by a track-layer to recover damages for personal injuries sustained in a collision of electric cars when he was returning home on one of them after his day's work was done, riding on a ticket from a book furnished him. The supreme court of Washington holds that he was not a fellow servant of the operators of the cars at the time of the accident. It maintains that when he had ceased his day's work at track-laying he was not in the employ or under the control of the company until he again resumed track-laying under the superintendency of the foreman of the track gang. The foreman had no control over him while going to and from his work, and he was not under any obligation to go to and from his work of track-laying on the cars of the com-

pany. At 6 o'clock his day's work ended. He had no rights and no privileges on that car, other than or different from those of any other passenger. He was not required to perform services on the car. He was under the control of the conductor of the car, and not of his own foreman, just as any other passenger on the car. Hence, the court holds that at the time of the accident he was not a servant of the company, and that, consequently, the doctrine of fellow servants had no application.

And the court holds that where two cars meet in a head-end collision on a single-track railway, there must be negligence somewhere, by somebody or other. That negligence, in the absence of other showing, must be assumed to have been primarily the negligence of the company's employes in charge of the cars, who caused or allowed them to come into collision. It being primarily the negligence of those employes, it is imputable to their employer, and that employer is in law responsible for its consequences.

But the book of tickets furnished had a stipulation printed thereon exempting the company from any liability for injury to this track-layer, and the company denied that it had agreed to furnish him transportation, while he alleged that his contract of employment provided for transportation without any condition upon it exempting the company from liability. And the court holds that when he offered his evidence as to his transportation, and the tickets in connection therewith, under the denial of the company, it was competent for it to offer in evidence any material matter to defeat the alleged contract or to show a different contract. It particularly holds that it was error to exclude evidence of the stipulation, and that it was signed by the man. It says that the company was not required by law or duty to give him work as a track-layer, and, when he sought to obtain such work, he had a perfect right to contract that he should be carried by the company over its lines to and from his work, subject to the condition that he would assume, while being so transported, all risks of accidents, etc., contained in the stipulation mentioned. However, it does not mean to hold that the mere signing of the condition, under the circumstances under which it was signed, was conclusive on the man, as showing that the contract of transportation was as claimed by the company. If the transportation was to be unconditional, he was a passenger for hire, and entitled to all his rights as such. The fact that he was employed by the day, and could quit at any time, and that he received from time to time ticket books with conditions thereon like that offered to be proven, would be strong circumstances to show that the contract for transportation was as the company contended, but it was not conclusive. It must be remembered that there was no showing or offer to show that the secretary who gave out the book, got the man's signature to the stipulation and signed it himself, was authorized to enter into contracts for the employment of track-layers, or that he was authorized to bring about a modification of the contract originally made by the foreman, and that at the time the latter employed this man nothing was said about his transportation having a stipulation attached which should exempt the company from liability. All these facts and the circumstances under which the condition was signed were for the consideration of the jury, under proper instructions, from which it might determine whether the contract of transportation was unconditional, as claimed by the man, or was conditional, as claimed by the company.

#### LIABILITY FOR INJURY OF EMPLOYEE RIDING FREE WHILE NOT ON DUTY.

Dickinson v. West End Street Railway Co. (Mass.), 59 N. E. Rep. 60. Jan. 2, 1901.

Persons riding gratuitously under a rule permitting policemen, firemen, advertising agents, news agents, and employes of the company in uniform to ride free at any time, such persons being required to ride upon the front platform, so far as practicable, the supreme judicial court of Massachusetts holds, are passengers, as well as those who pay the fare. All members of the classes included in the rule stand alike in reference to the duty of care which the company owes them, whether they come within one part of the description or another. The rule in reference to employes permits them to ride at any time and place, and for any purpose if they are in uniform. The reasons in each case for extending this privilege to members of these different classes are

not material. Probably they are different in reference to different classes. So far as employes are concerned, it is enough that, except possibly in regard to wearing uniform, they are given the same rights as others who have no direct connection with the company by employment or otherwise.

In this case, an employe, whose work consisted of a certain number of trips at fixed and regular times each day, who usually had about three hours, between twelve and three o'clock, during which he was not on actual duty, having, at about 12 o'clock one day, finished his morning's work, got on the first car that came along, and was going home to dinner, when he was injured through the negligence of the motorman on that car, which, it may be added, was not on the line on which he was employed. Under these circumstances, the court holds, he did not stand in the relation of a servant to the company at the time of the accident, and consequently was not a fellow servant of the motorman so as to relieve the company from liability to him for the latter's negligence. His rights, the court holds, were the same as if, after finishing his day's service, he had taken a car in the evening to visit a friend or to do any business of his own. The fact that he had been in the company's service during the day would not make him a fellow servant with the motorman while riding in the evening under the rule, any more than if he had been a policeman or a news dealer.

#### CITY MAY MAKE CONSENT CONDITIONAL AND MAKE RUNNING OF MAIL AND EXPRESS CARS A MISDEMEANOR.

St. Louis & Meramec River Railroad Co. v. City of Kirkwood (Mo.), 60 S. W. Rep. 110. Dec. 18, 1900.

Section 20 of article 12 of the constitution of Missouri of 1875 provides that no law shall be passed granting the right to construct and operate a street railroad without the consent of the local authorities. Section 2543 of the Revised Statutes of 1889, which is a part of the act under which the plaintiff company was incorporated, provides that nothing therein shall be construed to authorize the construction of any railroad in, upon or across any street or road without the assent of the proper city or county corporate authorities.

Now, it would be difficult, the full bench of the supreme court of Missouri thinks, to conceive of a more positive and unequivocal veto than that conferred upon the cities, towns, and villages of the state by the constitution, and it holds that when such power is given to cities and towns it is not limited to a mere yes or no, but they may impose such conditions upon their consent as they see fit. Again, it says that it is plain that the constitution and the statute referred to give the absolute power of consent to the city, and that it does not lie in the mouth of a company which has obtained this consent, to urge that a condition limiting it to a carriage of passengers is unreasonable. If so unreasonable as to make it void, the consent obtained upon that consideration, the court holds, is also void. In other words, as the consent in this case was given solely on such a condition, the court thinks it very clear that, if this condition was illegal, then the company was entirely without right in the streets. It was, however, entirely reasonable, it says, for the town authorities to grant the company the privilege of occupying its streets as a street railway for passengers,—a system which would cause little or no inconvenience to the traveling public, but, on the contrary, contribute to the comfort and convenience of its inhabitants,—and at the same time refuse its consent to a railroad carrying freight, which might block its highways, and amount in many instances to a practical monopoly of the streets. And it declares that it is clear that the company's acceptance of the condition imposed in the franchise granted it estopped it from grasping the benefits of that contract with one eager hand, while thrusting aside its burdens with the other.

Furthermore, while the company's charter gave it power "to take and convey persons and property \* \* \* and receive compensation therefor," the court says that there was no absolute rule of law compelling it to exercise all of its powers at all times and all places. Then, it must be remembered, it says, that the state was not here complaining of nonuser of its chartered powers, but it was the company, which obtained this consent to use the streets by contracting to carry only passengers on its cars, and thus to deny it itself merely one of its powers.

Wherefore, the court thinks that the facts in evidence constituted the company, so far as the city was concerned, a street railway, with the right to transport passengers only, and that in operating mail and express cars it exceeded the consent granted by the city, and thus made itself amenable to prosecution for the violation of an ordinance of the city punishing companies for operating cars in the streets for purposes not authorized by their franchises granted by the city. The ordinance in question prohibited any street railway running or operating any car or cars upon or over any route, or for any purpose or use whatever, in the city, not authorized by the franchise granted to it by the town or city of Kirkwood, and made a violation thereof a misdemeanor punishable by a fine of not less than \$95 nor more than \$100, or by imprisonment for not less than two nor more than three months, or by both such fine and imprisonment. The ordinance, the court holds, was a valid exercise of the corporate authority of the city. It says that it was not void by reason of being so unreasonable that the court would declare it void. The exclusive control over its streets was given to the city, and after notifying the company that it was violating its franchise, and after the company ignored its demand to conform to its privilege, the ordinance was justified. A street railroad laid in the street without authority is a nuisance, and so is the operation of a railroad of any kind in a city without authority of law. As the ordinance only made that an offense which is everywhere regarded as a nuisance, it was in no sense in excess of the city's power.

It may be well to add, the court says, that, as the franchise granted by the town of Kirkwood to the company was simply "for the transportation of passengers," the grant must be construed in favor of the public and against the railroad company, and this enumeration excluded the transportation of freight.

EFFECT OF CONSENT OF ELECTORS—PAVING RIGHT  
OF WAY—SPECIAL ASSESSMENTS FOR—GRADING  
PART OF—PETITIONS IMMATERIAL—LIEN  
WHERE ROADS CONSOLIDATE—MORT-  
GAGE RETAINS PRIORITY—SUMS  
DUE FOR PERMIT NOT A LIEN.

Lincoln Street Railway Co. v. City of Lincoln (Neb.), 84 N. W. Rep. 802. Jan. 4, 1901.

The supreme court of Nebraska holds that the provisions of the constitution and the statute of that state requiring the consent of a majority of the electors of a city before a street railway company is authorized to construct and operate a street railway in such city do not authorize the city to grant a charter to, or enter into a contract in respect thereto with, such company. The charter rights are derived from the state. By the ordinance under which the consent of a majority of the electors is secured, and the provisions of which obligate the company to construct its street railway within the time and in the manner stated, and make it subject to such regulations as may lawfully be established by ordinance, the company is privileged or permitted to enter upon the streets of the city for the purpose of constructing its tracks and to carry out the purposes of its organization, and it thereby derives no other or greater right than a privilege, license, or permission to enter upon the streets for such purpose. Its grant of corporate franchises or privileges is not determined by such ordinance, but by general law.

Now, under the provision first above referred to, an ordinance was adopted submitting to the electors the proposition of giving their consent to the construction and operation of a proposed street railway, in which ordinance it was provided that "said railway track shall be so constructed as to present the least practical obstruction to the ordinary public use of the streets, and that it shall, when required, conform to the established grades of the streets as now or hereafter to be established when such streets are brought to grade; and further, said railway company shall be subject to all reasonable regulations in construction and use of said railway which may be imposed by ordinance." But, even assuming that such provisions became a part of the charter of the corporation, having the elements of a contract with respect thereto, the court holds that an exemption from special assessment was not created, and the legislature was not thereby prohibited from imposing a liability on the company to pave the part of the street occupied by its tracks in conformity with the improvement of the

remainder of the street, or, in the event of its neglect or refusal so to do, to authorize the levy of special assessments or taxes against the property of such railway company for the costs and expenses necessary to pave such right of way to conform to the remainder of the street improvements. The right of the legislature to require street railway companies in cities of a certain class to do such paving, or in case of their failure or neglect to perform such duty, to authorize the municipal authorities to make such improvement, and, by the levy of a special assessment, charge the cost and expense thereof against such companies, which shall be a lien on their property, the court holds, is a reasonable exercise of the reserved power vested in the legislature. Nor does it consider that an act of this character will be special or class legislation because not applying to all street railways in cities of different classes throughout the state.

The court further holds that, as to a street railway company which is required to pave its right of way to conform to the remainder of a street improvement, it is immaterial whether or not the paving petitions had the required number of signatures. The authority to require the street railway company to pave its right of way does not depend upon the jurisdiction of the city council to establish paving districts and engage in the work of improving the streets therein by reason of the petition asking for such improvement, but on the statutory ground that when streets are improved by the city authorities it is incumbent upon street railways occupying parts of the streets to pave in conformity therewith the portion they occupy.

Where a city engages in the work of paving its streets, and, as a part of the general improvement, grading is done in order to accomplish the main object, the court holds that the cost of grading, being a part of the general improvement, is properly charged as being incidental to and a part of the work of paving, and that special assessments against a street railway company for the cost of paving its right of way may properly include the cost of grading, also; the grading being incidental and necessary to accomplish the main object of paving the street.

Where street improvements are made, and the cost of paving that portion of the same occupied by street railway companies is levied as special assessments against the property of several street railways as separate properties, and the different street railways are afterwards consolidated and merged into one property and operated as one street railway system, the old companies losing their individuality and identity, and the new company assuming the burdens and obligations of the constituent companies, the court holds that, as between the consolidated company and the municipal authorities levying such special assessment, the liens arising by reason of the several assessments against the different constituent companies and properties attach to the new property owned and operated by the substituted company as one property, in its entirety, and may be enforced by the sale of the property without dismemberment and separating it into fractional properties as it existed before consolidation.

Where, however, a mortgage was placed upon a street railway property, and afterwards another company, against which certain liens for taxes levied as special assessments existed, was consolidated with the mortgagor company, the court holds that the lien of the mortgage on the property covered thereby, without the consent of the mortgagee, could not be impaired by the agreements and acts of consolidation, and that the tax lien on the property consolidated and merged into the new company and with the property mortgaged could not be made prior to the mortgage lien on all the property after consolidation; that the tax and mortgage liens attached to the specific properties embraced in the levy and mortgage, respectively; and that the respective liens and their priority could be preserved unimpaired only by separating the different properties into their constituent parts as before consolidation, and awarding to each a lien according to priority.

But under an ordinance providing for the payment of certain sums by a street railway company in obtaining a permit to lay its tracks in streets already paved, and requiring that a bond be given as security for the discharge of the liability assumed, the court holds that there is no authority for making the sums due under the provisions of such ordinance a lien on the property of the street railway company, as in the cases of taxes levied as special assessments.



## CANADIAN NOTES

A company is being formed to construct an electric railway between Napanee and Gananoque.

Mr. J. W. Marr, of this city, has been appointed superintendent of the power house of the Niagara Falls Park & River Railway Co.

The Ottawa Electric Railway Co. has asked the Board of Health to join with the company in a crusade against people who spit in the cars.

The South Essex Electric Street Railway Co., Amherstburg, Ont., has been granted a charter for the construction of an electric road in the town.

Mr. J. Carson has been entrusted with the task of securing information regarding the water power privileges desired, especially those between Trenton and Ottawa.

A contract has been let by the Canadian Niagara Power Co. for the development of 25,000 h. p. at the falls, 10,000 h. p. to be brought overland for use in Toronto.

A charter has been granted for the construction of an electric railway from London to Port Burwell, Ont., and work will be commenced on the preliminary survey immediately.

Montreal capitalists who control the Gatineau and Pontiac railways, and the Inter-Provincial Bridge at Ottawa, are negotiating for the purchase of the Hull & Aylmer Electric Ry.

The development of the water power on the Nottawasaga River, near Stayner, Ont., may be looked for in the near future. A company is now being formed to acquire the necessary rights, and expects to build a power house without delay.

Mr. Chas. L. Farrer, of Perry Sound, Ont., who has till recently been in the employ of the Lachine Rapids Hydraulic & Land Co., of Montreal, has been appointed superintendent of the Canadian Electric Light & Power Co.'s plant at Chaudiere Falls.

We regret to announce the death of Mr. M. H. Watts, secretary of the Montreal Street Railway Co., which occurred since our last issue. Mr. Watts has been in poor health for some time, but was apparently recovering when a sudden attack of pneumonia proved fatal.

In addition to regular uniforms, the Ottawa Street Railway Co. is supplying conductors and motormen with false collars and neckties. These give the men a neat, bright appearance, as they are easily cleaned, and men must change collars on completing a trip if they are at all soiled.

The electric street railway of Moncton, N. B., which has been in the market for some time, is sold, so it is announced, to an American syndicate. If the city council will make some concessions, the new owners will put the road in good shape and operate it, otherwise the rails will be removed, and the equipment taken to some other point.

The Lachine Hydraulic Co. are now negotiating for a site for a new power plant in Montreal, Que., having definitely decided to build a steam power plant of 2,500 horse power. This is to be used as a reserve plant in case of accident to the company's power house at Lachine Rapids. Mr. W. McLea Wallbank, managing director of the company, has the matter in charge.

Mr. Thomas Roberts, an eminent engineer of Adelaide, Australia, is in Montreal making a study of the operation of the electric rail-

way systems. Mr. Roberts, who is connected with the state railways in Australia, proposes making a close study of this subject in the principal cities of Canada and the United States, with a view of adopting the best features on the government roads in his native country.

The Canadian General Electric Co. has purchased a block of some thirty acres, at the head of Landsdowne Ave., where it proposes to erect new works, including iron and steel foundries. It is endeavoring to secure from the city the extension of water mains and sewers to this property, which is outside the city limits, and promise in return therefor, to give constant employment to not less than 500 men.

Mr. Wm. M. Doull, secretary of the Cuban Electric Co., returned to Montreal recently from Havana, where Canadian capitalists are building an electric railway. Mr. Doull was in Havana when the first section of the road was opened for traffic. The first start made was on 10 miles, and the company found its cars insufficient to accommodate the crowds which wished to avail themselves of the new system of travel.

By the terms of an agreement made during the week by Mr. C. E. A. Carr, manager of the Montreal Park & Island Ry., Montreal is to have a new resort during the warm months. A large tract of land, with a splendid club house, has been leased at Cote des Neiges and every day and night free concerts will be given there by one of the country's leading bands. Mr. Carr proposes to give the public the best garden of the kind in Canada.

The franchise of the Belleville Electric Street Railway Co., including lighting franchise, plant and property, will be sold at a bargain. The railroad consists of about two miles of track running from the station through the business portion of the city, and could be made into a good paying concern, being the only street railroad in the city, which has a population of some 16,000 people. Full particulars can be obtained from the manager of the Bank of Montreal, Belleville.

Boston and Kingston capital is interested in a proposed electric road, to radiate east and west from Kingston, and ultimately to cover territory between Toronto, Cornwall and Ottawa. As soon as the company is complete the Ontario Government will be asked for a special act to enable it to get a charter. It seems that the Ontario act is not broad enough to take in the case of the present scheme, maintaining that a road shall not extend outside of a municipality more than a mile and a half, without special permission.

The Barton Township Council has granted the Cataract Power Co. permission to build a loop line running east from Hamilton by way of the Delta and Bartonville, and connecting with the Barton St. line near the Jockey Club grounds. By the terms of the by-law passed, the company has two years to complete the line to Bartonville, and one year to Delta. The company undertakes to run a half hour service, issue tickets at city rates (eight for 25 cents during certain hours, and six for 25 cents during the remainder of the day).

The program for the convention of the Canadian Association of Electrical Engineers, which meets at Ottawa, Ont., on June 19th, includes the following papers:

"Transformation of Current." Professor Owens, of Montreal.  
 "The influence of the load factor on the design and operation of a lighting and power system." J. R. Robertson, Montreal.  
 "Notes on the construction and protection of aerial lines."  
 "Dominion Electrical Standards." M. O. Higman, Ottawa.  
 "Rates for Electric Light." H. S. Doherty, New York.

The Louisville (Ky.) Railway Co. has disposed of bonds to the amount of \$200,000, the second series in an authorized bond issue of \$5,000,000. The proceeds from the sale will be used for the completion of the Crescent Hill line, for double tracking the Jacob Park and the Seventh St. lines, and for the purchase of new machinery.

## NATIONAL ELECTRIC LIGHT ASSOCIATION.

The twenty-fourth convention of the National Electric Light Association was held May 21st to 23d at the International Hotel, Niagara Falls, N. Y. There were about 350 persons in attendance. The exhibits of manufacturers were comparatively few, owing no doubt to the proximity of the Pan-American Exposition. One afternoon and evening were devoted to a visit to this exhibition which on account of its unequalled electrical illumination proved of special interest to the members of the association. After a brief address by President Cahoon, the reading of papers was taken up during the regular morning and afternoon sessions. These were: "The Transmission of Current at High Potential," by Calvin W. Rice; "The Foresee (4-C) System of Charging," by L. R. Wallis; "Uniform Accounting," by G. E. Tripp; "The Practical Side of the Incandescent Lamp," by Francis W. Willcox; "Arc Lighting at the Beginning of the Twentieth Century," by H. W. Hillman, and several committee reports. During the times between the business sessions visits were made to prominent points in the city, and at the close of the business the convention adjourned almost in a body to visit the exposition in Buffalo.

## FRANCHISE TAX LAW UPHELD.

The Appellate Division of the Supreme Court at Albany on May 21st, handed down three decisions upholding the position taken by the state board of tax commissioners in the enforcement of the franchise tax law. The decision determines the following points: That the state board of tax commissioners need not state what the basis of each assessment is and the method by which it determined each valuation.

That the board need not separate the value of the tangible from the value of the intangible property constituting the franchise.

That the board need not certify in each instance valuations placed on other franchises for the purpose of comparison.

That the board need not return in each instance all laws and ordinances by virtue of which the franchise under review is operated.

## CHICAGO METROPOLITAN "L" STATEMENT.

The report of the Metropolitan Elevated for the fiscal year ending Feb. 28, 1901, is as follows: Gross earnings, \$1,628,737; expenses, \$703,906; net earnings, \$924,831; interest on balances, etc., \$8,352; total income, \$933,183; fixed charges, \$620,707; balance for stock, \$303,475; surplus from previous year, \$55,398; dividends on preferred stock, \$304,783; surplus at end of year, \$54,089.

## NO STRIKE AT DAYTON.

During the last year there was an agreement in effect between the People's Railway Co., of Dayton, O., and its employees covering the rates of wages and various rules of the service. This agreement expired May 31st, and those of the men who were members of a union submitted a draft of a new agreement which provided among other things that all non-union men who had been in the service of the company for 60 days or more and who had given satisfaction should join the union within 15 days from the date of the agreement, and that no man shall be put on the cars to learn the business without a permit card from the union.

When this proposal was submitted to the company, the general manager, Col. George B. Kerper, declined to accept it and notified the committee that he could not receive it as representing the union, but would be glad to talk with the men as a committee of employees and discuss any alleged grievances. In conclusion Colonel Kerper said: "We cannot recognize the right of any outsider to take part in these conferences. You will remember that we took this position a year ago, and that the contract made with you was made with you as employees only and not as representatives of the union or any other body of men."

On June 3d a contract on the same lines as the old one was agreed upon, the position of the company as stated in Colonel Kerper's letter being conceded as a proper one.

## MECHANICAL ENGINEERS' MEETING.

The 43d meeting of the American Society of Mechanical Engineers was held at Milwaukee May 28th to 31st. The headquarters were at the Plankington House where the meetings were also held. There were five business sessions at which professional papers were presented. The number of members and guests registered at the secretary's office was about 350.

Among the various entertainments and excursions arranged by the local committees were visits to the shops of the E. P. Allis Co., the Filer & Stowell Manufacturing Co., the Christensen Engineering Co., the Bucyrus Co., the Nordberg Manufacturing Co., the Vilter Manufacturing Co., and the Cutler-Hammer Co. Wednesday morning the visiting ladies were entertained by a drive about the city, and Wednesday evening the society was given a reception at the Deutscher Club. Thursday afternoon there was an excursion by electric cars to Waukesha, special cars being provided by the Milwaukee Electric Railway & Light Co., which company also extended courtesies for the other afternoon trips.

## LEGAL BARRIER TO NEW YORK-PHILADELPHIA TROLLEY.

The Commonwealth of Pennsylvania has begun equity proceedings to prevent the completion of Albert L. Johnson's proposed continuous trolley road between New York and Philadelphia, upon the ground that the railway corporation intends to violate the general railroad laws of the State. The defendants named in the suit, in addition to Albert L. Johnson and his associate stockholders, were the Philadelphia & Lehigh Valley Traction Co., the New Jersey & Philadelphia Street Railway Co. and the Yardley, Norrisville & Trenton Street Railway Co.

The bill alleges that when the Philadelphia, Trenton & Lehigh Valley Railroad Company secured its charter, on March 1 last, the state officials were not informed of the exact purposes of the new corporation. Had the intentions of the company been set forth, it is stated, the charter would not have been granted, as the defendants now seek to operate a passenger and possibly a freight railroad under a coalition of franchises of railroad and railway companies, a plan which, it is contended, is contrary to the provisions of the general railroad laws.

## CINCINNATI-BETHEL INTERURBAN.

The Suburban Traction Co., of Cincinnati, Ohio, was incorporated last month with a capital of \$50,000, to construct an electric railway between Cincinnati and Bethel, a distance of 21 miles. The road will pass through the towns of Mount Washington, Fruit Hill, Cedar Point, Cherry Grove, Forrestville, Tobasco, Withamsville, Amelia, Mount Holly, Hollington, Bantam and Bethel.

The officers of the company are: G. R. Scrugham, president and general manager; J. M. Kennedy, vice-president; Lee H. Brooks, secretary; Guy W. Mallon, treasurer. The board of directors, in addition to the foregoing, includes Charles H. Davis, William E. Hutton and George H. Worthington. All of the company are Cincinnati capitalists except Mr. Worthington, who is from Cleveland, and was for some time receiver of the Columbus Central Ry. at Columbus, Ohio.

## STANDARD GAS ENGINES.

The Standard Automatic Gas Engine Co., of Oil City, Pa., has met with great success in operating its engines under the severe conditions of electric lighting and railway service and has quite recently received orders for 10 engines ranging in size from 50 h. p. to 1,000 h. p., all to be used in electric power stations. The 1,000-h. p. engine is for the Union Traction Co., of Philadelphia, and two of 400 h. p. each are for Citizens Traction Co., of Oil City, Pa. The company has standard sizes from 50 h. p. to 2,100 h. p. and builds larger engines to order. The engines have hollow cylindrical valves, open at both ends, and are oscillated by a corliss valve motion; they remain stationary during compression, ignition and expansion, commencing to move only at release. So far as possible the whole mechanism is designed to be fool-proof.

### NEW CAR FOR LEHIGH VALLEY.

The accompanying illustration shows a 34-ft. vestibuled, double truck car built for the Lehigh Valley Traction Co., of Allentown, Pa., by the St. Louis Car Co., of St. Louis. The length of the body is 34 ft., and the length of the vestibule from the end sill to the outside sheeting, 5 ft.; the car over all is 45 ft. 10 in. long.

The bottom construction is extra heavy; the flooring is double with heavy felt paper between the two layers; the bolsters are of built up steel; the bottom frame has truss rods extending from outside of the lower edge of end sill to end sill; and also underneath truss rods. The side construction is straight panel, tongued and grooved; the vestibules are stationary. The inside finish is of the best quality of quarter sawed white oak. The car has 12 sash on each side together with four double post spaces; the upper section of the sash is stationary and the lower sash drops sufficiently low to clear the arm rail. The seats are of the St. Louis Car Co.'s new style "walk-over" type. Each end of the car body has large

this country. In the railway department it has furnished within 60 days overhead equipment, and in most cases bracket arms and bonds also, for some 18 new railroads with a total mileage of 310 miles, and has now orders on the books for over 150 miles more.

### CUBAN AND MEXICAN STREET RAILWAYS.

The Brooklyn Eagle recently printed a letter from Mr. C. L. Rossiter, ex-president of the Brooklyn Rapid Transit Co., who made a pleasure trip through Cuba, Mexico and California. In speaking of Cuba he says: "With the still unsettled political condition of the island American capital has been very timid with its investments, while the English and Spaniards, accustomed to investing in foreign countries, are and have been taking up some of the most profitable concessions on the island. \* \* \* Havana opened its first electric road within the city but a few weeks before our arrival and the tracks, equipment and line all are substantially



NEW CAR FOR LEHIGH VALLEY TRACTION CO.—ST. LOUIS CAR CO.

double doors, arranged to work separately. The steps have malleable iron hangers with oak treads and covered with Mason's safety tread. There are four folding gates which are used in summer months when the folding doors of the vestibule are removed. A large wooden bumper is placed at each end of car and a draw bar jaw of the St. Louis Car Co.'s pattern fastened to the top of the bumper. The ceiling is of three-ply quarter sawed white oak veneer, neatly ornamented and decorated. The car is provided with push buttons, hand rail and register rods, register, arc electric headlight, two conductor's signal bells with necessary attachments, two 14-in. steel foot alarm gongs, one stove and four St. Louis Car Co.'s pattern sand boxes. The curtains are made of "Pantasote" fastened to spring rollers and provided with Curtain Supply Co. fixtures. All trimmings are of solid bronze.

The trucks are the St. Louis Car Co.'s No. 23, such as are used on the Milwaukee lines, the Chicago City Ry. and other roads having a heavy service; each truck has two motors which are inner hung.

### NEW TROLLEY WHEEL.

The Stuart-Howland Co., of 270-287 Devonshire St., Boston, has recently placed upon the market a trolley wheel which it guarantees to make a mileage of 5,000 miles. The wheel has been carefully designed and the company has spared no expense in endeavoring to make the best trolley wheel ever offered to the trade. The metal used is not hard but tough; the composition is from the company's own formula and is the result of exhaustive service tests made to ascertain the metal giving the best all-around results. The wheels are fitted with standard bushings containing the highest grade of graphite, the lubricating qualities of which is claimed cannot be excelled. The best proof of the quality of these wheels is that they are finding a ready and rapid sale.

The Stuart-Howland Co. started in the electric light supply business 14 months ago, and four months later added a street railway department. The growth of the business has been phenomenal, and the company is now one of the largest supply houses in

constructed and following the best modern practice. The fares charged for a ride of not over 25 minutes to one of the suburbs is 10 cents, but I notice that the papers were already agitating for a reduction of this to a 5 cent fare.

Of the Mexican railways Mr. Rossiter writes: "In the matter of street railway transportation but little progress has been made, and while nearly every city and town has its tramways they are in almost every case operated with mule power. In the City of Mexico about one-half of the lines have been reconstructed and are today being operated by electricity. The work has all been thoroughly and well done and its cars and equipment equal the best in the States, and its power house, shops and car houses are thoroughly modern and up-to-date."

### STANDARD TRACTION BRAKE CO.

The Standard Traction Brake Co., a new corporation in which the Westinghouse Air Brake Co. is interested, has recently been organized for the purchase of the business, patents, etc., of the Standard Air Brake Co., of New York, and arrangements have been effected by which the apparatus supplied by the Standard Traction Brake Co. will be made by the Westinghouse Air Brake Co. at its very large and complete plant at Wilmerding, Pa.

This arrangement will certainly insure the purchasers of Standard Traction Brake apparatus that it will be beyond criticism as to material and mechanical perfection, these elements being characteristic of all the appliances made by the Westinghouse Air Brake Co. The street railways are to be congratulated upon the union of these interests, which will undoubtedly be of great value in securing reliable and efficient braking apparatus for street railway service.

Since the consolidation of the Lynn & Boston and the Lowell, Lawrence & Haverhill Railway Cos., which occurred last month, a reduction of fares between several of the cities served by the consolidated system has been put into effect.



## PERSONAL.

MR. H. B. RICE was on May 28th appointed receiver of the Houston, (Tex.) Electric Street Railway Co.

MR. G. H. WALBRIDGE, of J. G. White & Co., New York, sailed May 15th for England on business connected with J. G. White & Co., Ltd., of London.

MR. W. B. CLEVELAND, president of the Forest City Electric Co., of Cleveland, is enjoying a three-months' trip through Europe combining business with pleasure.

MR. W. A. HELLER, of Allentown, Pa., who was recently appointed electric superintendent of the Muskegon (Mich.) Traction & Lighting Co., has been made general superintendent of the company.

MR. GUY L. FAIRBROTHER has resigned as superintendent of the Enfield (Conn.) & Long Meadow Electric Ry., a position he has held since the inception of the road, and will be succeeded by Mr. Larabee, of Boston.

MR. JOSEPH H. SMITH, formerly with the Interstate Consolidated Street Railway Co., North Attleboro, Mass., has been appointed electrician and master mechanic of the Milford, Hollister & Framingham Street Ry., Milford, Mass.

MR. D. A. BELDEN, on severing his connection with the Aurora (Ill.) Street Railway Co., as manager of that road, May 10th, was presented with several handsome cut glass and silver souvenirs by the employees of the company.

MR. CHARLES H. COX, Dayton, O., was presented with a gold watch chain and diamond charm by his employees on retiring from the management of the Dayton & Xenia Traction Co. Mr. Cox will engage in the construction of electric railways in the east.

MR. W. B. TARKINGTON, for several years master mechanic of the Omaha & Council Bluffs Railway & Bridge Co., of Council Bluffs, Ia., has been appointed general superintendent and will assume the duties of the office vacated by Mr. W. S. Dimmock.

MR. WALTER V. CROUCH, secretary of the New Orleans & Carrollton Railroad Co., is one of the oldest men in active railway business, having passed the age of 75 years; for the last 25 years of his life he has been the secretary and treasurer of this company. He was born in Richmond, Va., in 1826 and started in business at the age of 17, since which he has never been unemployed except during the four years of the civil war. Mr. Crouch has lived in

New Orleans for 54 years and during his long service with the New Orleans & Carrollton has never missed but two of the monthly and special meetings of the company. He has also never wanted nor taken a vacation in 25 years and in this time has lost only 20 days through sickness. Mr. Crouch has never sued or been sued and never endorsed for any one but once, in which case he had to pay for his experience. He has outlived four presidents, three acting presidents and many directors while in the New Orleans & Carrollton Railroad Co.



WALTER V. CROUCH.

J. W. GORMAN, 180 Fremont St., Boston, who conducts the largest summer amusement business in America, has recently issued a 24-page pamphlet describing the amusement attractions for agricultural fairs which he is prepared to supply during the coming season.

MR. HENRY C. PAIGE, of Lynn, Mass., has been appointed general superintendent of all divisions controlled by the Lynn &

Boston and the Lowell, Lawrence & Haverhill Railway Co., recently consolidated. Mr. M. N. Nash will be master mechanic of the company, with headquarters in Lowell.

MR. GEORGE ALFRED RICKER, who has made his home in Buffalo since 1880, was born in Portsmouth, N. H., in June 1863. For many years he accompanied his father, who was a ship master and a former officer in the United States Navy, traveling extensively until 17 years of age when he began work in the engineering corps of the Erie R. R. at Buffalo. After two years he entered the Massachusetts Institute of Technology and after a special course in civil engineering resumed work as assistant engineer upon the Helena & Red Mountain R. R., a branch of the Northern Pacific in Montana and later served as an assistant engineer upon the Buffalo division of the Erie R. R. In 1887 Mr. Ricker opened an office for the private practice of engineering in Buffalo, where he has since been located. His work includes the building of the Niagara Gorge R. R.; lines of the electric railway formerly owned by the Buffalo Traction Co.; the Buffalo & Depew Ry., and a number of important works in other branches of engineering, mainly docks, coal trestles and grain elevators and a large storage reservoir in Colorado. Mr. Ricker was the second vice-president of the Engineers' Society of Western New York and is a member of the American Society of Civil Engineers. His services are frequently in demand for examination and reports upon railroad and other enterprises, where the experience of an engineer is desired.



GEO. A. RICKER.

MR. GEORGE W. KNOX has recently been appointed consulting engineer for the following companies: Beloit, Delavan Lake & Janesville Ry.; Rockford (Ill.) Railway, Light & Power Co.; Wisconsin Midland Ry., of Berlin, Wis.; Manhattan Light, Heat & Power Co., of St. Paul, Minn.

MR. CLINTON L. ROSSITER, ex-president of the Brooklyn Rapid Transit Co., has accepted the presidency of a newly organized trust company, which will locate offices at Temple Bar, Court and Joralemon Sts., Brooklyn, in the fall. Mr. Rossiter is said to have associated with him Mr. David H. Leggett in promoting the enterprise.

MESSRS. C. N. DUFFY, F. E. SMITH AND H. C. MACKAY attended the National Convention of Railroad Commissioners, held in San Francisco, June 4th; they were the official representatives of the Street Railway Accountants' Association. The party left Chicago May 25th via the Chicago, Burlington & Quincy and Northern Pacific.

MR. E. B. GUNN has resigned as superintendent and chief electrician of the Lafayette (Ind.) Street Railway Co. to accept a position with the Richmond Street & Interurban Railway Co., which was incorporated May 1st. Mr. Gunn has been connected with the Lafayette company for five years, and will be succeeded by Mr. D. C. Emmons, of Philadelphia.

MR. H. DE STEESE, well and favorably known in the street railway industry, has become associated with the Morris Electric Co. as traveling representative in the Eastern territory. Mr. De Steese has been abroad for some time and for several years prior to leaving this country was in charge of the railway department of the Western Electric Co. He has had a wide experience in the street railway field both in the supply and operating lines.

MR. W. B. UPTON has resigned as vice-president, chief engineer and superintendent of the Brennan Construction Co., Washington, D. C., and has formed the firm of W. B. Upton & Co., Washington Loan & Trust Bldg., Washington, with the intention to engage in

general engineering and contracting. Mr. Upton was engaged in the construction of six of the Washington electric railways either as chief engineer or principal assistant engineer.

MR. W. H. M'ALISTER has assumed the duties of auditor of the Cincinnati Traction Co., succeeding Mr. W. R. Avery.

MR. WILLIAM S. TURNER, formerly of the firm of Woodbridge & Turner, will represent J. G. White & Co., Ltd., in Auckland, New Zealand, where he will have charge of the construction of the company's projected street railway system.

MR. J. R. NUTT, of Akron, O., one of the directors of the Southern Ohio Traction Co. and prominently interested in the development an operation of street railways in northern Ohio, was recently elected secretary and treasurer of the Savings & Trust Co., of Cleveland, and will remove to that city.

MR. T. F. WALSH, formerly president of the Akron (O.) & Cuyahoga Falls Rapid Transit Co., will act as general counsel for the Andrew Radel syndicate, with which he has lately become interested, and will make Bridgeport, Conn., his headquarters for business operations. Mr. Walsh and family will reside during the summer at Narragansett Pier, R. I.

MR. A. J. McDONALD, Montreal, has been appointed to the position of general superintendent of the street railway system of the City of Mexico. Mr. McDonald is 30 years of age, and has received his training on the lines of the Montreal Street Ry., where he has risen from the ranks to have entire charge of the central division of the company's system.

MR. M. S. JONES, who recently resigned from the Metropolitan Elevated R. R. of Chicago, as superintendent of transportation, will shortly sail for London, England, where it is understood he will assume a responsible executive position in connection with Charles T. Yerkes' London underground railway. On the evening of May 20th Mr. Jones was invited to the club rooms of the employees of the Metropolitan elevated and was there presented with two valuable testimonials of their appreciation.

MR. FRANK M. LEAVITT, M. E., who for the past 25 years has been closely identified with the wide range of engineering enterprises conducted by the E. W. Bliss Co., has severed his connection with that firm and has opened an office at 258 Broadway, New York, to engage in a general engineering practice. As chief engineer for the Bliss company Mr. Leavitt has had the entire management of all matters connected with the engineering branch of the business, and many of the patents owned by the company have been the subjects of his inventions.

MR. J. S. HAMLIN has resigned as superintendent of construction for the Christensen Engineering Co., of Milwaukee, and June 1st assumed his duties as master mechanic of the Union Traction Co. of Indiana, with headquarters at Anderson. Mr. Charles Berry, formerly superintendent of the Union Traction Co., has resigned and his duties will be divided between Mr. Hamlin and Mr. Chas. A. Baldwin, formerly assistant superintendent, who will have the title of superintendent of transportation. Mr. Hamlin has had an extended railway and shop experience, having been with the North Chicago Street R. R. in the latter part of the 80's, with the North Shore Electric Ry., Chicago, for three years, with the Metropolitan Elevated, Chicago, for two years and with the Christensen company for six years.

MR. GUY MORRISON WALKER, formerly of New York, has become associated with the Everett-Moore syndicate, of Cleveland, in the capacity of counsel. Mr. Walker has made a special study of investments as well as of corporation law, and is the author of a study of investments entitled "What Shall We Buy?", of which a large edition has recently been published by a Boston banking house; in this work attention is called to the singular manner in which the public has overlooked the merits of the securities of street railway and other public service companies. Mr. Walker is a native of Indiana and was graduated from DePauw

University; when a lad he spent several years in China, where his parents are still serving as missionaries, and within the last year has published a number of articles on China.

MR. A. H. HAYWARD has returned to New York from Buenos Ayres, where for nearly three years he has been acting as consulting engineer of the Buenos Ayres & Belgrano Railway Co. in the interest of the contractors, Messrs. Kincaid, Waller & Manville, of London. Having completed his work in South America Mr. Hayward has accepted a position with J. G. White & Co., of New York, as general manager of that company's street railway and electric lighting properties in San Juan, Porto Rico.

MR. W. G. ROSS, who has for several years been comptroller of the Montreal Street Railway Co., has been appointed secretary-treasurer of that company, filling the position of the late Mr. Watts, and combining therewith the office of comptroller. The appointment of Mr. Ross is a popular one, and his well known capabilities will show to greater advantage in the larger sphere. Mr. Ross is well known to railroad men throughout the United States and Canada and is a prominent member of the Street Railway Accountants' Association, and his friends will be pleased to hear of his advancement. Mr. Ross has been an accountant and auditor for over 20 years; in the 80's he was successively secretary, treasurer, and assistant manager of the Windsor Hotel Co. His connection with street railway interests dates from 1892, when he became associated with Mr. James Ross, who was very active in developing the street railways of Canada, having large interests in several companies.



W. G. ROSS.

MR. M. H. BRONSDON, who has been for some years chief engineer of the Union Railroad Co., and the Rhode Island Suburban Street Railway Co., has recently resigned that position to accept the eastern agency for the Lane & Bodley Co. for sales of its corliss engines and other manufactures. Mr. Bronsdon left railway work because he desired to engage in a business where his time would be more at his own command. He has been connected with the Union Railroad Co. since 1890 and was appointed chief engineer in 1893, having held the position since then. He takes with him the best wishes of both his former employers and employees. Shortly after his resignation he was visited at his home by 30 of the engineers who had worked under him for several years and was much surprised on being presented with a handsome set of drawing instruments as a token of their esteem and good wishes. Mrs. Bronsdon was also presented by the men with a valuable pin.

MR. P. WERNER, who for some years was with the Edward P. Allis Co. and recently with the Allis branch of the Allis-Chalmers Co., has accepted the position of chief engineer and general superintendent with the Filer & Stowell Co. In this position he succeeds Mr. Arthur Niedermeyer, now superintendent of the Buffalo branch of the Allis-Chalmers Co., also Messrs. W. F. Brown and Pelle Anderson, of the recently organized Brown-Corliss Engine Co. Mr. Werner is a native of Sweden, where in various schools, colleges and shops he received a thorough education as a mechanical engineer. He is a graduate of the Stockholm Institute of Technology. In order to be able to learn his profession as thoroughly as possible, he has worked both in foundry and machine shops. Upon his graduation he went into a shop building marine engines and steamers and worked at the vice as well as in the erection of engines on boats. In this country he has held several positions as a draughtsman and designed, first at Philadelphia, then at Drifton, Pa., and finally with the Edward P. Allis Co. of Milwaukee, Wis. At the Allis works he has succeeded through hard and honest work in gaining the full confidence, friendship

and esteem of Mr. Edwin Reynolds, general superintendent, and now chief engineer of the Allis-Chalmers Co., and was entrusted with the design and construction of such prominent engines as those built by the Allis company for the Metropolitan Street Railway Co. and the Manhattan Railway Co., of New York. These last mentioned engines are the largest stationary engines for the generation of electricity that have ever been attempted. In leaving the Allis company Mr. Werner takes with him the best wishes of Mr. Edwin Reynolds and Mr. Irving Reynolds, and his other co-workers and employers.

MR. EDWIN POTTER, president of the American Trust & Savings Bank and who is also receiver of the Calumet Electric Street Ry., has achieved a distinguished success in the world of finance. Since his election to the presidency of the American Trust & Savings Bank, in January, 1898, the bank's deposits have grown from \$4,800,000 to \$15,345,887, at which amount they were estimated at the last call from the state auditor, May 14, 1901; five million dollars in deposits were gained during the last year alone. Mr. Potter's business career began in Chicago in 1872 when he was commissioned by Abram French & Co., of Boston, to open a Chicago office for their extended operations. Seven years later the firm of French, Potter & Wilson, dealers in China and glassware, was formed and Mr. Potter was prominent in this concern. After the dissolution of the firm he entered that of Lyon, Potter & Co., where he remained until the winter of 1897. Mr. Potter's accession to the presidency of the American Trust & Savings Bank, was a new departure, and one which has resulted most fortunately for all concerned. On the death of General McNulta, Mr. Potter was chosen receiver for the National Bank of Illinois and the Calumet Electric Street Ry.

#### OBITUARY.

MR. W. E. PIMLOTT, electrical engineer and vice-president of the J. M. Atkinson Co., Marquette Bldg., Chicago, died at Memphis, Tenn., June 6th, from the effect of burns received at the power house of the Memphis Street Ry., on the morning of June 5th. Mr. Pimlott was born at Springfield, O., and was 29 years of age; he was on the electrical staff at the World's Fair, and later was for several years with Sargent & Lundy and the Martin J. Insull Co.

MR. A. LANGSTAFF JOHNSTON, consulting engineer, of Richmond, Va., died at his home in that city on May 15th. Mr. Johnston was born in Richmond, Aug. 16, 1850, and after graduating from the Virginia Military Institute entered the service of the Chesapeake & Ohio Ry. In 1888 and 1889 Mr. Johnston constructed part of the system of the Richmond Railway & Power Co., later he was engaged on work for the New Orleans & Carrollton R. R., for the Westonville, Montana & Fairmount Passenger Ry., of Philadelphia, and other electric railways. In 1896 he was awarded the John Scott medal by the Franklin Institute for a complete system of electric railway bonding. Mr. Johnston was a member of the Masonic fraternity, of the American Society of Civil Engineers, the American Institute of Electrical Engineers and the Franklin Institute. A widow and four children, two sons and two daughters, survive him.

MR. JOB H. JACKSON, president of the Jackson & Sharp Co., car manufacturers, Wilmington, Del., died at his home in that city May 24th, aged 68 years. Death was due to septic poisoning and resulted after a long and painful illness. The story of Mr. Jackson's life is that of a typical American who rose from the ranks of labor to a position of great prominence in the industrial world through no other means than those afforded by his exceptional business ability and indomitable pluck. He was born on a farm in Chester County, Pa., in 1833, and at the age of 14 removed to Wilmington, obtaining employment as salesman in a general store in that city. On attaining his majority Mr. Jackson left Wilmington for Altoona, where he spent a short time in the shops of the Pennsylvania Railroad. The practical training which he received in the shops inspired in Mr. Jackson an ambition to become the builder of cars on his own account, and in 1863 the first

step toward this goal was accomplished with the opening of the Delaware Car Works under the firm name of Jackson & Sharp. Mr. Jackson's interests were now united with those of Jacob F. Sharp, and the union proved an auspicious one. In 1870 Mr. Sharp retired from the firm and operations were continued by a stock company, of which Mr. Jackson was president, under the name of the Jackson & Sharp Co. Mr. Jackson recently disposed of his plant to the American Car & Foundry Co., intending to retire from active business life and to travel abroad. Socially and politically Mr. Jackson was one of Wilmington's most prominent citizens and his death is generally lamented throughout the city and state. He is survived by Mrs. Jackson and nine sons and daughters.

MR. WALTER A. PECK, the well known retired wool merchant of Providence, R. I., died suddenly at his home, 113 Waterman St., Friday morning, May 31st. Mr. Peck was one of the wealthiest men in the state of Rhode Island and was a director and one of the largest stockholders in the Union Trust Co., of Providence. He was one of the incorporators and had been treasurer of the Consolidated Car Fender Co. since its organization. Mr. Peck was born in Barrington, R. I., in July, 1854, and graduated from Brown University with the class of 1877. He was a prominent member of the Alpha Delta Phi fraternity while in college. After graduation he entered the wool business with his father and was in that business until three years ago when he retired. Oct. 15, 1879, he married Louise Lyman Aborn, the widow and three daughters survive him.

#### NEW PUBLICATIONS.

TRANSACTIONS of the Association of Civil Engineers of Cornell University for 1901 has just been published and contains addresses by non-resident lecturers, miscellaneous papers, and the membership list of the association. Its leading article is on the "Development of Iron Bridge Construction," by Charles S. Davis, C. E., and is followed by a description of the "Buffalo Breakwater," by Maj. Thomas Symons, U. S. Corps of Engineers, "Some Observations on Interurban Electric Railways," by Walter J. Sherman, C. E., and a number of other articles on civil engineering subjects.

THE TECHNOGRAPH, published annually by the engineering societies of the University of Illinois has just reached its 15th number, which has appeared for 1900-01. Price 50 cents. The book is a neatly printed magazine of 150 pages, many of which are illustrated. The leading article by W. L. Abbott, a graduate in mechanical engineering, is on the internal speed variation of a 3,500 h. p. vertical cross-compound engine. There are also a number of articles in relation to electrical engineering, among which may be mentioned the Regulation and Adjustment of Arc Lamps, by M. E. Chester, Electrically Operated Railway Signals, by F. J. Postel, An Inexpensive Mirror Galvanometer, by Prof. A. P. Carman, Regulation of Alternators Under Variable Reactive Loads, by G. W. Redfield. The other articles cover quite a broad range of engineering subjects.

UNIVERSITY OF TENNESSEE RECORD for April, 1901, comprises a special engineering number, all the articles being of an engineering and technical character. The leading article, which is a plea for technical education in the South, gives some interesting statistics of the vast agricultural and mineral productions of this section of the country and its correspondingly small, though growing, manufacturing industries. The South presents a most important field for textile, mineral and other branches of manufacture, and intelligent workmen in the field of engineering are always needed to develop industries out of natural wealth and resources.

INVESTOR'S MANUAL for 1901 has been issued by the Economical Publishing Co., of Chicago. It contains financial and other statistics of a large number industrial and railway corporations. The book is published annually in May, the price being \$1.00. It is specially complete in its report of Chicago corporations and contains very complete details of the street railway, electric light, gas and other public utility systems.



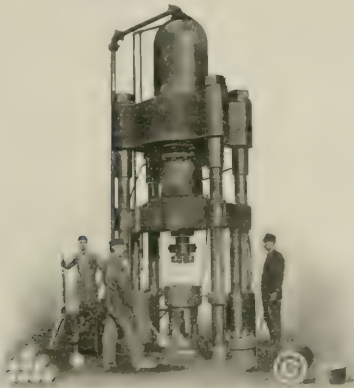
### NEW LOS ANGELES INTERURBAN.

The Interurban Railway Co., of Los Angeles, which was incorporated last month, proposes to build a number of interurban lines connecting Los Angeles with neighboring towns. Mr. F. E. Trask, of Los Angeles, is first vice-president and general manager of the new corporation, and is taking active measures to complete the lines to Santa Ana and to Long Beach as soon as possible. The new company has acquired by purchase the Santa Ana & Orange Motor Co., including the road now in operation as well as the buildings, equipments and franchises of the latter company. Mr. Trask states that almost all the rights of way have been secured for the proposed lines and that the work of construction will be pushed rapidly. He believes the line between Los Angeles and Santa Ana will be in operation in 90 days.

Mr. E. I. Tolle, manager of the Santa Ana & Orange Motor Co., will continue in that position. He is very sanguine of the success of the enterprise under its new auspices, the present arrangement being the fulfilment of the plan for which he has been working for many months.

### GEAR AND PINION MAKING.

The last decade of the nineteenth century was a period of great progress in the mechanical arts, and particularly in the application of electricity to street railway service. Many useful devices have

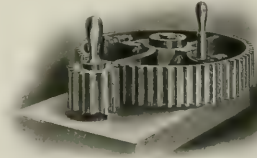


PRESS FOR GEAR MAKING.

been invented to fill the needs of street railways and among these is the patent pressed steel pinion made by the United States Projectile Co., of Brooklyn, N. Y. The object of the company was to produce a pinion that would be tough and more durable than

permit of accurate results being obtained. A pressure of over a million pounds is used to solidify and toughen the metal, and the company states that this process permits of using a steel much higher in carbon (and therefore harder) than can be cut to advantage in making cut pinions; at the same time the heavy pressures used give the steel a continuous grain that adds to the wearing qualities. The company also makes cut pinions for those who prefer them.

The patent pressed pinions have given such great satisfaction during the eight years they have been on the market, and in con-



DEVICE FOR TESTING GEARS.

sequence of the demand for a first-class gear to work with them the United States Projectile Co. installed a gear making plant. The gears are made of open hearth cast steel, accurately fitted and bolted together with eight bolts, each bolt being supplied with lock washers and cotter pins, provision also being made to prevent the head of the bolt from turning. The patterns are of up-to-date and of heavy design, and the gears are accurately cut on the latest and most improved machinery.

Although the company has had the gear plant in operation for a few months only, it has been compelled to run day and night to fill orders and this fact shows that the high standard of the goods is appreciated by the street railways.

### FATAL COLLISION AT ALBANY.

On Sunday, May 26th, two heavily loaded electric cars of the Albany & Hudson third-rail system met in a head-on collision at the apex of a curve, neither car being visible to the motorman of the other until the two cars were upon each other. Both cars were running at a high rate of speed in order to reach turnouts and both were well filled with excursionists out for a holiday. Both motormen and three passengers were killed, and 15 passengers were reported seriously injured, while almost all of the 120 or more passengers were slightly hurt. Both of the cars were totally wrecked.

The south-bound car left Albany at 4:30 o'clock, and the accident took place at 5 o'clock. The motorman of the south-bound car reached one of the switches, where he should have waited, but seeing no north-bound car, decided to take chances and go on to the next siding. It was at a curve between that the two cars met.

### GERMAN ELECTRIC RAILWAY STATISTICS.

Statistics published by the Electro-Technical Journal show that on Sept. 1, 1900, 99 German cities had electric railways; it is estimated that on Jan. 1, 1901, 107 cities were so supplied. In 1891, the number of such cities was 3; in 1895, 32; in 1899, 88. The last year has also witnessed a very large extension of existing systems. On Sept. 1, 1900, the length of track was 1,793 miles, against 1,280 miles in 1899. The number of motor cars was 5,994 (4,504 in 1899) and of trailers 3,962 (3,138 in 1899). The aggregate power of the electrical plants was 75,608 kw., against 52,500 kw. in 1899. The power of the accumulators was 16,800 kw. (13,532 in 1899). The system of overhead trolleys is used almost universally. The combined system of trolleys and accumulators has not been satisfactory. Three cities—Berlin, Dresden, and Düsseldorf—have short lines with underground conduits (2.1 miles in all). Only three lines use accumulators exclusively.



could be made, were it necessary, to cut the teeth. The method of manufacture is simple and will be readily understood from the accompanying illustration. The diagram is constructed to be

## Exhibits at the Pan-American Exposition.

### AMERICAN VITRIFIED CONDUIT.

The American Vitrified Conduit Co., 39 Cortlandt St., New York, has a prominent and interesting exhibit of numerous styles of vitrified underground conduits. This company, which is among the oldest in the business, has made rapid strides in the variety of forms of its products, all of which are included in its exhibit. Its leading article of manufacture is the multiple duct conduit, and while multiple conduits up to 6 ducts are well known on the market, this company has succeeded in making perfectly formed multiple duct conduit in 9, 12 and 16 ducts, comprising complete systems in themselves. These permit very rapid and solid construction and it is claimed that the use of the square duct hole renders the drawing of the cable through them with one-third less frictional resistance than with the round hole, and it also carries 25 per cent more cable than a duct with a round hole. The multiple pattern also requires no cement between the ducts, and in construction does away with the necessity of concrete on the sides of a conduit system.

This company furnished last year all of the conduit for the subway commission of Baltimore, Md., which amounted to over five million feet; it also furnished upwards of three million feet to the Narragansett Electric Light Co., Providence, R. I. The Boston Elevated Railway Co., Boston, Mass., the Massachusetts Telephone Co., Boston, Mass., and the Worcester Electric Light Co.,



Worcester, Mass., were among other large users last year. For the present season the Rapid Transit Tunnel in New York, which requires twenty million feet, the Manhattan Elevated, New York, which requires over two million feet, the Metropolitan Street Railway Co., New York, the Keystone Telephone Co. and the Girard Estate, of Philadelphia, have all purchased the conduit from this company.

The American Vitrified Conduit Co.'s factory has a very extensive capacity equal to almost any emergency, and it is in operation both day and night. The company also has a plant in Ohio, from which the Western trade is supplied. In addition to the multiple ducts the company makes a full line of single duct conduit known as the heavy single self-centering, in 18-in lengths, and the common single duct with butt ends in 18-in. lengths. This exhibit is in charge of Mr. Wardell E. Brown, who looks after the construction interests of this company, and is well known in the trade.

### ARNOLD POWER STATION CO.

The Arnold Power Station Co., of Chicago, has an attractive exhibit which gives the visitor an admirable idea of the field covered by the company and the work it has done in engineering and contracting. The exhibit occupies a corner with large wall space, on which are shown general drawings of various power station and railroad shop installations made by the company. In the front of the exhibit, on a counter, are aluminum operating models of some of the principal stations, showing the Arnold system in its method of operation. There are also some magnetic clutches on exhibition, and some other features of power station design.

### GOLD CAR HEATING CO.

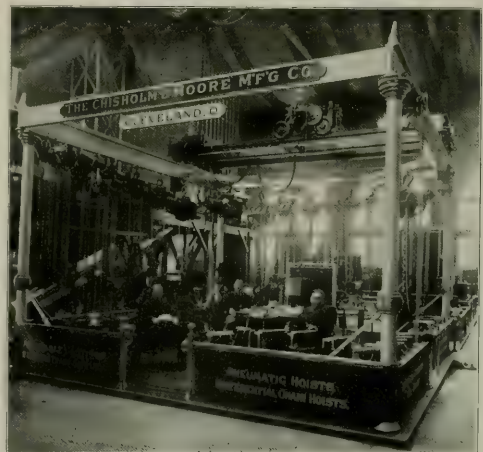
The Gold Car Heating Co., of New York City, is fitting up an attractive booth in the Railway Terminal Building. The display will comprise electric heating apparatus for street cars, staterooms of steamboats, offices, dwellings, etc. The car heaters are shown in operation as applied to longitudinal and cross seats. The even



and agreeable temperature that is maintained with Gold apparatus irrespective of the outside temperature has brought these heaters into great favor with street railway managers, and the company is booking orders from all over the country. The Gold company is also showing its steam heating apparatus for steam railroad trains.

### CHISHOLM & MOORE MANUFACTURING CO.

The Chisholm & Moore Manufacturing Co., of Cleveland, O., has one of the most complete and interesting displays in Machinery Building. The exhibit consists of the following: One pneumatic traveling crane of 5 tons capacity; four pneumatic wire rope hoists of 1½, 3, 5 and 10 ton capacity; two pneumatic motors of 10



ton capacity, one in operation and one open showing its construction; two pneumatic drills, one of three cylinders, and one of two; 13 Moore anti-friction differential chain hoists, from ½ ton to 15 tons capacity; six direct, differential chain hoists of from ¼ ton to 3 tons capacity; 35 American standard rail joints for both T and

girder rails, some of which joints are of new design; door hangers, elevator locks and a fine display of malleable castings. A new specialty is a pneumatic switchboard which enables any number of pneumatic cranes to be operated by one attendant from any central point. The company has recently put in two of these switchboards for the American Bridge Co. Col. W. E. Ludlow, manager of the railway department, who is well known in the street railway field, had charge of the installation of this display and may well feel proud of the result of his efforts. Mr. Frank A. Draper, who has had an extensive railway experience, and who is now Mr. Ludlow's assistant, has taken charge of the exhibit, and all of the company's many friends are invited to make this booth their headquarters.

#### PANTASOTE CO.

The Pantasote Co., of New York City, is located in Manufacturers' Building, where it has an elaborate display of pantasote as utilized for upholstery purposes. Several styles of easy chairs finished in pantasote are included in the exhibit, and many words of admiration are heard from visitors who are attracted by the beauty and evident durability of this material. The company also has samples of pantasote curtains with silk lining designed for the win-



dows of parlor street cars, or wherever a rich and beautiful curtain is desired. Pantasote in a great many instances is taking the place of plush as a covering for car seats, its firm, clean surface rendering it very popular for this service. Mr. W. L. Bretton of the New York office, is representing the company.

#### GILBERT WIRE CLEANER.

The Gilbert trolley wire cleaner will be found in the western end of Electricity Building. This device which is made by P. H. Gilbert, of Scranton, Pa., consists of a short secondary trolley pole carrying a sleet cutting trolley wheel, and designed to be attached to the regular pole in such a manner that the sleet wheel will precede the regular wheel and free the wire of all snow and ice.

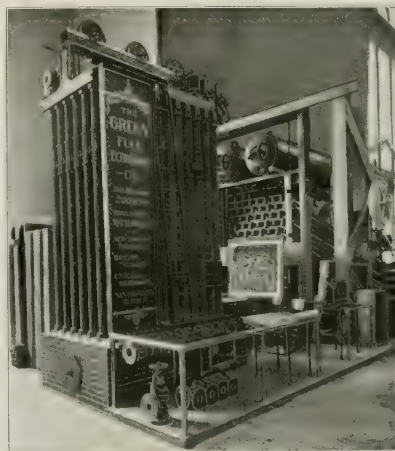
#### SCENIC RAILWAY.

L. A. Thompson, of New York City, builder of scenic railways and other similar attractions, has one of his popular railways on the Midway, and it has become one of the best patronized features of that now famous street. Mr. Thompson has purchased a large amount of new scenery and novel effects, which are placed in the several chambers and which cause so much delight and merriment to the riders as the cars dash by on this most exhilarating ride. In connection with this attraction Mr. Thompson has combined an "Aquarama," or scenic water way, which occupies the lower part of the structure devoted to the railway. While riding down this miniature river in an open boat, the passengers glide by realistic scenes from the principal countries of the world, passing from

time to time through pitch dark tunnels, which seem to be more appreciated by the young people than the scenic effects. One noticeable feature in connection with these two attractions is that every one, both old and young, leaves the boat or car with a smiling face, good evidence that the trips have been enjoyed.

#### GREEN ECONOMIZER CO.

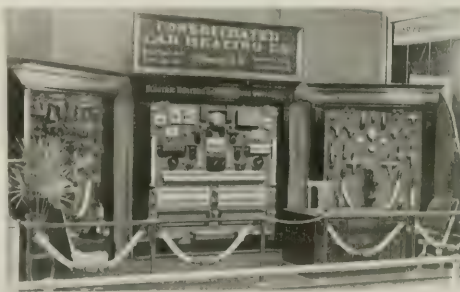
The Green Fuel Economizer Co., of Matteawan, N. Y., has a full size 250-h. p. Green fuel economizer in operation at Machinery Building, where the company will be glad to furnish facts and figures in support of its claim that by using a Green economizer for heating the feed water by means of the waste gases, the fuel



bill of the power station can be reduced from 10 to 20 per cent. A miniature working model of a 120-pipe economizer is also exhibited, by means of which the course of the hot gases and of the feed water is made evident. The excellent grade of material utilized in making this apparatus is exemplified by specimen castings showing cross and longitudinal sections of the pipes, all of which are tested to 500 lb. pressure per sq. in. before they leave the company's works. The class of orders which the company is taking is illustrated by a large framed blue print drawing of the installation of Green economizers at the new station of the Manhattan Railway Co., New York City.

#### CONSOLIDATED CAR HEATING CO.

The Consolidated Car Heating Co., of Albany, is in the Railway Terminal Building, the chief feature of its booth being three sam-



ple boards. The one of special interest to street railway men contain different types of the company's electric heaters for cars with



either longitudinal or cross seats, as well as hangers for attaching heaters to different styles of seats; special three-way regulating switches; double-switches for heavy currents; and a special connection for joining up the electric heaters in elevated railway trains. One of the other boards shows samples of automatic traps, sections of traps, and the Sewall pipe couplers employed in steam heating work. The third board contains drums and apparatus for use with hot water heating systems. Electric heaters are also shown actually applied to car cross-seats, one of the seats being of the Hale & Kilburn type and the other made by the Heywood Bros. & Wakefield Co. Mr. W. H. Fulton, mechanical inspector for the Consolidated company, is in charge of the booth.

#### GENERAL ELECTRIC CO.

The General Electric Co. has a comprehensive exhibit occupying the northwest corner of Electricity Building. The principal fea-

ture of the exhibit is, of course, the 5,000- h. p. transformer plant which transforms all of the current used by the Exposition company in the lighting scheme of the building and the grounds. This company has shown exhibits presenting a few of the most novel and recent developments in the practical field, showing such apparatus and appliances as have been perfected in the last few years and become recognized as of real importance commercially.

One of the popular features of Electricity Building is the four motor car equipment with electric brakes shown in this company's space. Two standard trucks for each electric car are shown supporting a platform on which are all of the devices of a standard car equipment. The trucks are operated by four 58 h. p. G. E. 67 motors with electric brakes. These have two B-19 controllers located one at each end of the frame on the trucks. Current is taken from a section of grooved trolley wire which is actually installed with various line material made by this company. An interesting fact is here illustrated that when the motors are running full speed, the trolley may be pulled down and then when the electric brakes are thrown on, the wheels come immediately to a standstill, thus showing that these brakes work independently of the trolley circuit.



VIEWS SHOWING THE EXHIBIT OF THE GENERAL ELECTRIC CO.

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Visitors looking for information on electrical railway motors will undoubtedly spend considerable time at the General Electric exhibit. They will find here an actual working example of the train control system of this company with two G. E. 66 railway motors and controllers representing all the apparatus required for operating a single car by the General Electric system of train control. It illustrates in a practical manner the fact that this system applies equally well to one car or to several in one train. The company's sectional third rail system is also fully illustrated by an actual installation of contact rails and sectional switches. The

Electric air compressors are now being used by so many roads, that this company now makes electric air compressors, and has shown a standard type known as CP-12 operatively connected. The fact that compressed air is so useful for cleaning about car houses is practically illustrated in the company's space, where this method of cleaning and dusting is used.

The latest form of trolley motors of various capacities made by the General Electric Co. are also shown. The wide use of the General Electric Co.'s standard appliances has necessitated the development of a wide range of instruments, switches, etc., for use on switchboards of all classes of electrical work and they have made a most interesting exhibit of this material. Of course, the large switchboard in the transformer plant comprising both high and low tension panels with the oil break switches are of exceptional interest, but this switchboard being in service during all the open hours of the Exposition, renders it difficult for visitors to inspect the fittings as fully as they may desire. The same may

be stated of the several switchboards for different apparatus in the working part of the company's exhibit. Therefore, the company has made a special exhibit of switchboard appliances on blue Vermont marble panels conforming in design to the standard switchboards. This contains samples of each of the various types of measuring instruments made by this company with recording wattmeters, frequency indicators and other notable appliances of recent development. There are switches and circuit breakers of various designs for high and low tension work, and oil break switch being arranged so that the fullest examination may be made. One of the company's new cabinet panels is also shown. All of this material is of standard construction used by the company in filling orders, and visitors will therefore be able to form an accurate idea of the various finishes and forms of instruments which are furnished regularly by the company.

The company's line of small motors is indicated in the display of alternating and direct current motors for various apparatus, many of them being operatively connected to machines of various types for household and shop use. The exhibit also contains a motor generator set of the type extensively used for charging automobiles.

The General Electric Co. furnishes a great deal of material for mines, notably mining locomotives and motors for mining pumps and mining hoists, and considerable attention is attracted by the 10-ton mining locomotive shown at the Exposition. This is a standard locomotive and of a type widely used, the one shown being already sold to the Union Pacific Railway Co., to whom it will be delivered after the Exposition closes. The hoist and the pump are the latest design and fully equipped with the company's motors and controlling devices.

Other exhibits include a complete installation of the company's series alternating enclosed lighting system, compensated type of generator in 100-kw. and 200-kw. sizes, the C. R. regulator, various types of lamps, marine apparatus and a comprehensive display of electric apparatus for mining.

In the foreground of one of our views of the company's exhibit is one of the nickel steel forged rings to be used for the new Niagara Falls generators now building by the company.

#### MORRIS ELECTRIC CO.

The Morris Electric Co., of New York City, is making in Electricity Building a comprehensive display of the many street railway supplies and specialties which it handles as manufacturers' agent. Prominent among these are the following: Poles, brackets and cross arms of the Electric Railway Equipment Co.; overhead material, "Aetna" and "Hecla" railway insulators of the Albert & J. M. Anderson Manufacturing Co.; "Kerite" wires and cables, made by W. R. Brixey; switchboard instruments of Keystone Electrical Instrument Co.; brake shoes of Wheel Truing Brake Shoe Co.; Garton lightning arresters and kicking coils; "Monarch" single and double fare registers; the "Elden" circuit breaker; Wood's platform gates; Beverly ratchet clutch brake handles and ratchet clutch vertical brake wheels; "Falcon" fans; "Mason" vitrified salt glazed terra cotta conduits, made by Potomac Terra Cotta Co.; Morris rail bonds; hydraulic rail punches and hydraulic "Solderless" splicing press of the Splice & Terminal Co. The exhibit is tastefully arranged, most of the small specialties being mounted on heavy, polished boards for convenient inspection. The hydraulic splicing press is attracting particular attention, owing to the fact that with this machine wires, cables and bars can be spliced quickly, without the use of solder and without first heating the pieces.

#### GOULD STORAGE BATTERY COMPANY.

The Gould Storage Battery Co., of New York City and Depew, N. Y., has an exhibit in Electricity Building where it is showing what is said to be the largest storage battery cell in the world. The cell was made at the Depew works of the company, and an idea of its size will be had from the following: Weight of element, 5,752 lb.; weight of tank, 1,100 lb.; weight of acid, 1,808 lb.; total weight of cell, 8,750 lb.; capacity, 10,000 ampere hours; discharge, 2,000 amperes for 8 hours or 18,000 amperes for 20 minutes. The cell is shown in operation. The company is also exhibiting samples of all styles of the Gould battery plates, both formed and unformed, and also samples of cells and parts. The Gould company has re-

cently furnished a battery containing 2,000 plates for the new plant of the Lansing (Mich.) Street Ry.

#### HAZARD MANUFACTURING CO.

The Hazard Manufacturing Co., of Wilkesbarre, Pa., and New York City, maker of wire and wire rope, is showing samples of its products in Electricity Building. These include magnet wire, rubber covered and weatherproof wires and cables, telephone and telegraph wire, submarine and aerial wires and cables for all purposes. In the background of the booth is a sample board of steel and iron



wires. The Hazard company supplies all the rigging for the yachts built at the Herrshoff works, and the company takes particular pride in the fact that the successful defenders of the championship cup for several years have been rigged with Hazard ropes. The company supplied 2,000,000 ft. of wire for the fire and police telephone system on the Exposition grounds.

#### STANDARD UNDERGROUND CABLE CO.

The Standard Underground Cable Co., of Pittsburg, Pa., has four handsome cases in Electricity Building. One is devoted to its street railway products; one to electric lighting and power supplies; one to telephone cables and one to telegraph and fire alarm wires and cables. The street railway case includes the following: Samples of special trolley wire; corner junction box for street railway distribution; "Able-on" terminal with wall bracket



for protecting ends of cables; spider terminal base for clamping to top of pole; rubber covered wires and cables; multiple conductor cables; lead covered cable connecting bars, as used in underground junction boxes for connecting sections of cables; and magnet wire for armature and field winding.

#### ELECTRIC STORAGE BATTERY.

The Electric Storage Battery Co., of Philadelphia, has a booth in Electricity Building, the main feature of the exhibit being a modified compound 80-kw. booster for regulating the storage battery load in street railway power stations where batteries are used.



There are also shown different styles of cells ranging from 4,000 ampere hours down to 4 ampere hours in capacity. At the back of the booth is exhibited the company's end-cell switch for use in Edison lighting systems. The Electric Storage Battery Co. supplied the batteries installed in the sub-stations of the Buffalo Ry.

#### BIERBAUM & MERRICK.

The Bierbaum & Merrick Metal Co., of Buffalo, makes an exhibit illustrative of the uses to which its "Lumen" bronze metal has been put. This metal is a bearing bronze whose compressive and tensile strength is about 20 per cent higher than that of brass. It has a low coefficient of friction and when used in bearings is



guaranteed not to cut the journal or pin. Samples of "Lumen" journal and axle bearing castings are displayed and also a number of the "Ideal" trolley wheels which this company makes. One of the specimens shown is a rough "Lumen" casting which has been in service for 30 days in the bearing of a Brill truck without heating or cutting the journal. Bearings cast of this metal do not require an inside lining of any other material whatever.

#### AMERICAN STEEL & WIRE CO.

This company, whose name is known throughout the world, shows a complete line of its products from the raw material to the finished article, in iron, copper and zinc ores, coal, coke and limestone from its own mines, ovens and quarries; also steel and copper wires of every size from the rod to .001 in., in steel wire, and .003 in. in copper. A splendid showing is also made of pig iron, ingots, blooms, billets, steel plates and sheets, skelp, steel hoops and bands, spring and tire steel, "Juanita" horse shoes, cold drawn shafting, round, flat and odd shaped wires, tinned mattress wire, bright annealed and galvanized stone wire, bottling wire, weaving wire, standard and miscellaneous wire nails, brads, special nails, spikes, wire tacks, staples, florist's wire, wire bale and shook ties, wire hoops, woven wire fencing, wire gates, barbed wire, poultry netting, wire ropes, and strands, galvanized wire clothes lines, electrical wires and cables, rail bonds, springs, furniture springs, music wire, covering wire, magnet wire, lamp cord, telegraph and telephone wire, spooled wire, structural steel, card wire, tinned broom wire, aluminum wire, needle wire, copper trolley wire. Among the so-called by-products are venetian red, copperas and oxides of iron.



The central feature of this exhibit is a magnificent Pagoda of bronze in which, in panels, are displayed the samples of many of the finer products. The exhibit, which is in Machinery Building, is in charge of Mr. N. H. Van Sicklen, of Chicago.

#### BULLOCK-WAGNER SALES DEPARTMENT.

The Sales Organization of the Bullock Electric Manufacturing Co., of Cincinnati, and the Wagner Electric Manufacturing Co., of St. Louis, has made an exhibit covering the full line of products of the two companies. Of the Wagner make, are shown the following: one 175-kw., 1,100 to 1,850-volt, oil-filled, water-cooled transformer; one 100 kw., 2,200 to 148 to 180-volt, air-blast transformer, 22 of which type are now being installed at the plant of the Castner Electrolytic Alkali Co., of Niagara Falls; six sizes Wagner standard transformers, ranging in size from .6 kw. to 25 kw.; five Wagner, single-phase, self-starting motors, of different sizes, designed for use wherever constant speed motors can be employed; a panel on which are mounted Wagner instruments of various types, including ammeters, wattmeters, voltmeters, ground detectors, etc. For the Bullock Company is exhibited: one 150-kw. direct current, engine type dynamo; one 25-kw. engine type dynamo; one 30-kw., belted type, compound-wound machine; a line of direct-current, enclosed type motors, ranging from 2 h. p. to 50 h. p., all of which are fitted with a reaction type brush holder; one 20 h. p., 240-volt, 600-r. p. m. motor; one 3 h. p., 240 volt, 900 r. p. m., back-gear motor; one printing press controller. In the background of the booth is a handsome electric sign showing the shield and names of the companies, and flashing four different colors. An interesting collection of photographs, showing various kinds of Wagner



and Bullock apparatus, is also exhibited. Messrs. F. B. Smith and L. J. Rehnapp are in charge of the booth, which is near the center of Electricity Building.

#### J. G. BRILL CO.

One of the most interesting features of the exhibit of the J. G. Brill Co. is the 28-ft. semi-convertible car, which type is one of the latest productions of the Brill shops. It is the design and invention of Mr. John A. Brill, and will no doubt attract a great deal of attention, because in spite of all the numerous disadvantages

two Dedenda gongs, the Brill angle iron buffers and headlights in each vestibule. The finish over the windows inside is in handsomely figured mahogany and the finish of the entire car is very elegant. In the "Review" for March, page 173, we illustrated a car of this type built by the Brill company for Washington, Alexandria & Mt. Vernon Ry.

The accompanying engraving shows the Brill convertible car exhibited at the Pan-American Exposition. This type has been extensively built during the last two years. It is used on some of the largest roads in the country, and its success has been marked. When closed it might be accurately described as a cross



BRILL CONVERTIBLE CAR AT-PAN-AMERICAN EXPOSITION.

of the forms already in use, the semi-convertible car is steadily growing in favor with the railway managers, as well as with the public. The new design (which aims to avoid all the troubles which railways have had with the old type of this car) provides a safe storage place for the glass in the roof of the car, where it is out of the way and perfectly secure. The sashes are raised with more ease than those of the ordinary street car, and when up they are entirely out of sight, securely held, and leave the car as completely open as any car of this kind. They can be lowered to place in the same way that the ordinary steam car sash is handled, and with no more effort. The body of the car is 28 ft. long, 7 ft. 8½ in. wide at the sills, and 8 ft. wide over the posts. The platforms are 4 ft. 8½ in. long and are completely vestibuled. The vestibules are furnished with double doors, which fold against the body of the car. The head linings are of clear, white maple. The seats are of the walkover pattern upholstered in green embossed plush. The seats are arranged to go between the windows, and the frame of the car is so disposed that a considerably greater inside width is available than is possible with any ordinary construction. The seat ends next the window rest upon the truss plank, which extends the whole length of the car body, and is firmly

seat, center aisle, standard box car. It is, however, provided with the steps at the sides. When it is necessary to use it as an open car, the glass and the side panels move along grooves into the roof, where they are completely hidden, and securely held. In the engraving of the exterior the right hand section of the car is shown open, while that at the left has the panels and windows down. This shows how perfectly the car conforms to each of the standard types. The body of the car is 28 ft. 4 in. long, 7 ft. 2



FORGED SIDE FRAME.

in. wide at the sills and 7 ft. 10 in. wide over the posts. The platforms are 4 ft. 8½ in. end, making the length over the dashers 37 ft. 9 in. The vestibules are round, sheathed with steel, and are provided with double doors folding against the body of the car. The openings also have Brill folding gates. The panels are of cold rolled steel, and the sills are sheathed with ½ x 7 in. steel sill plates. The interior finish, as made up, is very handsome, the wood work being mahogany, and the head lining of three-ply maple veneer. Great care was evidently taken in the selection of the grain, to make as handsome a background for the decorations as possible. The seats are upholstered in spring cane, and are of the Brill reversible pattern.

The exhibit includes the Brill 27-G truck, one of the features of which is that the side frames are solid forgings. Those interested in good blacksmith work will find these frames as fine samples of work as can be often seen. They are smooth, straight, and so perfectly finished as to often deceive experts into the idea that they are castings. One of the frames is also shown independently, and gives the visitor an opportunity for examining carefully the details of the workmanship. Special machinery of an expensive and elaborate type has been necessary, and long experimentation was required before it was possible to turn out such forgings commercially at reasonable figures. The truck embraces the latest features of the 27-G. The links are of the strap form, hooking under the spring seats. The nest spirals are used on the journal boxes, and full elliptics on the spring plank. These trucks are growing in favor on account of their safety and easy



BRILL 27-G TRUCK.

edge bolted to the sill, and also to each of the posts. This not only increases the width of the car, but greatly increases the strength. In the roof the posts are held together by the letter-board and an inside plate, which together have a cross-section nearly equal to that of the sill, giving a particularly strong construction. The car is mounted on No. 27-G trucks, which have wrought iron side frames. We note that there are two sand boxes,

riding under all conditions, and because of their convenience for the great variety of street and suburban conditions. Another forged frame is in the Brill exhibit. Considered as a forging it is an exceedingly difficult piece of work, and like the one previously mentioned, the accurate work and the intricate form make it well worthy of attention. It is intended for the "Eureka" maximum traction truck, and is a duplicate of those used in the truck of this kind, under the convertible car in the exhibit. The strength and uniformity of forgings makes them great favorites wherever they have been adopted.

The company has also on exhibition a No. 21-E truck, with the solid wrought frame. These trucks are almost too well known to railway men to need any description. Their easy riding is generally recognized. The wrought frames have made them favorites because the frame itself practically needs no repairs.

Other points of the Brill exhibit are draw bars, and the Dondena gong. The latter seems to deserve a much wider recognition among railroad men than it has had. The pedal locks fast, level with the floor, and is completely out of the way of the feet of passengers. It has the additional advantage that it is always ready for use, because the pedal cannot be taken out and lost.

#### NEW YORK CAR WHEEL WORKS.

The New York Car Wheel Works, of Buffalo, N. Y., has a very attractive exhibit of its standard "Machined" wheels for electric and cable cars and steam railway service in the Railway Transportation Building. This includes all diameters of wheels from the 12 in. used under transfer tables to the 36 in. intended for sweepers and snow plows in electric service, and from 26 in. truck wheels to 42-in. tender wheels for steam railway service. The company exhibits a number of wheels especially designed for electric roads running heavy cars at high speeds, those for the heaviest inter-

to 36 in. in diameter, weighing in all 2,950 lb., and suspended from a cast iron test bar 1 in. square and 12 in. between supports, made from the same metal as the wheels. A similar bar is cast by this company representing every wheel made, and this is broken in a regular testing machine, giving an exact knowledge of the strength of the iron in the wheel before it is shipped. The exhibit is attractively decorated with flags of the various countries of Europe where foundries have been established for making wheels under the same system, together with photographs of the works in the different countries.

#### MINIATURE RAILWAY.

The Miniature Railway Co., of 301 Broadway, New York City, has a popular exhibit, consisting of a three-mile miniature railway, running around the exposition grounds, with three stations on the Midway. This smallest steam railway in the world has been



named the "Northwestern Miniature Ry.," and the miniature trains, drawn by tiny but actually working steam locomotives, make regular trips from station to station. The road is doing a tremendous business, the principal patrons being, of course, the children, though many of the grown-ups take the opportunity of enjoying this novel ride. The miniature railway is coming to be very popular as an attraction for street railway parks.

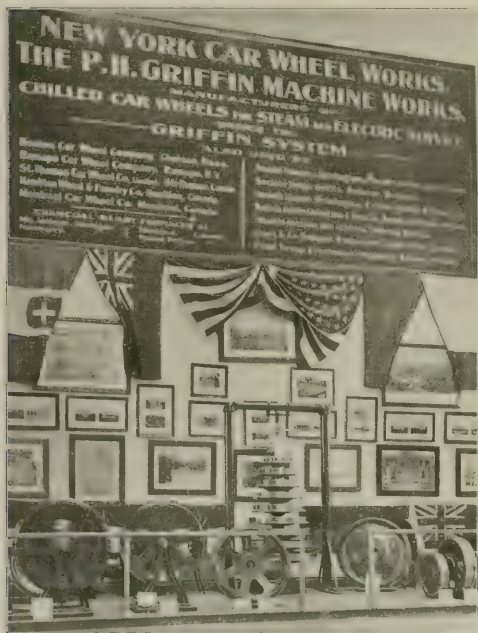
#### ERICSSON TELEPHONES.

The Ericsson Telephone Co., 296 Broadway, New York, is exhibiting a 50-subscriber switchboard and a number of its different telephones in Section S of the Electricity Building, and Mr. W. Jac Marland is in charge of the exhibit. It is showing its goods in connection with others in a collective exhibit which will undoubtedly prove of interest, and extends to all its friends and patrons a cordial invitation to visit its exhibit and talk over its instruments.

We are informed that the Ericsson telephone was awarded first prize at Paris, 1881; Madrid, 1883; Vienna, 1884; Stockholm, 1886; Copenhagen, 1888; Chicago, 1893. Also that its exhibit in Paris in 1900 was from the St. Petersburg, Russia, factory, which was also awarded first prize.

#### STANDARD PAINT CO.

One of the most interesting of the exhibits at the Exposition is the pavilion of the Standard Paint Co. This is inscribed with the American and European trademarks of the company and the names of the cities where the company has head offices—New York, London, Paris, Hamburg, Berlin, Sydney. The well-known rooster is in evidence. The pavilion is constructed entirely of ruberoid; the exterior walls are decorated in imitation of gray birch, with pilasters of oak; the interior walls and ceiling are painted in floral and allegorical designs and the flooring has a tastefully colored Grecian border. The company exhibits the P. & B. electrical compounds, insulating varnish and tape, P. & B. insulating papers, roofing, etc. This company always make a point of being well represented at all great industrial expositions, and the Pan-American is no exception.



urban service having single and double plates instead of spokes, which give increased strength, and which absorb more uniformly the heating action due to the increased braking pressures.

A most interesting and unique feature of the exhibit is a pyramid of wheels for electric tramway service ranging from 12 in.

## AMERICAN DISTRICT STEAM CO.

The American District Steam Co., of Lockport, N. Y., has taken space in Machinery Building and has an array of data and apparatus, instructive alike to the financial and the mechanical man. The exhibit is devoted to an exposition of the company's systems of direct and exhaust steam distribution in cities and villages for heat-



ing and power. A complete full size section of a 6-in. street main is shown with all the details, including the expansion joints, which are placed at frequent intervals to provide for expansion and contraction; street intersection and take-off joints; anchor "specials" which are the fixed points in the mains from which expansion takes place; and the company's standard insulation which consists of a wrapping of asbestos around the iron pipe, the pipe then being placed in a round tin-lined wood casing, having 4-in. walls, with a dead air space of 1 in. between the tin and the asbestos covered pipe. The company believes that by virtue of its 23 years experience in the steam heating business it is now in a position to give complete and reliable information in all matters pertaining to the economical distribution and supply of steam for warming stores, residences and buildings of all kinds, with profit to the power house owners and entire satisfaction to the consumer.

## PITTSBURG REDUCTION CO.

The Pittsburgh Reduction Co., of Pittsburgh, has taken space in the Manufacturers' Building, and is making a display that will appeal more directly to the general public. The adaptability of aluminum to the making of kitchen utensils, toilet articles, and useful and fancy bric-a-brac of all kinds is well demonstrated by the display of hundreds of different samples. The company also shows a pyramid of aluminum wires and cables, including all sizes from fine telephone wires to the largest street railway feeder cables. A pile of aluminum ingots weighing from 1 to 100 lb. each is also in evidence. The Pittsburgh Reduction Co. supplied the aluminum cables comprising the new high-voltage, three-phase transmission line between Buffalo and Niagara Falls.

## SAFETY CAR HEATING &amp; LIGHTING CO.

The Safety Car Heating & Lighting Co. provides a novel and interesting demonstration of the pleasant and efficient light given by Pintsch gas for cars, offices and dwellings. Part of the booth in the Railway Terminal Building is fitted up as a section of a dining car, with a table laid with heavy silver plate and cut glass ware, and all the other artistic decorations found in the modern railroad dining car. The readiness with which the Pintsch system lends itself to increasing these decorative effects is well shown. The Safety Car Heating & Lighting Co. has equipped nearly 3,000 cable and compressed air cars with the Pintsch light. The exhibit also includes the "Safety" system of hot water heating.

## PHOENIX IRON WORKS.

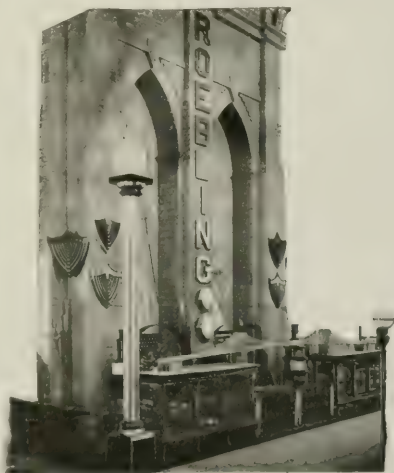
The Phoenix Iron Works Co., of Philadelphia, maker of the "Dick & Church" automatic cut off engine, boilers and heaters, is exhibiting one of its center crank, 20½x18 in. engines with sub base. The engine, which is rated at 400 h. p., is made extra heavy in all parts. The main bearings are 9¼x18½ in. and the crank pin 9¼x20.

## SPEER CARBON CO.

The "Speer" self lubricating motor brushes are shown in a small case at the exhibit of W. J. Marland, in Electricity Building. These brushes are known and used all over the world and have become standard on many leading street railway systems. The factory and headquarters of the Speer Carbon Co. are at St. Mary's, Pa.

## ROEBLING COMPANY.

John A. Roebling's Sons Co., of Trenton, N. J., is displaying in Machinery Building an extensive line of its wires and cables for electrical purposes, and iron and steel cables for bridges, hoisting and conveying. All the modern improved styles of telephone cables, electric light and power cables, for overhead and underground uses for currents from 1 to 50,000 volts, are included, as well as all the latest styles of regular and special shapd trolley wires. The central figure of the exhibit is a huge stone model, 40 ft. high by 60 ft. wide, representing the Brooklyn tower of the Brooklyn bridge, with the rest of the bridge, the New York tower and the city of New York shown in perspective. There is also a small model of the Brooklyn Bridge, 24 ft. long, built accurately to scale. This is the model exhibited at the Paris Exposition. The booth has been fitted



up with easy chairs, table, wash room and other conveniences, and the company invites all its customers and friends to make this their headquarters during their visit to the Exposition. Mr. G. W. Swan is representing the company.

## CONTINUOUS RAIL JOINT CO.

The Continuous Rail Joint Co., of Newark, N. J., is exhibiting a number of samples of its joint. The company claims for the "Continuous" joint that it has the fewest possible parts, and that the base plate, being an integral part of the joint, gives great horizontal and vertical rigidity, prevents any play between surfaces, and holds the rail ends in perfect line and surface. The booth is decorated with large colored sectional drawings of different styles of the "Continuous" joint, as well as with photographs taken in the Boston Subway, in which many of these joints are used.



### WEBER RAIL JOINT.

The Weber Railway & Manufacturing Co., of New York City, shows five sample joints as follows: Girder rail joint for 9-in. girder rail, also one for 6-in. girder rail; Weber standard joint for 85-lb. A. S. C. E. T-rails; insulated joint for track circuits applied to P. R. R. 100-lb. rails; and a step joint connecting a 100-lb. 5½-in. T-rail, with an 85-lb. 5-in. T-rail. The exhibit is in the Railway Terminal Building.

### LEA ELECTRIC MANUFACTURING CO.

The Lea Electric Manufacturing Co., of Elwood, Ind., displays on the main aisle in Electricity Building, its standard enclosed arc lamps for 110, 220 and 500 volt direct current; its miniature enclosed arc lamps for 110, 220 volts direct current, at 2½ amperes; and its alternating current lamps equipped with the "Northall" swinging cover. It is also showing the Lea self-contained automatic arc headlight for street railway suburban and interurban cars.

### CLING-SURFACE.

The Cling-Surface Manufacturing Co., of Buffalo, N. Y., is making a practical demonstration of the value of its belt dressing. at a booth in Machinery Building. Here it is shown that an average of 40 per cent more power can be transmitted by a belt treated with cling-surface than with one not so treated. This is proved by means of a 10-h. p. Westinghouse motor, driving by two 4-in. belts on its one pulley, two ¾-kw. dynamos, each running at 400 r. p. m. One belt is treated with cling-surface and the other is not, the exhibition demonstrating that the treated belt, although running so slack that the two sides nearly touch, does not slip in the slightest degree, while the untreated belt slips constantly, and does about one-half the work of the cling-surface belt under exactly the same conditions. The load on the machines consists of two banks of lamps at the back of the booth, either of which group



can be thrown on either of the two machines. The interests of the company are looked after by Messrs. Albert B. Young, William Dickson Young, and J. L. Harper.

### M'GUIRE MANUFACTURING CO.

The McGuire Manufacturing Co. is exhibiting an extensive line of its well known street railway car specialties, including snow plows and sweepers, various styles of trucks, fenders, brake handles, etc. One of the most striking items of this exhibit is the McGuire combination snow plow and sweeper shown in the accompanying illustration, of which there are now 500 in use by railway companies in all parts of the country. Included in the company's exhibit of trucks is one No. 39 A truck, one solid steel

"Columbian" truck and one maximum traction No. 3 truck. The 39 A truck is built with a solid steel frame in which there are no rivets used and in which there are no bolts under any considerable stress. These trucks are designed for use on high speed interurban cars and are provided with swing bolsters, elliptical and helical springs and are cushioned over the axles. The solid steel "Colum-



bian" truck exhibited represents the pattern of which there are more in use than of any other style built by the company. A noticeable feature of this type is that it contains remarkably few pieces, and in its construction the same plan is followed of avoiding the use of bolts which would come under heavy strain. The maximum traction No. 3 truck is of a lighter pattern than either of those described and is specially adapted for heavy city service. Although of a different type its general construction conforms very closely to the 39 A type. The company also exhibits one "Royal Flush" fender and one cushioned sliding fender, which are shown mounted on a car platform. The cushioned sliding fender is of a new design, in which the fender folds under the platform. There are two stoves for car heating on exhibition and the ratchet brake handles made by this company. Mr. T. J. Callinan is in charge of the exhibit.

### PROBABLE PURCHASE OF TOLEDO TRACTION CO.

Although no actual negotiations have taken place, it is probable that the Toledo Traction Co. will before long be purchased by the Everett-Moore syndicate. President Lang of the Traction company, states that this syndicate had asked for a price on the Traction company's property and that a price had been quoted. The same figure has also been submitted to a Baltimore syndicate at its request, but no negotiations have taken place with either party.

The Everett-Moore general scheme is to acquire all the electric lines between Cleveland and Port Huron, Mich., and from Cleveland south to Wheeling, W. Va., and all their suburban feeders.

### CLEVELAND-TOLEDO THROUGH LINE.

By means of a traffic agreement electric cars will soon be running through from Cleveland to Toledo and probably from Cleveland to Detroit.

The Everett-Moore syndicate has made a traffic arrangement with the Toledo, Fremont & Norwalk line under which the cars of the Lake Shore electric line from Cleveland to Norwalk and those of the Toledo & Detroit shore line northwest of Toledo may be run over the Toledo, Fremont & Norwalk tracks and those of the Toledo, Fremont & Norwalk may be run over the tracks of both the other roads.



THE MIDWAY AT THE PAN-AMERICAN.

### HOTEL ROCKFORD, BUFFALO.

Visitors to the Pan-American Exposition at Buffalo, will find excellent accommodations at the Hotel Rockford, situated on Main St., near Glenwood Ave.

The house is equipped with all the modern improvements, including electric lights and bells and elevators. From the roof can be had a magnificent view of the Pan-American electric display, one of the most marvelous features of the Exposition.

The hotel is located within about ten minutes' ride of either the shopping or theater districts, and about the same distance from the Exposition grounds. Transfers can be had from cars passing the house to Niagara Falls, and any part of the city can be reached in fifteen minutes.

The extensive patronage the hotel enjoys is due to a uniform study on the part of the manager, E. T. Rung, and all the employees, to do everything possible for the comfort and convenience of the guests. It is run on the European plan, the rate ranging from \$1 to \$3 per day.

### "PHONO-WIRE" ABROAD.

In a paper on the "Equipment of the Sheffield Electric Tramway System" read before the Northern and Midland Counties (England), Association of Tramway and Railway Officials, by A. L. C. Fell, general manager of the Sheffield corporation tramways, we find the following concerning "phono-electric" wire, one of the products of the Bridgeport Brass Works:

"We have lately erected some patent wire known as 'phono-electric.' So far excellent results have been obtained. The benefit derived is having the number of broken trolley wires reduced to a minimum. On the average it was found that the 'phono-electric' trolley wire gave about 50 per cent greater tensile breaking strength and withstood two and one-half times the reaction breaking strain of good hard drawn copper wire."

### CONSOLIDATION IN OHIO.

May 25, the properties of the Cleveland & Chagrin Falls Railway Co. and the Chagrin Falls & Eastern Railway Co. were purchased by the Cleveland & Eastern Railroad Co., and all three roads will in the future be operated as one system. Overtures for the sale of part of the stock of this system to the Everett-Moore syndicate have been made, and it is probable that these gentlemen will be included in the directorate of the reorganized company. Mr. R. L. Palmer, manager of the former companies, owns a franchise for an extension between Garrettsville and Warren, which was not included in this sale.

### UNION SUBURBAN RAILWAY DEPOT.

The Electric Depot Co., of Cleveland, O., which was recently incorporated with a capital stock of \$200,000, commenced work last month on the new depot building, mentioned in our March issue, which will be provided with every appliance for handling both passengers and freight. The offices of several of the suburban roads, it is stated, will be located in the new building. Cleveland will be the first city in the country to have a union suburban railway depot.

At Cleveland, O., an effort is being made by the City Council to oblige all street railway companies to sprinkle the pavement between their tracks.

The master painter of the Lexington (Mass.) & Boston Street Ry. states he finds the best cleaner for renovating the varnished surfaces of street cars is made by placing a cake of Babbitt soap in the bottom of a small tin pail, and adding a quantity of pulverized pumice, with sufficient water to form a suds. With a bunch of curled hair this suds may be applied energetically to the car body without danger of scratching the varnish.



## WESTERN ELECTRIC SUPPLY CO.

The accompanying illustration gives a general view of the new building of the Western Electric Supply Co. erected during the past year in St. Louis, Mo. It contains every modern appliance for the rapid and convenient handling of electrical supplies.

The building was erected under plans and specifications approved by this company. The walls are extremely heavy, the floors and columns being calculated to carry heavy loads; the upper floors are fitted up with shelving, bins and cases which contain all kinds of electrical apparatus and appliances, while the first floor is divided into general offices and the shipping department.

The offices are handsomely finished in natural oak, and present a very attractive appearance. The shipping room in the rear is especially large and convenient, and goods can be shipped from three different sides of the building. The elevator equipment is electrical, and the building has its own steam plant. The basement, 15 ft. in height, is finished with a granitoid floor, and has windows on three sides, furnishing abundant light. The entire



FACTORY OF WESTERN ELECTRIC SUPPLY CO.

building is equipped with a 25 station system of the intercommunicating telephones, so that one can sit at his desk and communicate with any part of the house.

In addition to this building the company has two large warehouses which are required to carry its very extensive stock of merchandise.

This company's growth has been unusually rapid. Organized in 1891, it has grown from a small house doing a purely local business, to one of the largest concerns of its kind in the country. The extensive stock of this company is composed of a thousand different articles used by the electrical trade, and embraces everything from a toy motor to a dynamo, including iron and copper wires and cables of all kinds, poles, cross-arms, arc and incandescent lamps, transformers, motors and generators of various sizes, telephones, switchboards, line supplies and construction material.

Among the supplies for which this company holds exclusive territorial agency are the Eddy Electric Mfg. Co., direct current dynamos and generators; the Warren Mfg. Co., alternating current apparatus; the John A. Roebling's Sons Co., copper and iron wires and cables of all kinds; the Indiana Rubber & Insulated Wire Co.,

rubber covered wires and cables; the Adams-Bagnall Electric Co., arc lamp; the Ohio Brass Co., railway overhead material; the Emerson Electric Manufacturing Co., alternating current desk and ceiling fans, and a number of others.

The company reports that its business this season has opened up in a most satisfactory manner, and that at the present time all of its different departments are crowded with orders.

It publishes a very complete set of catalogs and descriptive matter covering everything pertaining to the electrical supply business. Its general catalog is a volume composed of 1,100 pages, and is one of the largest and most complete catalogs ever issued by an electrical supply house.

It also issues catalogs devoted exclusively to electric railway supplies and construction material, to telephones and switchboards, to lighting supplies and to electric fixtures and supplies, any of which will be mailed upon request.

## CINCINNATI, NEWPORT & COVINGTON STATEMENT.

A condensed monthly statement for April, 1901, with a comparison with April, 1900, is given by the Cincinnati, Newport & Covington, as follows: Gross receipts, \$62,979, last year, \$60,183; operating expenses, \$27,112, last year, \$24,972; net earnings, \$35,867, last year, \$35,210; tolls, taxes, damages, etc., \$12,397, last year, \$12,314; net profit, \$23,469, last year, \$22,896; ratio of expense to earnings, 43 per cent, last year, 41; same including taxes, damages and rent, 50 per cent, last year 49.

## ARRESTED FOR SUNDAY WORK.

General Manager Warren of the Duluth-Superior Traction Co., with 12 men who were at work for the company in repairing track in violation of the Sunday labor law, were arrested and required to give bail to appear in the municipal court.

The corner where the repairs were being made is the transfer point to the East end, and from that direction over the other lines of the company. The track and street had been torn up, and the company officials felt in duty bound to replace the paving as rapidly as possible, so put on a crew Sunday. With the sand, paving blocks, etc., piled about, it was almost impossible for people to get into the places of business in the vicinity, and it was to obviate this condition that the company was rushing the work of repair.

Manager Warren said previous to being arrested, that he believed a majority of the people were in favor of the company making much needed repairs on Sunday, and that statement was substantiated by the talk about the corner where the arrest took place. The case will undoubtedly be carried to the highest courts.

## RAIL BOND TEST AFTER FIVE YEARS' SERVICE.

The Fairmount Park Transportation Co., of Philadelphia, whose track was installed five years ago, has just completed a thorough test of the conductivity of each rail bond on its line. The Weston instrument used measured both the drop in 3 ft. of unbroken rail and of the bond. The track was of 90-lb. rail, with standard angle plates and bonded with the "plastic" rail bonds. The tests were made by two men, one representing the road and the other the bond, to avoid all question as to the facts in the case.

On several curves the track was recently shifted, which evidently injured some of the bonds, nevertheless the total number of defective bonds was but 6 1/2 per cent of the entire number, making an annual rate of depreciation of 1.3 per cent. The conductivity of the rail including the joint compared very favorably with that of similar length of unbroken rail. A few joints were found on recently built track which had never been bonded. It is interesting to note that the rebonding of these defective joints, less than 200 altogether, out of nearly 4,000, reduces the average load from 2,700 amperes to 2,200, thus saving nearly one-fifth.

The excellent showing made by the "plastic" bonds after five years of severe service should be an effective reply to criticisms made concerning the durability of this bond.



### RAPID GROWTH OF THE PANTASOTE BUSINESS.

The accompanying illustration shows the factory of the Pantasote Co., maker of "Pantasote," the well-known substitute for leather. This product which has been on the market for nine years has been used by leading furniture makers, carriage and yacht builders, steamship lines, and many railway coach and street car makers, and is a substitute that has proven equal to and better than the article for which it was intended to serve. "Pantasote" has many distinct advantages over leather, being water-proof, stain-proof, germ-proof, and fire-proof. It does not rot, peel nor crack; it wears well and always retains a good appearance. Street car builders have found numerous uses for "Pantasote" for both utility and ornament which almost makes its use a necessity; besides its costs but half as much as leather. For upholstery purposes in street cars, "Pantasote" has no equal. It is a handsome material, soft, pliable, and exceedingly durable. It will not scratch and is defaced with difficulty. Under no conditions will it shrink, stretch, or stiffen.

Being a non-absorbent material, "Pantasote" will not collect nor hold disease germs, which makes it a desirable material with which to upholster seats and backs in cars that are meant for the use of the public at large. After many thorough and exhaustive tests of numerous materials, the United States Army officials have



FACTORY OF THE PANTASOTE CO.

chosen "Pantasote" for upholstering the army ambulances, having proved to their entire satisfaction that this material is germ-proof, and also unaffected by any climatic conditions.

When soiled, "Pantasote" may be washed with soap and water, making it like new. It may be soaked in water, hot or cold, fresh or salt, for any length of time and when dried it will be found unharmed in any way. The fact that it will stand all sorts of rough treatment with scarcely a sign of wear, and that it may readily be cleansed, makes it particularly adapted for street car upholstery.

This is an excellent material for car curtains. It is manufactured in a weight particularly suited for this use and being unaffected by the sun or any climatic conditions, it always remains the same. The curtains of a street car are continually exposed to much dirt and dust, and the fact that those made of "Pantasote" may be taken down and scrubbed, thus adding to their life and appearance, makes them most economical.

The Pantasote Co. has also prepared a large variety of embossed panels of this material that may be used for decorative purposes, such as head linings, etc.

This company, whose offices are at 29 Broadway, N. Y. City, will gladly send samples upon request to be tested in any way the purchaser may desire.

The Michigan Traction Co. is negotiating for the purchase of a site, at Kalamazoo, where the projected car houses may be erected.

The Atlanta (Ga.) Railway & Power Co. has subscribed \$800 towards paying the cost of the concerts given at Grant Park. This is the usual contribution of the company for this purpose.

### AMERICAN CAR & FOUNDRY CO. BUYS JACKSON & SHARP WORKS.

On May 18th the announcement was made that the American Car & Foundry Co., of St. Louis, had purchased the entire plant and business of the Jackson & Sharp Co., of Wilmington, Del., which will henceforth be known as the Jackson & Sharp plant of the American Car & Foundry Co. The business, including the manufacture of steam and street cars, ship building and architectural wood work, will be conducted along the same lines as by the former owner, though it is expected that the output will be considerably increased.

### FATAL ACCIDENT AT WILMINGTON, DEL.

At midnight on May 30th two closed cars of the People's Railway Co., of Wilmington, Del., returning from Brandywine Springs got beyond the control of the motorman while descending a long grade and collided with an open car proceeding in the opposite direction. The conductor of one car and one passenger were killed and fifty persons were reported more or less injured. It is stated that the brakes on the forward in-bound car failed to work and that when the motorman undertook to reverse the current the fuse was burned out; shortly after this the second in-bound car struck the other and the two then ran down the grade together until the open car was met.

### PECKHAM COMPANY ELECTION.

The stockholders of the Peckham Manufacturing Co. held their annual meeting last month and elected the following officers for the ensuing year: President and treasurer, E. Peckham; vice-president, C. H. Duel; secretary, George H. Bowers. Mr. Duel, the vice-president, who was commissioner of patents at Washington and resigned a few months ago, will take an active part in the affairs of the Peckham company and will have full charge of patent matters. The company is doing a large business and recently received an order for 60 of its extra heavy M. C. B. trucks from the Aurora, Elgin & Chicago Ry.; this, we believe, the largest truck order placed by a western interurban road.

### BOND WIRE THIEF CONVICTED.

The Winnebago Traction Co., of Oshkosh, Wis., which has recently had considerable trouble from thefts of bond wires, has secured the arrest and conviction of one of the guilty parties. Frank Mondl was charged with stealing copper bond wire from the tracks of the railroads to the value of \$102; as his defence he claimed that he bought the wire from a man named Bowen, who gave his home as Ohio, but professed not to know that the wire had been stolen. One count in the indictment charged Mondl with receiving stolen property, and he was convicted on this count.

### CHICAGO ELECTRIC TRACTION REPORT.

A report was filed last month by Mr. Charles Henrotin, receiver of the Chicago Electric Traction Co., for the first quarter of the year ending March 31, 1901. The statement of the receipts and expenses for this quarter show a deficit of \$1,632.

This showing is not regarded as discouraging, however, as the best business of the road usually comes with warm weather, when the open cars running through the South Side districts carry a large number of passengers. The road is now undergoing repairs by which the motive power of the line is to be changed from the storage-battery system to the overhead trolley, and the Court recently allowed an expenditure of \$250,000 for this purpose and authorized the issue of receiver's certificates for this amount.

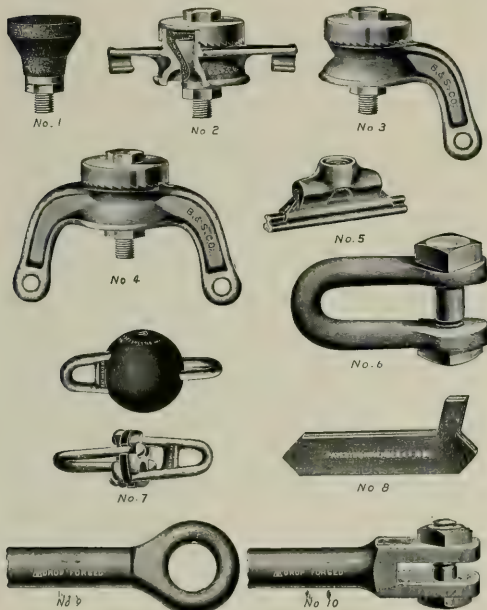
Several thousand dollars has already been spent on a new powerhouse equipment and the overhead wires, though it will take some time to complete the work.

The Salt Lake City Railroad Co. inaugurated a new Sunday schedule May 19th, whereby the same service is given on Sunday as on week days.

### BILLINGS & SPENCER LINE MATERIAL.

The type of suspensions now made by the Billings & Spencer Co. is the outgrowth of the combined study of an electrical engineer of a street railway and the late H. E. Billings. The railway company required a material not too expensive, a stronger type of insulating stud than that commonly used and one capable of resisting the influence of salt air. The present type of line materials known as the B. & S. has demonstrated by a number of years of satisfactory service that the requirements of the street railway are met in the material produced.

The conical stud, Fig. 1, is drop forged and is finished complete at the company's works. It will be seen at once that the weight of the trolley wire does not produce a shearing stress on the insulation. In conjunction with the straight line hanger, shown in Fig. 2, the conical stud has successfully withstood a stress of 12,000 lb. without breaking or affecting the insulation. This test was made by a foreign government without the knowledge of the company. A careful examination of the cut will disclose an important addition to the equipment of the hanger, viz., a spring for holding the cap in place, which insures against the liability of the



BILLINGS & SPENCER LINE MATERIAL.

caps loosening, thereby allowing the studs to become detached from the ears and the line to drop.

The B. & S. single curve and double curve hangers are illustrated in Figs. 3 and 4 and are made both in bronze and in galvanized malleable iron. They have shown long life wherever put in service and seldom or never require repairs. The trolley wire clip, Fig. 5, commends itself for either round or Fig. 8 sections of trolley wire, and is made of bronze or galvanized malleable iron. Its great merit lies in the ease with which it is fastened to the wire. There are many thousands of these clips in satisfactory service.

Fig. 6 shows the B. & S. link ball strain insulator, which it is claimed is the strongest pattern in the market. The metal parts are drop forged and galvanized and the insulation is ample. These insulators have been in great demand on account of their reliability.

The drop forgings of this company have long held an enviable reputation for good quality, and Fig. 9 shows a forged eye bolt designed specially for railway service. The shank is usually 12

to 17 in. long by  $\frac{5}{8}$  in. in diameter, and it is drop forged in steel or iron and galvanized. Fig. 10 illustrates a clevis bolt of the same dimensions.

A drop forged and galvanized frog pull-off is shown in Fig. 7. It is furnished as shown with machine bolt and one hole in the frog is threaded, thereby adding to the security of the bolt.

Fig. 8 shows one of the company's drop forged commutator bars which was patented in 1888. The superiority of drop forged segments was at once recognized and they were generally adopted. They are forged from a single piece of unalloyed copper and have a perfectly homogeneous structure throughout.

### WILLARD BATTERIES IN COAST DEFENSE SERVICE.

Early in the year of 1898, Sipe & Sigler, of Cleveland, O., makers of the Willard storage battery, were awarded their first contract for a Willard battery in the United States coast defense service. This battery was installed in Ft. Jasper, Charleston, S. C., and is in use as a lighting battery as well as in general coast defense service. A year later they were awarded a contract for a second large battery for like service which was installed in Ft. Terry, New London, Conn., and they have just closed a contract for furnishing four batteries of the same character to be installed in Ft. Williams, off the coast near Portland, Me. They have also just been awarded the contract for furnishing one battery in like service to be installed at Fort Adams, off the coast near Newport, R. I.

These orders for Willard batteries are sufficient evidence of their satisfactory performance in this class of service during the past three years.

Among the company's recent orders may be mentioned one large battery for municipal lighting for the city of Dawson, Minn., a large lighting plant for the Franciscan Monastery, Oldenburg, Ind., one battery for the operation of a combination fire apparatus wagon manufactured by the Fire Extinguisher Manufacturing Co., Chicago, Ill. The latter will be the largest battery ever used in the operation of a vehicle on the highway. The battery alone will weigh nearly three tons. The completed wagon will weigh more than seven tons.

The catalogue of the Willard storage batteries gives illustrations of a large number of battery plants installed by Sipe & Sigler and points to the extent to which they have been adopted as well as to the variety in which they are made. The number of services to which these batteries have been successfully applied are far too numerous to mention, but they are made in such a large number of sizes and styles as to be available for every use to which batteries could be applied.

### INFLUENCE OF RAPID TRANSIT ON CITIES.

A picture of the future of great cities as influenced by the development of rapid transit is given by Mr. H. G. Wells in a contribution to the London Fortnightly Review on the England of 2000 A. D.: "The influence of this rapid transit will be not to condense population, but to spread it out all over the land. Huge towns and cities will all but disappear, and the inhabitants will betake themselves to the country again. Hitherto the great cities have been confined, he points out, within a radius of about eight miles from the center; horse traction and bad train services have compelled it. Soon the radius will be thirty miles. The available area for even the common daily toilers of the great city of the year 2000 will have a radius very much larger even than that. Now, a circle with a radius of 30 miles gives an area of over 2,800 square miles, which is almost a quarter that of Belgium."

May 13th, the mayor of Janesville, Wis., vetoed the ordinance granting the Beloit, Delavan Lake & Janesville Railway Co. a franchise through the latter city. The mayor's objections were that under the ordinance as presented the railway company might establish a freight traffic through the principal streets of Janesville. The council, however, passed the ordinance over the mayor's veto, and so far as the city is concerned the franchise matter is settled for 50 years to come.

**NILES CAR & MANUFACTURING CO.**

In May the Niles Car & Manufacturing Co., of Niles, O., was incorporated with a capital stock of \$250,000 and will engage in the building of street and suburban electric, elevated and steam passenger coaches, and private, dining and chair cars. The officers of the company are: President, George B. Robbins; vice-president, A. B. McCorkle; secretary, C. P. Souder; treasurer, William Herbert; general manager, W. C. Allison; assistant general manager and contracting agent, G. E. Pratt; general superintendent of works, A. L. Jacobs. It is expected that the works will be completed by September and orders for late fall delivery will be taken as early as August.

The plant is located at Niles, Ohio, directly on lines of Erie, R. & O., and Pennsylvania roads, with switches running directly into the yards. An electric testing line will be built around the works to connect with the city electric road for testing purposes. The works will cover, outside of the lumber yards and sheds,  $4\frac{1}{2}$  acres and the capacity will be about two cars per day. The general dimensions of the building are: Erecting shop No. 1, is 134 ft. x 218 ft.; capacity, 43 cars. Erecting Shop No. 2 is 130 ft. x 202 ft.; capacity, 40 cars. Between these two shops will be a modern transfer table operated by electric power, and in connection with these two shops a large paint shop will be erected, to hold some 25 cars at once. The mill will be two stories, 130 ft. x 202 ft., the first floor of which will be equipped with the latest and most modern wood working machinery. The second floor will contain cabinet, upholstering, varnish and headlining rooms. Blacksmith's shop will be equipped with modern forges and appliances, conveniently distributed within the space of 35 ft. x 85 ft. The machine shop containing the latest improved machinery, is 25 ft. x 85 ft. The office building, two stories, is 35 ft. x 85 ft.; the first floor will be the general offices of the company; second floor, the draughting rooms. Overhead cranes will be operated by electric power and compressed air will be used throughout the shop for loading, unloading and for any other purposes found necessary. The shops will be lighted throughout by electricity, and protected against fire by automatic sprinklers. The dry kilns are of the latest improved make, with a capacity of 75,000 ft. and the dry rooms 40 ft. x 85 ft., with a capacity of 500,000 ft. The estimated cost of the plant is \$75,000.

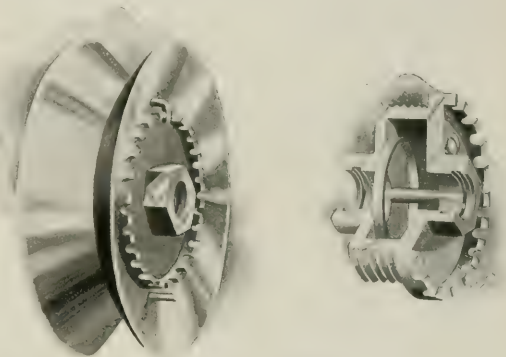
It is the intention of the company to furnish car equipments complete with trucks, and motor equipments, and to test them before leaving the works, so that when the cars are received at the destination they will be all ready to immediately enter service. The company will work in harmony with electric truck manufacturers, not building any electric truck of its own, and will afford every facility for storing trucks; electrical companies furnishing electrical equipments will also be assisted in every way. The policy of the company in dealing with its customers will be to furnish the very best equipment which can be built, with latest and newest designs in interior fittings, and where a contract is once made, and specifications clearly determined on, the company will not depart in any way from the specifications, but furnish the customer everything called for. It is the intention of the company to depart from the antiquated horse-car construction, substituting the most modern construction to withstand the present severe service required, especially in the case of suburban double truck equipments, and steel and iron will largely enter into the framing.

The general manager, Mr. Allison, has been engaged many years in mill work and the lumber business; he is also a practical business manager and thoroughly posted on shop management. The assistant general manager and contracting agent, Mr. George E. Pratt, is a practical locomotive and car man, with an experience of some 15 years in railroad construction and operation, and latterly as contracting agent for the Jackson & Sharp Co. All details and all business pertaining to contracts will be under his personal supervision, and he has announced that his policy will be to honestly fulfil all contracts and give customers the best facilities possible for inspecting the work at all times. Mr. Pratt has resigned his position with the Star Brass Works, in which he is personally interested, the resignation taking effect July 1st.

The superintendent of the works, Mr. A. L. Jacobs, and the chief draftsman, are both men of long experience in car building and designing.

**KUHN TROLLEY WHEEL.**

The accompanying illustrations show a new trolley wheel made by Robert Kuhn, Eighth St. and McLean Ave., Cincinnati, in which the principle of the ring oiler is embodied. Heretofore the ring oiler has only been useful when resting upon a revolving shaft. The ring being revolved by the revolution of the shaft, but in this trolley wheel the conditions are changed. The shaft remains at rest while the wheel revolves. The central portion of the wheel consists of a hollow chamber, which is filled with oil. The walls of the chamber are connected by a strip of brass on which the ring rests, this brass strip is known as a bridge, and as the wheel revolves the oil is carried by the centrifugal force to the outer rim of the chamber. The bridge revolves with the wheel and with each revolution strikes the ring, thus driving it forward a fraction of the revolution each time. The outer portion of the ring is submerged

**KUHN TROLLEY WHEEL.**

in the oil, and as the ring revolves the oil is carried to the shafts. In the bearing it is collected by the grooves and from the grooves are ducts leading to the oiling chamber. No oil is wasted and one supply of oil will last indefinitely and give perfect lubrication. A great deal of the trouble from the trolley wheels is due to poor lubrication or no lubrication at all.

The wheels are made of high grade bronze, and as the central portion outwears the rim the design is such that a new rim may be placed on the old center. The maker announces his willingness to supply samples upon application.

**RAILWAY SWINDLER INDICTED.**

In the "Review" for May, page 289, there was described the arrest of two noted railway and accident insurance swindlers, Gilbert J. Moffett and Joel E. Emerson. Mr. Franklin J. Moore, who was instrumental in securing these arrests, recently appeared before the federal grand jury in Windsor, Vt., where he was successful in securing the indictment of Emerson for swindling the General Accident Assurance Corporation, of Scotland, of which Mr. Moore is assistant United States manager.

**AURORA-ELGIN LINE COMPLETED.**

The Aurora Street Railway Co. completed the suburban line connecting that city with Elgin, Ill., last month, and through cars are now running between these points. For use on the line the company has ordered four new cars which are of a handsome design. They contain smoking compartments and are equipped with four motors instead of two as on the other cars of the company, and are run at a high rate of speed. This is a part of the system of the Aurora, Elgin & Chicago Ry.

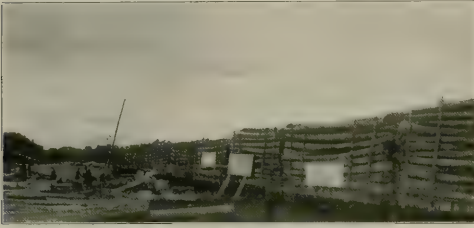
The Toledo Traction Co. has recently ordered 10 closed cars of the Brill company.



### SUPPLYING CEDAR POLES.

But few people who see the number of cedar poles along the streets and highways realize the work that is necessary to cut, inspect, sort, handle and deliver them to the users. The growth of this industry is shown in the business of W. C. Sterling & Son, who started 21 years ago with one pole yard at Monroe, Mich., and at present have 11 yards in the state.

This firm has worked out an economical plan in handling the poles. Its inspectors go along the different lines of railway and pick up the poles as cut in the woods, have them peeled and properly trimmed and cut to proper lengths. They are then loaded on cars and shipped into one of the large sorting yards, where



TRAIN OF 38 CARS OF CEDAR POLES.

they are received by the yard foreman, who again inspects them and has teams haul them to the respective piles, each length and size by itself. There is no delay in making shipments when an order is received, as the stock is all sorted and ready to be loaded on cars. The loader makes a final inspection before the pole goes on the car.

The poles are hauled from the pile to the track, and a gin or loading pole and ropes and blocks are used to hoist them on the car. Often consumers complain that poles are found broken on the cars, but such is an impossibility, as a broken pole could not be loaded. They are hoisted over the heads of four loaders, and it would endanger their lives to handle a broken pole in that



YARDS OF W. C. STERLING & SON.

manner. After the pole is hoisted high enough to clear the tops of the car stakes, it is gradually lowered and set in place on the car. Many poles are broken in being unloaded or dumped from the cars by the buyer. This, however, can be easily prevented by means of two ropes. One end of each rope is tied to the spring or brace of the car on the side on which the poles are to be dumped and run over the car, making a turn or half hitch on the car stake on the opposite side. A man holds on to the end of each rope while the car stakes are being cut on the dumping side, and when everything is ready for the poles to fall they can loosen up slightly on the ropes and allow the poles to slide off gradually.

During the months of October, November and December of 1900 this firm furnished poles, ties and posts to over thirty different electric railway companies, covering a territory running east and west from New York to Kansas and as far south as the Gulf states.

Cedar ties for railway use are among the principal products of the firm. They run from 7 ft. long, with 5 in. face and 5 in. thickness, to the standard 8-ft. length, with 6 in. face and 6 in. thickness.

Many poles, ties and fence posts are handled by water, being thrown into the streams and "driven" to the yards, whence they are "rafted" to some city and loaded on cars. A "drive" coming down one of the streams often contains 50,000 poles and 100,000 ties.

Some users of poles are very particular about the looks and quality and apparently do not stop to think how cedar grows. Many want them to be as straight as a lead pencil and as sound as iron. In the first place, a pole with not more than 20 per cent rot at the butt is not injured to the extent many imagine, as cedar poles do not rot under ground, but only at the surface of the ground, so a pole with a hole in the butt end will last as long as a sound one. The quality and moisture of the soil largely determine the life of a pole.

This firm also manufactures lumber and is in a position to furnish bridge timber in hemlock. It gets its cedar from the forests and sells direct to the trade.

### BRAKE TESTS ON LIVERPOOL ELECTRIC CARS.

A series of official brake tests were recently carried out under the direction of Mr. C. R. Bellamy, manager of the Liverpool, England, electric tramways. The following tests were made on a grade of 1 in 17 with an empty car weighing 8½ tons. The car was equipped with both hand and electric brakes.

Running up the hill taking the trolley off the wire, and as soon as ever the car began to move backward again it was brought to almost a stop in 1 ft. by the action of the motor becoming a generator and so braking itself. When the speed of the motor became practically nil, then the car moved again, and continued moving at the rate of about half a mile to one mile per hour down the hill, but was again brought to rest in a few yards by the action of the electric brake. On such an incline the effect of the use of this brake is to bring the car to rest and liberate it alternately.

Running the car at the rate of about 10 miles an hour down the same gradient of 1 in 17, and at a certain point the hand brake was put on and the car was stopped (the lines being dry) in 36 ft.

Running at the same rate down the same dry lines, and down the same gradient of 1 in 17, using the electric brake at a given point, and the car was brought violently almost to a stop in 6 ft. by means of the motor again acting as a generator, and in the same way as before it moved very slowly down the hill, but was again brought to rest in a few yards by the action of the electric brake. On such an incline the effect of the use of this brake is to bring the car to rest, and liberate it alternately.

Watering the rails on a gradient of 1 in 14, running the car at 10 miles an hour, using the electric brake alone, when, without the application of sand, the car was brought to a standstill in 69 ft.

Using the electric brake first, the hand brake to hold the car, and sand down the same gradient of 1 in 14, and at the same speed, when the car was brought to a standstill in 42 ft.

### A UNIQUE ADVERTISEMENT.

The New Jersey & Hudson River Railway & Ferry Co. firmly believe in telling possible patrons of the attractions to be found on its "Hudson River Line" and we have at various times made mention in the "Review" of attractive and novel advertisements issued by the company. One of the latest is a pamphlet entitled "Birds and Flowers of Bergen County, N. J., which contains a list of 33 species of birds classed as permanent residents, 52 as winter residents and visitors, 120 as summer residents and 14 species classed as migrants. For flowers there are given the botanical and common names of 217 varieties.

## PEORIA (ILL.) ELECTROLYSIS CASE.

The report of Mr. Frank L. Wean, the special master in chancery appointed by the United States Circuit Court May 26, 1898, to take evidence in the matter of the petition of the Peoria Water Works Co. for an injunction to prevent the Central Railway Co., of Peoria, Ill., continuing to operate on the single trolley system, has been filed with the court.

The report gives a brief history of the litigation, a statement of the ordinances under which the water company and the railway occupy the streets, makes reference to electrical surveys of the property and to the testimony taken, and the master then gives his conclusions as to the facts and the law.

Want of space prevents us giving more than the following abstract of the report:

"There are at present 17.84 miles of streets in the city of Peoria in which complainant's water mains are laid, and on which same streets defendant's street railway lines are located and operated. Of this mileage 15½ miles of water mains, now constituting an important part of complainant's system, were in existence, laid in these streets before any license was granted by the city to lay street railway tracks or to operate any kind of a street railway."

"The ultimate facts disclosed by the evidence may be briefly summarized as follows:

- "1. The injury complained of exists.
- "2. The injury is permanent and continuing.
- "3. The injury has been and is being caused by the defendant.
- "4. The complainant can do nothing to prevent the injury.
- "5. The defendant can prevent it by the use of the overhead double trolley system, or by any system which provides a completely insulated metallic circuit for the electric current.
- "6. The overhead double trolley system, though more expensive to install, has been demonstrated by use and experience to be safe, economical and satisfactory in its operation as the single trolley system."

"Both parties to this suit acquired their rights in the streets by a grant under statutory authority from the City of Peoria by ordinance passed by the Common Council. Each occupies the streets by legal authority. Each is performing a duty to the public, and each is compelled, under the ordinance of the city and the law, to serve the public. Each has money and property invested in its system and plant, a considerable portion of which, in each case, occupies the streets by such legal authority. Both are entitled to the equal protection of the laws against the invasion of their rights and property by others."

"The injury which is being done to complainant's water pipes by defendant's currents of electricity, is not a mere incidental injury or inconvenience, but is a permanent, continuing injury to a legal right, which will, in effect, if the injury is permitted to go on, ultimately result in the absolute destruction of complainant's plant and property. This would amount to nothing less than the taking away from complainant of the use of its property by the defendant street railway company, which, if it be done under defendant's license authorizing it to 'propel its cars by electric motive power' would be a taking of private property for public use. The constitution of Illinois provides that 'private property shall not be taken or damaged for public use without just compensation.'"

"Although the defendant is operating its railway under an ordinance from the city, granting it a license to propel its cars by electric motor power, and in so doing is interfering with the property and water pipes of complainant, such interference and injury is not damnum absque injuria because:

"1. It is possible for the defendant to so operate its railway by electric motive power as not to injure the complainant's property.

"2. It is impossible by any known method for the complainant to protect its property from such injury.

"3. Where there are two methods of accomplishing a legal result, and one method will work an injury to another and the other method will not, it is the duty of the person doing the thing, to use that method which will not result in injury to such other persons."

"4. The failure on the part of the defendant to observe such duty constitutes negligence, and when it results in damage to another, such damage is actionable."

"The injury found to be going on in this case, is the direct con-

sequence of the unnecessary and wrongful acts of the defendant in accomplishing a legal result, that is, the propulsion of its cars, and unless the defendant is protected by its license from the city, it is liable to the complainant for such injury. These acts, unnecessary and wrongful in themselves, are not rendered lawful by the ordinance granting the use of the streets for the purpose of propelling cars by electric motive power, and, inasmuch as they work 'hurt, inconvenience and damage' to the complainant, they constitute a nuisance which is actionable at the suit of the injured party."

"The injury complained of being actionable, there can be no doubt of the power of the court to grant some remedy. The damage already done is chargeable to the defendants, and so far as such damage is capable of being definitely ascertained, the defendants should be held liable in a suit at law. But a suit and recovery at law would not stop the injury which is and must necessarily be continuous under existing conditions. The very life of complainant's plant and franchise is threatened. The only adequate remedy is, therefore, by injunction, as prayed in the petition."

The master's report will have to be passed on by the court, and a decision is expected early this coming fall. The Central Railway Co. will doubtless appeal the case in event the decision should be unfavorable.

## NEW ENGINE COMPANY.

The Brown-Corliss Engine Co., capitalized at \$1,000,000, has been incorporated at Milwaukee and purposes building an immense plant in Racine County, Wis., where 1,200 acres of land have been purchased as a site. Five hundred men will be employed at the works, and the town which the erection of the projected plant will undoubtedly cause to spring up at this place, will be christened Corliss. The Brown-Corliss Engine Co. has perfected its organization with Julius Wechelsberg, president; Walter S. Whitings, vice-president, and Walter F. Brown, who has been connected with the Harris Corliss, E. P. Allis and Filer & Stowell companies, second vice-president and general manager.

## THE CHICAGO ELECTRICAL ASSOCIATION.

The Chicago Electrical Association held its 10th anniversary banquet at the Grand Pacific Hotel on the evening of June 4th, about 40 members and guests attending. It is generally conceded that the decennial celebration was the greatest success in the banquet line yet scored by the association, although the yearly feasts on former occasions have been exceptionally pleasant and profitable. On the present occasion W. Clyde Jones acted as toastmaster. Toasts were awarded and responded to as follows: "The Association a Tenth of a Century Ago," by Thomas G. Grier; "Ten Years of the Infant Industry at College," by Prof. Dugald C. Jackson, of the University of Wisconsin; "A Decade of the Treble Hello," by Kempster B. Miller, of the Kellogg Switchboard & Supply Co.; "The Scientific Accomplishments of the Decade," by A. V. Abbot, until recently chief engineer of the Chicago Telephone Co.; "Ten Years of Electrical Accomplishments," by Prof. P. B. Woodworth, of the Lewis Institute, of Chicago; and "A Decade Hence?" by R. F. Schuchardt, who reviewed the progress made by the society during the past 10 years, and added that he hoped the next decennial meeting might be celebrated by the society in clubrooms of its own.

## CONSOLIDATED TRACTION AND PHILADELPHIA CO.'S COMBINE.

Unofficial announcement is made of the terms upon which the Consolidated Traction Co., of Pittsburg, and the Philadelphia Co. will be combined. The new company is to be organized with a capital of \$25,750,000, to take over both properties, and it will issue \$40,000,000 5 per cent bonds. Of these \$18,750,000 will be issued in part exchange for Philadelphia Co. stock, \$12,000,000 in partial exchange for Consolidated Traction stock and the balance reserved for future purposes. It will also issue \$15,250,000 preferred 5 per cent stock and \$10,500,000 common stock, which will be issued in partial exchange for the preferred and common stock of both companies.

### RECEIVER FOR WASHINGTON COMPANY.

The Washington (D. C.) Traction & Electric Co., having failed to pay the interest on its bonds, due June 1st, has been placed under the receivership of Allen L. McDermott, its president, on the application of the United States Mortgage & Trust Co. Mr. McDermott's appointment as receiver of the company was made by the United States Court for the Eastern District of Virginia on June 3d. The company was organized two years ago by the consolidation of all the street railways in the District of Columbia, with one exception. Its capitalization was \$12,000,000, of which \$11,200,000 had been issued, and \$20,000,000 in 4½ per cent bonds, of which \$13,442,000 are outstanding. The company's default in paying the interest on the latter was not unexpected. A committee representing the large bondholders has been formed, and under the project of reorganization the interests of all concerned will undoubtedly be protected.

### TO MEET TROLLEY COMPETITION.

The Philadelphia & Reading has determined to meet the trolley competition on its Chester branch, extending from 24th and Chestnut Sts. to Darby Creek, and in order to do so has put new rates into effect which are a material reduction from the former rates and in some cases are even lower than the trolley fares. From Philadelphia to 84th St. the single trip fare is put at 10 cents, excursion ticket, 15 cents, package tickets, 13 for \$1, and 50-trip tickets, \$4.00. From Philadelphia to Darby Creek the single fare is 20 cents, excursion ticket, 30 cents, package tickets, 7 for \$1.05 and 50-trip tickets, \$5.50. The 50-trip ticket is the feature of the new rates which brings the fare cheaper than that of the trolley.

Mr. Charles Howell, superintendent of the Pittsburg, McKeesport & Connellsville Traction Co., is quoted as announcing that the proposed line from McKeesport to West Newton will be put in operation June 15th or soon thereafter.

The Worcester & Blackstone Valley Street Ry. will install two 500-h. p. Hamilton-Corliss engines direct connected to 325-kw. Westinghouse generators in its new power station. Foundations will be put in for two additional units.

Electric cars are again in operation on the interurban line between Fall River, Mass., and Providence. Owing to an accident at the power station in Warren the electric service had been temporarily abandoned and steam cars substituted for trolley cars.

The Winnebago Traction Co., of which E. E. Downs is general manager, has erected an electric fountain at Oshkosh, which was publicly tested May 30th. The fountain throws a spray of 40 ft., and was designed by John Davy, chief engineer of the company.

The Metropolitan Street Railway Co., of Kansas City, Mo., has notified conductors to collect fares from all police officers unless they are in uniform or are carrying a special permit issued in the name of the bearer. The action was taken to protect the company from persons who wear police stars without the right to do so.

Mr. Royal H. Holbrook, manager of the Ottumwa (Ia.) Electric & Steam Co., informs us that the company's franchises in Ottumwa, which are about to expire, will probably be extended for a period of 25 years. The council of that city has passed an ordinance providing that the franchise matter shall be submitted to public vote on Monday, July 1st. In view of the excellent service rendered by the company, a favorable result may be confidently expected.

The line which is under construction between Grand Rapids, Mich., and Holland, crosses a marsh just outside the latter city, which on the night of June 2d swallowed the grade for a distance of 100 ft., rails, ties, dump cars and all. The contractors found the railway six feet under water, and a large force is employed in fishing it out. The prospects of getting a roadbed foundation over this route are still discouraging though the tallest sand bluffs in Michigan have been dumped into the marsh for the purpose.

### SALE OF PENNSYLVANIA STEEL CO.

June 12th it was reported that the Pennsylvania Railroad Co. has secured control of the Pennsylvania Steel Co.

Rails were laid June 1st connecting the lines of the Aurora, (Ill.) & Geneva and Geneva & Carpentersville Street Rys.

June 1st the Louisville (Ky.) Railway Co. abandoned the use of mules on its last animal traction line, four miles long, and is now operating by electricity. The company is double tracking many of its single track lines.

The Greenfield (Mass.) and Turner's Falls Electric Ry. has put in service a combination express and passenger car, which will make four trips daily from Greenfield to Turner's Falls and one from Turner's Falls to Montague.

### GERMAN EXPERIMENTS IN RAPID TRANSIT.

The association for the study of electric rapid transit railroads states in its report for 1900 that the elevated track of the military road between Berlin and Zossen, upon which experiments will soon be made, has been carefully inspected and strengthened. It is hoped to attain a speed of 125 miles per hour. Two cars will be employed which are supplied with powerful motors and will hold from forty to fifty passengers. The construction of the cars and their equipment differ, in order to make manifold experiments. Each car will have four motors, aggregating from 1,100 to 3,000 h. p., two three-axle trucks, and the necessary switching apparatus, etc. The cars will be 71½ feet long and will weigh about 90 tons. The effect of this speed on the elevated track will also be noted. The experiments will doubtless prove of the highest importance for the improvement of rapid transit, although it may be found that the speed contemplated will not be feasible.

THE NATIONAL BRIDGE CO. has recently been incorporated in New York with a capital stock of \$200,000 and will engage in the construction of highway and electric railway bridges and steel and iron structural work. The company has already acquired two first class plants, and is prepared to take orders for immediate work, and has, it is reported, a large stock of material on hand. The officers of the company are W. N. Conger, president; A. A. Miller, vice-president; C. W. Smith, secretary; George T. Bacon, treasurer. The general offices of the company are at 45 Broadway, New York.

### THE LAKE SHORE TO BUFFALO.

The Lake Shore & Michigan Southern Ry. is running eight fast trains daily from Chicago to Buffalo, for the special accommodation of visitors to the Pan-American Exposition. The service includes every provision for the comfort of patrons, the trains being composed of the finest type of Pullman sleepers, diners, palace and buffet cars. A rule has gone into effect whereby passengers holding one way tickets to Buffalo or points beyond may, if they desire, use the steamers of the C. & B. line between Cleveland and Buffalo without additional charge. The same privilege applies on round trip tickets to Buffalo and points beyond, and the boat line may be used by passengers either coming or going. On all through tickets via Buffalo a stop-over at that point not exceeding ten days will be permitted providing the ticket be deposited with the agent and a fee of \$1 paid. On tourist tickets with an open limit of October 31st this privilege is granted without deposit or charge. On tickets to New York City reading over the Lake Shore and New York Central, passengers may use the Hudson River boats between Albany and New York without extra cost.

"Lake Shore Tours," published by the Lake Shore road, contains a selected list of pleasant trips, with routes and rates, and this as well as "Book of Trains" and other printed matter will be sent on application to F. M. Byron, G. W. A., Chicago. Reduced rate tickets to the Pan-American Exposition are now on sale. The train service between Chicago and Buffalo via the Lake Shore is unexcelled.



## LOCKE PORCELAIN INSULATOR.

Our illustration shows the No. 12 porcelain insulator, made by Fred. M. Locke, of Victor, N. Y., which is suitable for pressures up to 7,000 volts. The insulator is  $3\frac{3}{4}$  in. in diameter and  $3\frac{3}{4}$  in. high, with a top groove to take wires up to and including 250,000-



NO. 12 LOCKE INSULATOR.

c. m. cables. These are in either brown or white porcelain and are recommended as having the same advantages over glass, that is greater strength and more efficient insulation, as have the higher voltage insulators made under the Locke patents. Last week two carloads of 60,000-volt insulators were shipped to the Pacific coast and a large order of 24,000-volt insulators to Italy.

Recent heavy storms in Utah damaged the property of the Salt Lake City Railroad Co. to the extent of nearly \$3,000.

The receipts of the Union Traction Co. of Philadelphia from Jan. 1 to May 13, 1901, exceed those for the corresponding period last year by \$26,000.

The notice—"Wait Until the Car Stops; Face Forward"—is blown in the glass set on the right-hand side of the platform on all new cars of the Brooklyn Heights R. R. The management reports that its efforts to instruct patrons how to alight from cars have resulted in greatly decreasing accidents from this cause.

The Brooklyn Rapid Transit Co. made a record for expeditious work by getting the projected line from Hamilton ferry to the Park Plaza well under way between 11 p. m. Saturday, June 1st, and 7 o'clock on the following morning, the injunction which had prevented the company from proceeding for a year having been dissolved Friday afternoon.

Mr. J. Peyton Clark, the new manager of the Terre Haute (Ind.) Electric Co. has announced that the practice of contractors of moving houses across the company's tracks during the day time must be stopped. The question of whether contractors moving a house can compel the company to transfer passengers, will, if necessary, be taken to the courts.

The Kansas City & St. Joseph Electric Railway Co. has arranged for an issue of bonds to the amount of \$1,500,000, the United States Trust Co., of Kansas City, being co-trustee of the Interstate Trust Co., of Boston, trustee. Construction contracts for the proposed electric road from Kansas City to St. Joseph provide for its completion by Jan. 1, 1902.

A supplementary trust deed issued by the Chicago & Milwaukee Electric Railway Co. in July, 1899, to the Cleveland Trust Co. and the Royal Trust Co. to secure an issue of bonds aggregating

\$1,500,000 has been filed for record. It specifies that the bonds shall be payable at the option of the company on any interest day, upon the payment of the face value and a premium of 5 per cent.

Mr. Horace A. Andrews, an officer in the company proposing to build an electric line from Utica, N. Y., to Frankfort, is quoted as stating that the road will be built through private rights of way, all of which the company has obtained. The promoters of the Utica-Frankfort line are negotiating for the use of the tracks of the companies operating between Frankfort and Herkimer in order that a through service from Utica to the latter city may be opened.

The Consolidated Traction Co., of Pittsburg, Pa., has issued a statement for the month of April, 1901, with a comparison of the same month for 1900. Net earnings from operation April, 1901, \$111,954; April, 1900, \$119,566; total net earnings and income, April, 1901, \$140,950, April, 1900, \$147,290; total deductions, April, 1901, \$63,915, April, 1900, \$61,649; total income, April, 1901, \$77,431, April, 1900, \$85,641; fixed charges, April, 1901, \$86,640, April, 1900, \$86,475; deficit, April, 1901, \$9,209, April, 1900, \$833.

## TO THE EXPOSITION FROM THE EAST.

The Pan-American Exposition has been triumphantly inaugurated and bids fair to be one of the most successful of all expositions.

Probably no similar Fair in the history of this country will be visited by so many from New England; first, because that not since the Philadelphia Centennial, 25 years ago, has there been one that was geographically so near us as Buffalo, and then the interest in it has been especially great. Certainly no better location could be selected than Buffalo, not only on account of its being so thoroughly central, but in addition thereto, it is only twenty miles from Niagara Falls and thus gives an opportunity to combine the world's greatest natural wonder with one of the greatest Expositions of the world's history. Aside from it being an education, it will be a most interesting trip as well.

The transportation facilities between Boston and Buffalo via the Boston & Albany and the New York Central lines, make the trip itself, in each direction, one of the pleasant features of such a visit.

As is well known, the Boston & Albany is universally recognized as the equal in all respects of any railway in the world and in some special features superior to all others, particularly its roadbed, its beautiful stone stations, and, it might be added, its exquisite scenery through the Berkshire Hills, while the New York Central, which is the greatest trunk line in the world, and over whose tracks the through cars from Boston run west of Albany, is by far the greatest railway in America.

Not only is the equipment of all the through trains between Boston and Buffalo via the Boston & Albany and New York Central, maintained to the highest degree of perfection and luxury, but the most complete and rapid train service as well, and this service, although sufficiently complete to satisfy the most exacting, is, we understand, to be supplemented by additional trains at a very early date.

The through trains from Boston to Buffalo, as well as further western points, are equipped with the most magnificent sleeping, parlor and dining cars ever put in operation. The dining-car service of the Boston & Albany and New York Central lines is superior to that of any other railway in the world.

Special inducements are offered by the Boston & Albany and New York Central for traveling to Buffalo, during the Exposition period, and various kinds of tickets, according to the prices and tastes of all, have been arranged for, of which full information can be obtained at the City Passenger office of the Boston & Albany Railway, 366 Washington St., at the South Terminal Station, or upon application to the General Passenger Agent, Mr. A. S. Hanson, Boston.

With the magnificent through sleeping cars, the finest ever put in service, that are run without change between Boston and Buffalo, all that is necessary to do is, quoting the words of Mr. Daniels of the New York Central, say to the conductor or porter, "put me off at Buffalo" and the Boston & Albany and New York Central will do the rest.

# ECHOES FROM THE TRADE

THE NEW HAVEN CAR REGISTER CO. has closed a contract with the Buffalo Railway Co. for 6,600 fare registers.

THE BURT MANUFACTURING CO., of Akron, O., has recently equipped the San Juan Light & Transit Co., Porto Rico, with "Cross" oil filters.

THE CLEVELAND OFFICES of the Westinghouse Electric & Manufacturing Co. were on June 10th removed to No. 1007 New England Bldg., Cleveland.

THE NEW PROCESS RAW HIDE CO., Syracuse, N. Y., has recently shipped one of its New Process noiseless pinions to Germany to be used on the private yacht of Kaiser Wilhelm.

THE CONTINUOUS RAIL JOINT CO. OF AMERICA has removed its general office from the Lawyers Bldg. to the sixth floor of the Century Bldg., 142 Market St., Newark, N. J.

JOHN H. FOWLER, 1705 Fisher Bldg., Chicago, makes a specialty of cedar poles in extra long lengths, and carries in stock all sizes of poles, fence posts and ties for electric railway purposes.

W. S. DAVIS & SON, of Concord, N. H., are meeting with great success with their tower wagons for use in repair and construction work on street railways. The firm will be glad to send prices on application.

THE HUNTER ILLUMINATED CAR SIGN is being used on the cars of the Omaha Street Railway Co. with satisfaction and promises to become as popular in Omaha as in St. Louis, where several thousand Hunter signs are in use on street cars.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, manufacturer of the "Chloride Accumulator," has placed the Pennsylvania sales office under the direction of Mr. E. L. Reynolds, who for a number of years has been associated with the company in its New York office.

THE DETROIT UNITED RAILWAY CO. has completed the equipment of the Wyandotte & Detroit River division with Magann storage air brakes. This is the first line to be equipped under the recent order for the application of these brakes on the entire system.

A. L. IDE & SONS, of Springfield, builders of the "Ideal" engines, are now building a new erecting shop 50x160 ft. and a new foundry 120x160 ft. New machinery will be installed and the capacity of the plant doubled. Included in the equipment is a 16-ton traveling crane of 60 ft span.

A. L. WILKINSON, the popular sales agent for the Ohio Brass Co., for Ohio and adjacent territory, reports a record breaking season for the sale of that company's well known goods, having taken orders for 635 miles of overhead material since January 1st, a large part of which was taken in Ohio.

THE JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J., has issued the June number of its publication, Graphite, which contains a number of articles in regard to the manufacture and use of this material. The leading article is a reprint of an article on Graphite in the Stevens Institute Indicator, by Malcolm McNaughton, M. E.

THE SARGENT CO., of Chicago, held its annual meeting May 29th and elected the following officers: Geo. M. Sargent, chairman board of directors; W. D. Sargent, president; H. K. Gilbert, vice president and treasurer; Day McBirney, secretary. The com-

pany is planning a considerable extension to its present works at Chicago Heights, Ill.

THE METROPOLITAN WEST SIDE ELEVATED RY., Chicago, last month placed contracts for 47 cars. The Jewett Car Co., of Newark, O., will furnish 12 motor cars and the American Car & Foundry Co. 28 passenger cars and 7 special control cars which are similar to the passenger coaches but will be used on the special "rush hour" trains that do not run east of Canal St.

THE AMERICAN ELECTRICAL WORKS, Providence, is now at work on its annual addition. The new building is to be of brick, 230 x 80 ft., three stories high, and will be occupied by the copper mills. The Washburn Wire Co. plant, adjoining that of the American Electrical Works, is almost completed; this plant will produce iron and steel wire.

HARTSHORN'S ROLLER for May contained as usual, witticisms and pictures in abundance. The most attractive feature is the center-page illustration, "Signs of Summer," a pleasing design, very admirably executed. This sprightly periodical is published by the Stewart Hartshorne Co., East Newark, N. J., in the interest of Hartshorne's self-acting shade rollers and similar products.

THE R. WOODMAN MANUFACTURING & SUPPLY CO., of Boston, has just closed a contract with the Buffalo Railway Co. for 864 of its No. 3 transfer ticket punches and is completing an order for the Detroit United Ry. which included punches for the entire system. The Woodman company has met with an exceptionally heavy demand for its goods, which are well-known for their excellence of design and workmanship.

THE HEYWOOD BROTHERS & WAKEFIELD CO. enjoys an excellent trade in the electric railway field and has recently supplied seats for new cars to the following roads: Toledo, Fostoria & Findlay; Youngstown & Sharon; Columbus, London & Springfield; Tolledo & Monroe; Wabash & Peru; American Railways Co. A late order was for the seats for 17 new electric cars of the New York, New Haven & Hartford R. R.

THE FALK CO. is at present engaged upon a number of large orders for special work. The company is getting out cast steel work for the Duluth-Superior Traction Co., the Canton & Massillon Electric Ry., and the Metropolitan Street Ry. Co., of Kansas City, and built-up special work for the Denver City Tramway Co. and the Tri-City Ry., Davenport, Ia. The company is now building an addition to the foundry, which will greatly increase the capacity.

THE CENTRAL ELECTRIC CO., of Chicago, is this season handling the two standard lightning arresters, i. e., the Garton and Westinghouse. These two makes are well known to be accurate under the most severe discharges and, now the summer months are coming on, all street railway and power plants should be protected against storms by these devices. The Central company will send descriptive catalog and quote net prices upon application.

H. M. SHAW & CO., of New York, makers of the "Medbury" overhead material, have opened a Boston office at 41 Federal St. and have also appointed the Wallace Supply Co., 56 Fifth Ave., Chicago, agents. Mr. Shaw reports business excellent and states that the company has just finished shipping material for eight miles of road to the Mountain Lake Ry., Gloversville, N. Y.; the shipment included all overhead material, track material and machinery for the machine shop.

THE COLUMBIA INCANDESCENT LAMP CO., of St. Louis, is making a specialty of lamps for street railway service

and is the only company, so far as we know, that has adopted the policy of carefully selecting railway lamps for uniformity in current consumption. Such selection insures a uniform distribution of light in the cars and long-lived lamps. The company also has special round bulb lamps for headlight use, which are also adapted for trolley party decorative lighting. Trial orders are solicited.

THE B. F. STURTEVANT CO., of Boston, Mass., has published a new catalog, No. 115, which is a condensed statement of the large number of products of this concern. The catalog contains brief information with illustrations of the articles which are also treated in separate catalogs numbering over 30 and containing some 1,500 pages. Another new publication of this company is entitled "Who Uses Mechanical Draft?" and contains the names of over 900 users of Sturtevant fans, which includes, however, only the larger plants which have been equipped by this company.

SOME IDEA of the magnitude of the works of the B. F. Sturtevant Co., of Boston, can be gathered from the fact that the engine and electrical departments, covering over an acre of floor space, which were recently damaged by fire, represented only about one-quarter of the total floor area of the plant. It was therefore possible by a process of compression in the blower and heater departments to provide within these walls sufficient space to re-establish the damaged departments. This was quickly done, the offices are again occupying their old quarters and work is progressing much as before the fire.

THE GREEN ENGINEERING CO., of Chicago, manufacturers of Green traveling link grates, has recently received a number of large orders, among which is the contract, mentioned in our last issue, for twenty-four 500-h. p. grates for the Metropolitan Street Railway Co., of Kansas City, which is the third order received from the company and the largest order ever placed for automatic stokers outside of New York. Among the larger orders are 16,000 h. p. for the St. Louis Transit Co., 8,000 h. p. for the Chicago Union Traction Co. and 4,000 h. p. for the Milwaukee Electric Railway & Light Co.

R. W. BLACKWELL, of R. W. Blackwell & Co., Ltd., London, has issued a circular letter announcing that he has been obliged to accept the resignation of Mr. E. Chalanqui Beuret as manager of his Paris office, and to dispense with the services of a number of his former employees. Mr. Blackwell will assume personal direction of his Paris office retaining as assistants Messrs. Eugene Estavard and F. W. Vallat. Mr. Blackwell states that he has been unable to find certain records of the Paris office and begs that those having matters of business pending will advise him so that proper settlement may be made.

THE H. W. JOHNS MANUFACTURING CO. recently secured the contract for covering all the new work installed in the plant of the St. Regis Paper Co., Watertown, N. Y., in which asbestos fire felt covering was used; it also secured the contract for covering the new boilers installed in the Iron Steamboat Co.'s ships, "Columbia," "Sirius" and "Taurus," "Asbestocel" sheets and asbestos cement being used. This company is getting up a neat little pamphlet on "Asbestocel Pipe Covering, Sheets and Paper," which it is expected will be ready very shortly. One of these pamphlets can be had by addressing the H. W. Johns Manufacturing Co., 100 William St., New York.

THE VALUE OF A BATTERY of chloride accumulators as a reserve power in case of emergency was forcibly illustrated on the evening of May 11th, at Philadelphia during the severe electrical storm which visited the city at that time. A portion of the generating machinery at the Union Traction Co.'s Ogontz substation was disabled by lightning, and the battery station at Erie and Germantown Ave. carried the load for about a half hour, while connections with the Beach St. power house were being made. Without the battery this section of the road would have been forced to suspend operation for a considerable time.

THE AMERICAN BRAKE SHOE CO., which is the owner of numerous patents covering designs, methods of manufacture and application of brake shoes, has issued a pamphlet describing the various products manufactured under these patents by its licensees. These shoes are divided into two general classes, driving brake shoes and coach and car shoes, and a number of different styles are illustrated and described under each head. These include skeleton steel, skeleton steel insert, "Diamond S," improved combination reinforced steel insert and other patterns in which the material and methods of manufacture are varied to suit the various classes of service in which they are employed.

THE JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J., has just issued a new catalog entitled "Graphite Productions," which is not only a handsome example of the printers' art but contains a full description of all the Dixon graphite productions. In the center of the catalog is a half tone illustration showing the company's main plants at Jersey City and its graphite works at Ticonderoga. It also contains views of its graphite mines and cedar mills, the latter being used in connection with the manufacture of lead pencils. The list of products contained in this catalog are too numerous to mention, but it includes all of the well-known graphite manufactures of this company which are fully described and illustrated.

THE NEW BOILER PLANT which is to be erected by the University of Chicago for purposes of heating, lighting, etc., will have a capacity when completed of about 3,500 h. p. Mr. A. D. Houghton, the mechanical engineer in charge, received instructions from the authorities to thoroughly investigate mechanical stokers of all kinds and to recommend for use in this plant the stoker that was best suited to the requirements of the station. After an investigation extending over some 90 days Mr. Houghton's decision was in favor of the Jones under-feed mechanical stoker, and an order was placed with the Under-Feed Stoker Co. of America for the equipment of the plant; 10 of the stokers to be installed this year and balance when plant is completed.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has recently closed contracts for five "Chloride" accumulator plants to be installed at rotary sub-stations on suburban electric roads about to be built in the vicinity of Pittsburg, by the same interests which now control the Monongahela Light & Power Co., the Monongahela Street Railway Co., and the Pittsburg & Birmingham Traction Co. Three of these plants will be installed on the Pittsburg & Charleroi road now under construction, one will be located in McKeesport, and the fifth at Springdale, Pa., on the projected Allegheny Valley Street Ry. One of the important objects obtained by these battery installations is to permit current for both railway and lighting work to be taken from the same 60-cycle alternators.

THE STERLING-MEAKER CO., of New York, about May 1st installed new machinery in its factory which will double its production of safety brakes, this increase being demanded by the pressure of orders. The Sterling brake combines the many elements required in a good street car brake and it is always under the absolute control of the motorman. Properly adjusted it multiplies the pull applied enormously, equal to the needs of any car, and its action, though quick, is graduated, thus retarding the wheels before stopping them. Its greatest sale has been in large cities where safety requires quick and frequent stops without jolting the passengers or flattening the wheels. The very best materials are used in all its parts. The company is several weeks behind its orders on registers, but is making strenuous efforts to catch up. The solid and trustworthy character of these machines appeals to railway managers.

THE NEW PROCESS RAW HIDE CO., Syracuse, N. Y., reports the export sales of its new process noiseless pinions as rapidly increasing. The company has recently shipped 100 electric railway pinions for G. E. 800 motors to London on an order from an electric supply house in that city. The pinions are to be used on one of the big railways recently built there. A shipment of pinions has also been made to the Allion Motor Co., a big



English automobile company. In the general machinery line the company has just shipped a number of big bevel gears, both iron and rawhide, some of the latter as large as 32 in. diameter, to a large English ship building concern. A number of railway pinions have been shipped to Germany and Norway and reports from those countries say that the demand for them is increasing. Several inquiries for catalogs and prices have lately been received from Japan. A good-sized order is in process of construction for one of the mines at Kalgourlie, Australia.

THE CHICAGO BOILER CLEANER CO. reports the following as among the purchasers of its "Famous" oil filters and refiners during the month of May: F. Gilman, Handsworth, England; Houghton & Hancock (Mich.) Street Ry.; Imperial Electric Light, Heat & Power Co., St. Louis; Allegheny County Light Co., Pittsburg; Ashburton Mining Co., Folsom, Cal.; City of North Vernon, Ind., Water and Light Department; Milford (Mass.) Street Railway Co.; W. H. Frear & Co., Troy, N. Y.; Syracuse Electric Railway Co.; also, two filters for Rio Janeiro, Brazil. The manufacturer of these filters claims that most power plants are troubled with accumulation of impurities in oil cups, making lubrication of the bearings difficult and creating excessive wear. The very presence of foreign matter in the oil cups indicates an excessive amount of impurity in the oil. The "Famous" oil filter is guaranteed to overcome this serious difficulty, for the apparatus delivers an absolutely pure quality of oil the year around. For particulars and booklet describing this device, address, the Chicago Boiler Cleaner Co., Chicago, St. Louis or Pittsburg.

The dam across the Wisconsin River at Kilbourn, which Philip L. Spooner, of Madison, projects building, will cost \$400,000, and work is shortly to be commenced. Before January 1st power will be generated at Kilbourn for the operation of the Madison Election Ry. The street railway system was purchased by Mr. Spooner in March.

The Monessen (Pa.), Webster, Bellevue & Fayette City Street Railway Co., which was recently organized by Samuel M. Graham, Frank M. Fuller and Charles H. Seaton, of Uniontown; John R. Byrne, of Cotsdale; C. F. Eggers, of Bellevue, and Col. James M. Schoonmaker, of Pittsburg, proposes to build a 10-mile electric line along the Monongahela River from Webster to Fayette City. Rights of way are being obtained, and it is expected to have the line in operation by early fall.

#### A GRAND SCIENIC TRIP.

The "Daylight and Dark Route" of through first class sleepers daily between Chicago and San Francisco, via the Rock Island, the Denver & Rio Grande, the Rio Grande Western and the Southern Pacific is the subject of a handsome poster just issued by the Chicago, Rock Island & Pacific Ry.

The schedule is so arranged that in both directions the best scenery of the Colorado Rockies and Sierra Nevada is traversed by daylight in both directions.

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## CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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This paper is a member of the Chicago Trade Press Association.

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JULY 15, 1901.

NO. 7

In our legal department this month brief reference is made to a dissenting opinion filed in an Illinois case where the judge in the minority uttered the astounding doctrine that a street railway had no greater right to the use of its tracks than the "humblest teamster." If such opinions were held by many of the judges of our higher courts things would indeed be in a bad way for the street railways. Another decision, however, that cannot fail to be a comfort to the busy manager is that of the Maryland judge who rules that a street railway company is not negligent if its employees start the cars without looking underneath to see if any children may be caught in the mechanism.

As we note elsewhere in this issue suits have been begun to determine the validity of act of the Illinois Legislature passed in 1865 and extending the franchise of the Chicago street railways for the full term of their charters or until 1958. Though some 20 years ago the city of Chicago was advised by its counsel that this law could not be successfully attacked the city has never admitted all the claims of the railways. The street railways have considered it better not to force a conflict on the point and consequently no adjudication has ever been secured. The present suits are brought by Mr. W. L. Elkins, a stockholder of the North and West Chicago companies, after the boards of directors had refused to sue in the names of the companies.

Although the Metropolitan Street Railway Co., of Kansas City, has franchises which provide that the company may charge a fare of 5 cents, a 4-cent fare ordinance was recently introduced in the city council. The committee to which the matter was referred desired to learn the feeling of the public in regard to the matter and arranged to hold a meeting at which argument on the measure would be held. Although the meeting was well advertised there was not a person present who favored the passage of the measure. Several persons spoke in opposition, however, taking the ground that the passage of the ordinance would be fair notice that Kansas City intended to become a corporation baiter and would seriously

injure the city by keeping foreign capitalists from seeking investment there; others urged that by cutting down the company's income extensions to the suburbs would be prevented.

The recent experience of the People's Railway Co., of Dayton, O., is interesting as showing how futile it is to enter into contracts when one of the parties cannot be held responsible. In the latter part of May certain of the employees of the People's Company, who were members of a union, demanded "recognition" of the union and threatened to strike. The management refused to accede to the demand because that would make the union and not the company the judge as to the fitness of employees, and deprive the company of a proper control over its men, while not reducing its liability for their misconduct. After a conference a contract for a year was made between the company and its men, but within three weeks the members of the union struck, demanding that the company sign the agreement that had been submitted in May, and formally abandoned by the men. The result of this ill-advised action will undoubtedly be that the company will hereafter recognize the union by refusing to employ union men.

For several years the term "public utilities" has been very generally used to include street railways, gas and electric lighting companies, water works and other enterprises which serve the public in a similar manner, and doubtless we all think we know what the term means. It may be, therefore, something of a shock to know that in deciding some suits to which the Nashville street railways were parties, the Tennessee court said that counsel had not been able to furnish the court any definition by lexicographers, publicists or adjudged case of this term. In these cases a "public utility" was considered as something belonging to the public, and was distinguished from a "quasi-public" corporation. Thus a water works plant owned and operated by a city would be called a "public utility" while if it were owned and operated by a private corporation, the enterprise would be called that of a "quasi-public corporation." The term "quasi-public corporation" is considered a misnomer by leading legal writers, the claim being that it is the business and not the corporation which is public in its nature.

The later announcements of the A. S. R. A. Committee on Standards indicate that strenuous efforts will be made to accomplish some results in the matter of standardizing street railway rolling stock, motors, rails and line material. Probably nothing has had more effect in calling attention to the desirability of standards than the consolidation of the city lines. In nearly every such case the consolidated company has succeeded to an equipment which comprises all kinds and makes and a vast store of repair parts is necessarily carried in stock.

Though it may be difficult to convince those in charge of an isolated or self-contained system that any standard other than the one that may have been adopted is desirable, the interurban companies are differently situated. The cars of interurban lines in most cases have to use or wish to use the tracks of other companies and the adoption of recognized standards in rail sections and wheels would often prove of advantage. Also standard journal brasses, oil-boxes, brake heads, etc., would be found convenient in event of the renewal of such parts becoming necessary when the car is on a foreign line.

On another page we publish some extracts from an article on "Patents" by Mr. J. Snowden Bell, of Pittsburg. One of the points to which attention is called is that the railroads of this country could have avoided a great deal of vexatious and costly litigation over alleged infringements of patent rights if the companies had availed themselves of the opportunity offered by the technical papers and published descriptions of the various devices at the time they were introduced on their roads. By such a publication a company would provide easily accessible evidence against claims for damages brought by some later inventor of the same device who might have it patented. Mr. Bell is well qualified to speak on this point since he had experience in the mechanical departments of railroads as well as in the practice of patent law. The columns of the technical papers are always open for the publication of descriptions of new devices pertaining to the fields covered by these papers, and it is not putting the matter



too strongly to say that no other one department is of greater benefit or interest to the readers than that devoted to novelties in the art.

From the announcement of the general secretary of the Permanent International Tramway Union, the tramway association of Continental Europe, of which we give an abstract elsewhere, it is apparent that the subject of uniform methods or standard forms of accounting is a live one on the Continent as well as in Great Britain. The Tramway Union adopted a classification of "working accounts" in 1888, and feeling the need of an extension of the system with particular reference to electric railways has appointed a committee to undertake that work and report at the convention to be held in July, 1902.

The reports presented to this association are based upon questions prepared by the executive committee and sent to the member companies, and in addition to the reports proper we note that it is the intention to compile a great deal of statistical information concerning the details of equipment and methods and cost of operation. The meeting in July next year will be held in London at the invitation of the Tramways and Light Railways Association, and one of the features of the convention will be an exhibit of apparatus and supplies similar to the one which was so successfully arranged last year under the auspices of the Tramway and Railway World.

The action taken by the Association of Railroad Commissioners at its annual convention held in San Francisco last month is particularly gratifying to all those who are interested in the Street Railway Accountants' Association. By the new constitution adopted by the Railroad Commissioners the Accountants' Association is recognized as a component part of the Association of Railroad Commissioners and is entitled to representation by three members. Even more important was the decision of the Railroad Commissioners to appoint a committee to formulate a standard form of report for electric railways; this committee will be instructed to confer and co-operate with a committee of the Accountants' Association. This is a substantial endorsement of the methods pursued and work done by the Accountants.

When the question of organizing the Street Railway Accountants' Association was under consideration four years ago, representatives of companies in states where street railways are required to report to the railroad commissioners were undecided as to the expediency of forming such an association, fearing that the commissioners would prescribe forms of accounts, irrespective of what the Accountants' Association might recommend. Experience has shown, however, that such fears were groundless and that the commissioners are quite as anxious as the street railway companies to adopt forms of reports and accounts that shall be satisfactory to all parties concerned. The standard form of accounts, the first standard taken up by the Accountants' Association, was adopted, with only a few changes, by the Association of Railroad Commissioners. There is every reason to expect that it will be equally easy for the two associations to agree on a form of report. By working together the labors of both committees will be greatly facilitated and the report agreed upon will have greater weight, because it represents the views of officers looking at the matter from opposite standpoints.

The experiment undertaken by the Metropolitan Express Co., of New York City, which on June 28th inaugurated an express service on the street railway lines of the city will undoubtedly be watched with great interest by street railway men. The present plans do not contemplate the handling of matter other than express and baggage, but it is safe to predict that in event the service proves to be as popular as is expected, it will be only a short time before the business of hauling freight will also be taken up. The great advantage of the new service is the saving in time in reaching distant parts of the city, a consideration which cannot fail to be appreciated by patrons. The cost of transportation by electric traction is so much less than when animals are used that the new company can handle at a profit long haul business that the old line express companies find very undesirable; the new company is not, therefore, to be considered as a competitor of the old ones, because it has a field of its own. Electric automobiles are to be utilized in collecting the goods and also in distributing from up-town depots reached by the railway lines.

About three years ago we illustrated the special cars used in Buenos Aires for transporting dressed meat from the abattoirs to the city, but so far as we know a similar service has not yet been attempted in this country, though such a plan was recently discussed in New Orleans. In July, 1898, the Chicago General Railway Co., whose tracks intersect the lines of 17 steam railroad companies, decided to haul freight to and from the various freight depots and two cars were built for that purpose; the company met with considerable success, but was unable to develop the service as had been intended, because the management did not feel justified in laying the necessary sidetracks and switches.

The valid objection that can be urged in behalf of the public against permitting urban electric railways to engage in such traffic is that the additional cars might interfere with the passenger service on lines where it is necessary to run cars at short intervals. By providing suitable sidetracks at the various goods depots, as has been done in New York, all danger of such interference with passenger traffic could easily be avoided, and besides, the public need not fear that any street railway wishes to undertake a new service that will prevent it from carrying passengers.

The question of 3-cent fares on urban street railways is one that springs up perennially in various localities without any apparent basis of reason except as a bid for popularity by some politician. To any unbiased person who will look into the statistics of street railway earnings and cost of operation it will soon be evident that there is not a railway in the country which could give its passengers the present advantage of a long haul and transfers to intersecting lines on a 3-cent fare and continue to earn enough to pay its fixed charges. The public has the impression that a street railway property is an enormously profitable investment, but everyone with a practical knowledge of the street railway business knows that it requires a very close and careful business management in order to pay any dividends to the common stockholders; and even in the case of the most profitable systems a loss of 40 per cent of their revenues, which is what a change from 5-cent to 3-cent fares mean, would hardly leave enough earnings to pay their operating expenses.

The only possible case where a 3-cent fare could be granted with any degree of profit to a railway company is in places where the haul is extremely short and where no transfers are given. We do not believe there is any general demand for 3-cent fares, but on the contrary think that the public is far more willing to pay 5 cents for the privilege of a long haul with transfers than to pay 3 cents and pay it oftener. The fact that 3-cent fares cannot be substituted for 5-cent fares under generally existing conditions without running the roads at a loss is sufficient reason why it will not be done, and if 3-cent fares are demanded the length of the haul must be modified accordingly.

This arrangement, which is mentioned elsewhere in this issue, was put on trial in Lorain, Ohio, less than a month ago and has already stirred up a vast amount of dissatisfaction among all but a few patrons who are directly benefited by the change. The Lorain Street Railway Co. operating in Lorain and Elyria and with an interurban line between these towns has adopted a 3-cent fare within the corporate limits of each town and the same on the suburban line, dividing the road into three divisions with a 3-cent fare on each. The old rates were 5 cents within either town, 10 cents between the towns, with the exception that from Elyria to the steel plant at Lorain the rate was 5 cents.

The new rates work a peculiar hardship on those employees of the steel works who live in Elyria, the fare for them being increased from 5 to 9 cents. Other patrons may save 1 or 2 cents or lose 1 cent according to the length of their ride.

The Lorain case is only one example of how the zone system of fixing street car fares would operate in most American cities, and if it were generally adopted the result would be the crowding of the laboring classes into more limited quarters nearer their places of work, which condition is one of the serious problems in European cities.

It may perhaps be urged that the Lorain road is an interurban line and the experiment is merely that of substituting three 3-cent sections for two 5-cent sections. Granting this point, it is nevertheless quite evident that in this case the 3-cent section is not of great benefit to the laboring man in whose behalf such reductions are generally urged.

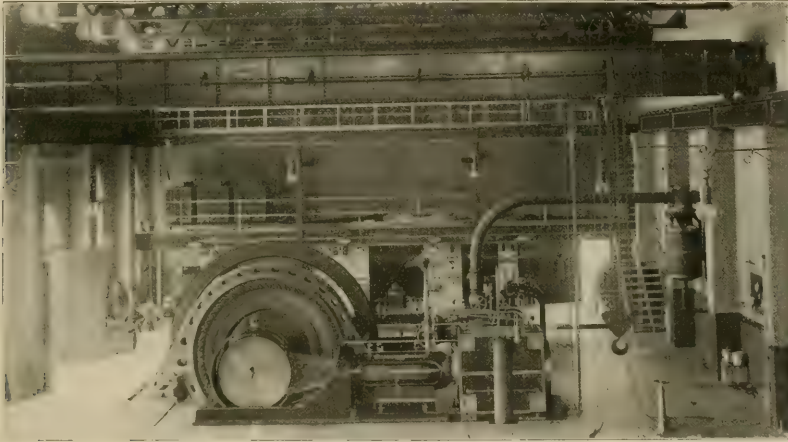


## The Toledo & Monroe Railway.

The Toledo & Monroe Ry. which forms the southern division of the line from Toledo to Detroit was completed April 4, 1901, and is now in operation. A branch from Monroe to Monroe Beach, 4 miles long, was opened on July 4th. The section in operation is about 21 miles long, beginning at the terminus of the Toledo city lines and extending in a nearly northerly direction to Monroe, and from there to Monroe Beach. The engineering and construction work was done by J. G. White & Co., who secured the contract through their Michigan agent, Mr. Jos. E. Lockwood, president

Monroe being 17.84 miles, which is nearly level throughout. The maximum grade is but 1.67 per cent and this extends only 1,000 ft. The track is laid with 70-lb. T-rails of the A. S. C E. section, made by the National Steel Co. "Continuous" rail joints made by the Continuous Rail Joint Co. of America are used. The ties, which are of oak and cedar, are laid 2 ft. between centers. The ballast is broken stone.

The road is operated on the alternating-direct current system. A double trolley wire of No. 00 section is used, one being used by



ENGINE AND GENERATOR ROOM.

of the Michigan Electric Co. of Detroit. Nearly the entire line is over a private right of way, and the roadbed and track have been built in a most substantial manner equal to the best steam road practice. Drainage has been secured by building the road-bed 2 ft. higher than the surface of the adjacent ground, and grade crossings with other railways have been avoided as the cars of this road are scheduled to run at 30 miles an hour, including stops, making the actual maximum running speed about 55 miles an hour.

The road is a single track line with turnouts, the length to

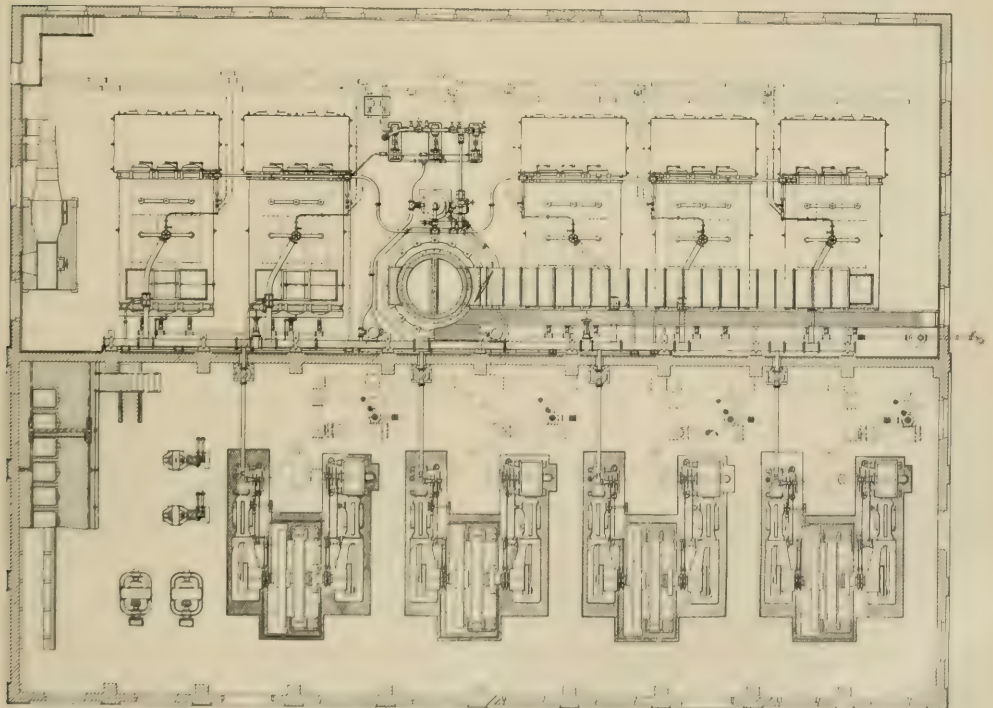
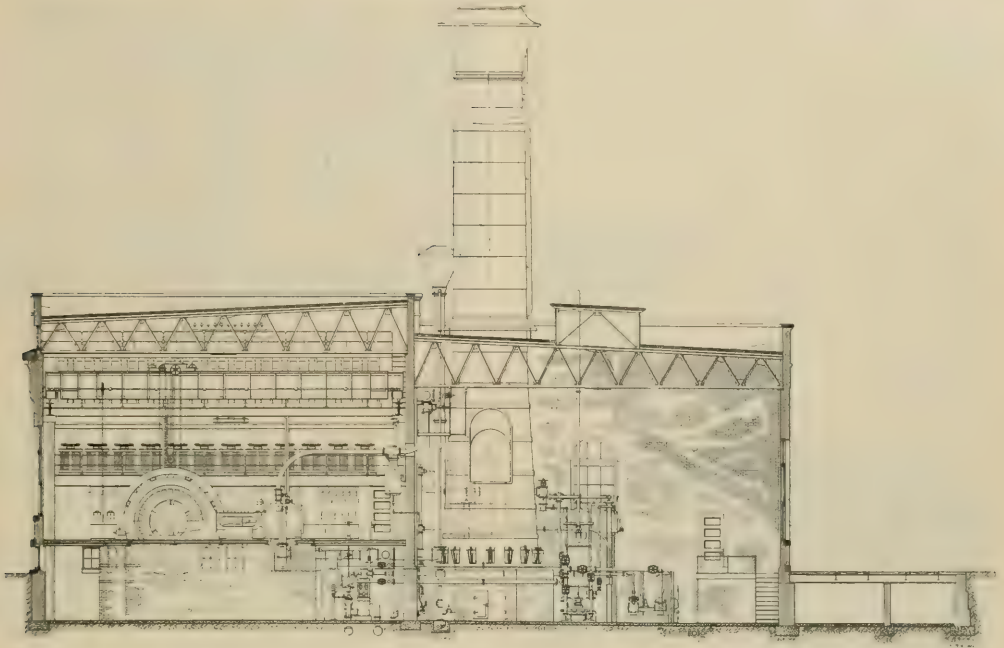
cars in one direction and the other by cars in the opposite direction, so as to avoid overhead switches at the turnouts. A No. 0000 feeder runs parallel to the track along the whole length, with additional copper at places, making in all 23.4 miles of feeders. The overhead materials are of the Ohio Brass Co's. make.

The poles are of wood finished in octagon shape, 37 ft. 12 in. at the base and 8 in. at the top, where the high tension lines run. For the rest of the distance they are 30 ft. long; 10 ins. at the base and 8 ins. at the top. The high tension line is protected from



TRACK AND LINE CONSTRUCTION. TOLEDO & MONROE RY.





PLAN AND CROSS SECTION OF POWER HOUSE, TOLEDO & MONROE RY



switch board extends along the wall beneath the transformer gallery. The switchboard contains one generator panel, one exciter panel, one load panel, one transformer panel, two rotary transformer panels and one feeder panel.

The power house contains one 200-kw., 3-phase, 25 cycle Westinghouse rotary converter and three 135-kw. step-up transformers. These are provided with high tension circuit breakers and lightning arresters.

The general arrangement of the substation will be seen from the accompanying illustration which gives the plan side and end



INTERIOR BOILER ROOM.

compartment at the front end, and especial attention should be called to the arrangement of the motorman's compartment, this being completely cut off so that passengers entering or leaving the car cannot disturb the motorman. The cars have electric heaters made by the American Electric Heating Corporation.

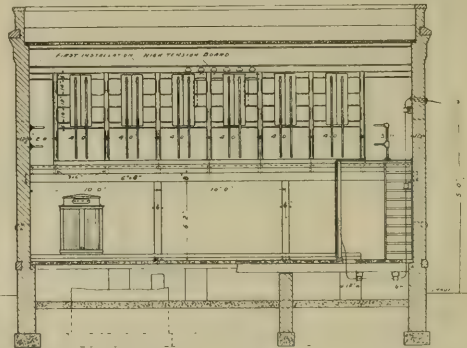
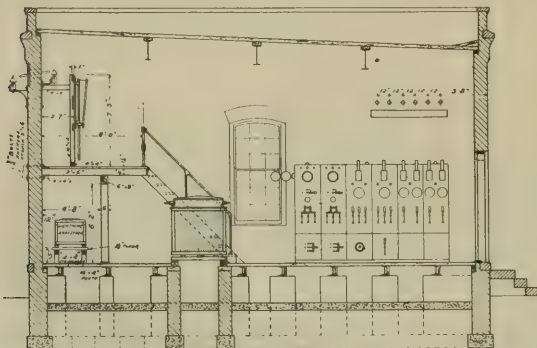
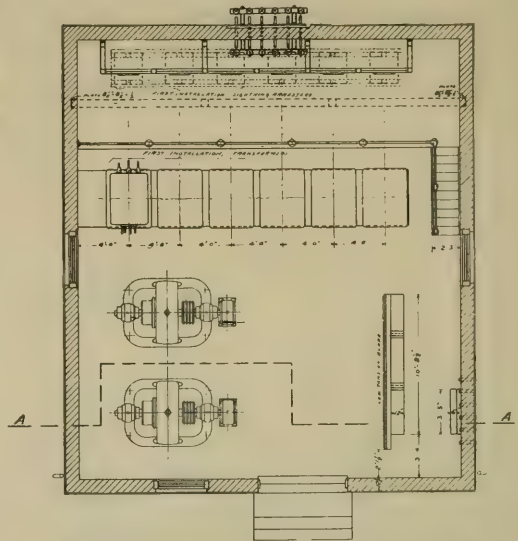
The cars are mounted on Peckham "extra strong" long wheel base No. 26 double trucks which are designed expressly for high speed



POWER HOUSE AT MONROE.

elevation of the building and plant. The ground dimensions of the building are 32x35½ ft. This contains the step down transformers which are arranged in a row across the room near the center. In the rear of the transformers is a gallery upon which the high tension switchboard is placed, and beneath the gallery are the lightning arresters. In the front of the room are the two 200-kw. rotary converters, to one side of which is the low tension switchboard.

The rolling stock comprises five passenger cars and two combination passenger and baggage cars, all of which were built by the Jewett Car Co., of Newark, O. An idea of the general appearance of these cars is had from one of the half-tone engravings. The cars are 42 ft. 4 in. long over all, the body being 33 ft. long; the width is 8 ft. 4 in.; the weight of the car body is 18,000 lbs. The interior finish is white birch. There are 24 double rattan seats supplied by the Heywood Brothers & Wakefield Co., giving a seating capacity for 48 persons. There is a smoking



GENERAL ARRANGEMENT OF SUB-STATION, TOLEDO & MONROE RY.

suburban and interurban service: the trucks are 21 ft. 7 in. between centers. The side frames are of the Peckham patent bridge truss construction connected at the ends with cross bars of angle section. The angle cross bars are secured to the ends of the side frames, which are machined to fit them, by machine turned bolts driven into reamed holes. The ends of the side frames are so constructed as to reduce their height to less than 15 in. The truck is provided with swing bolster supported upon a combination of helical and elliptic springs, the helical springs being located at the ends of the bolster and the elliptic springs in the center. These springs are adjusted so that the weight of the empty car body is supported by elliptic springs, and the helical springs reinforce them as the load of the car increases. The bolster is supported upon links which are hung from the transom bars. Buffer springs are provided to prevent excessive movement of the bolster which is secured between angle transom bars sufficiently strong to prevent them becoming bent or warped. The transom bars are secured to the side frames, by a strong ribbed casting, secured in place, upon the side frame, by machined bolts, driven in reamed



CAR BARN AT MONROE.

holes, to insure perfect fit. The transom castings are of semi-steel and so constructed as to distribute the weight of the bolster evenly upon the side frames.

The brake rigging used is an improved type, with the shoes bearing upon the inside of the wheels so that no rods have to be removed when taking out the wheels. The brake shoe link hangers are designed to prevent the chattering of brake shoes and are made in one piece with an adjustable clip so that the wear can be taken up. The release springs are connected to the top of the live lever so that they require no adjustment when shoes are adjusted, and they cannot cause the shoes to drag on the wheels. The shoes can be easily adjusted without placing the car over a pit, which is sometimes necessary on long suburban lines.

Extra strong construction throughout is used and all parts are well fitted; all rivets are driven hot under a pressure of 30 tons by pneumatic process. Compared with its carrying capacity this truck is light; with 5-in. axles and 800-lb. steel wheels, it weighs 7,866 lb. and with 4-in. axles and 443-lb. cast iron wheels it weighs 6,440 lb.

Each truck is equipped with two Westinghouse No. 36 motors. The wheels are 33 in. in diameter, with chilled treads and reinforced spokes, made by the St. Louis Car Wheel Co.

The car house is located alongside the power house site and is a brick structure 162 ft. long by 76½ ft. wide. It has a capacity for 18 cars.

The officers of the company are C. A. Black, president; E. M. Fowler, vice-president; A. E. F. White, secretary; J. M. Mulkey, treasurer and general manager; A. F. Edwards, superintendent.

The Indianapolis & Vincennes Railway Co. recently secured a temporary injunction restraining a competitive company from encroaching on the right of way through Maywood.

Port & Hamilton, Youngstown, O., have awarded the National Steel Co. the contract for rails to be used in the construction of the Sharon-New Castle electric line. Work on this railway is progressing rapidly.

## PROSPERITY OF THE TWIN CITY CO.

Statements made public in the latter part of June show the condition of the Twin City Rapid Transit Co., operating in Minneapolis and St. Paul, to be exceptionally prosperous. Gross receipts for the five months of 1901, ending June 1st, were \$1,178,257, by far the greatest earnings for a similar period in the history of the company. At this rate the earnings of the Twin City railways for the entire present year may be expected to exceed \$3,000,000. Net earnings for the first five months of 1901 were \$614,593, as compared with \$548,432 for the first five months in 1900; \$491,022 in 1899; \$414,139 in 1898, and \$351,981 in 1897. The increase for the present year to date over last is 12 per cent, over 1899, 25 per cent; over 1898, nearly 50 per cent, and over 1897, nearly 75 per cent. Last year's surplus applicable to dividends was 23 per cent larger than that of 1899; 83 per cent larger than that of 1898, and 159 per cent larger than that of 1897. The surplus applicable to dividends for 1901, on the basis of operations thus far in the year, may be expected to approximate \$1,200,000, a sum which exceeds the fund for 1900 by 31 per cent; the surplus for 1899 by 62 per cent; that of 1898 by 140 per cent, and that of 1897 by over 200 per cent.

Twin City common stock was quoted in June, 1897, at only 12 cents on the dollar with no sales of consequence at that figure. The common stock earned no dividends, and but small dividends were at that time paid on the preferred. The beginning of the market movement in Twin City common dates from August, 1898, during which month the selling price rose to 30, an increase of 9 points in 10 days. The rise since then has been constant though not regular. The greatest sales of Twin City Rapid Transit securities were made during January, 1899, the transactions being almost exclusively in common stock. July 10th Twin City was quoted at 93.

The total distributions of dividends during the past five years have been as follows: in 1895, \$59,598; in 1896, \$79,534; in 1897, \$79,604; in 1898, \$119,854; in 1899, \$562,803, and in 1900, \$655,050.

Last year the company carried \$56,284,000 passengers, as against 49,536,000 in 1899 and 42,900,000 in 1898. Passengers carried this year will undoubtedly number over 60,000,000 and the car mileage will exceed 12,000,000.

There is no truth in the report recently circulated that President Thomas Lowry had sold a controlling interest in the Twin City Rapid Transit Co. to Canadian parties. Although a good many shares of stock held by eastern capitalists have been acquired by Toronto investors, Mr. Lowry's interest is not affected by their purchase.

## EXPRESS CARS IN NEW YORK.

On June 28th there were placed in commission on the system of the Metropolitan Street Railway Co. a number of cars for carrying freight matter, this being the inauguration of what will probably be the most extensive application of the trolley express idea ever attempted. It is the opinion of the Metropolitan street railway officials that inasmuch as the development and extension of the transportation facilities of New York City have gradually moved the center of the resident population farther and farther into the northern section of the city, the time has now come when the street railway lines should provide better means of carrying baggage, express, merchandise and in fact all classes of supplies from the downtown depots and distributing points into the residence districts in Northern Manhattan, the Bronx, Yonkers, White Plains, Mount Vernon and New Rochelle. The growth in population in this district has been phenomenal, so rapid in fact that the facilities for bringing even the necessities of life to the homes of the people have not kept pace with the demands. There are, of course, a number of old line express companies operating in this district, but by far the greater part of the hauling has to be done in trucks and wagons, the hauls in many cases average 20, 25 and even 30 miles.

To better serve the people in this respect, a new company known as the Metropolitan Express Co. has been organized and will do a regular express business, using special express car running at frequent intervals over the various lines of the Metropolitan Street Railway Co. from the Battery on the lower end of Manhattan Island, to and through the resident districts to the north, including the suburban towns as far north as White Plains. It is not expected



that these cars will do an extensive short haul business, but it is believed they will soon secure by far the greater part of the long haul traffic. Arrangements will be made with commission houses, produce houses, retail grocers and merchants for carrying merchandise and supplies of every description, in this way greatly reducing the amount of teaming on the street and delivering the goods up-town in better shape and in less time than the local firms can do it with their own teams and wagons. The trolley express company will also cater to the wants of individuals as well as business houses, and will carry trunks and other baggage, small parcels, etc., to and from all depots and steamboat landings, and to and from residences in all parts of the city. The schedule of rates for this service has not yet been definitely decided upon, but the rates will be practically the same as those now charged by the regular expressmen.

It is not the intention to antagonize the old line express companies by cutting rates, and as a matter of fact it has been determined that many of the established companies will be glad to divert the long haul business to the trolley cars, retaining for themselves the more desirable and remunerative short haul carrying.

The express cars will operate only on the main through lines and possibly at two of the principal cross-town lines. No express cars, however, will run on Broadway, as that artery is now taxed to the utmost taking care of the regular passenger traffic. The collecting and delivering of goods will be made with electrical vehicles and

## AUGUSTA, GA., EMPLOYES' CLUB ROOMS.

A year ago this month the employees of the Augusta (Ga) Railway & Electric Co. organized an association called the Augusta Railway Athletic and Benefit Association, the plan of which was described in the issue of the "Review" for September, 1900. Within four weeks from its inception seventy names had been placed on the roll of membership. One dollar initiation fee and six dollars per year dues are charged and for this sum the members have the services of a first-class physician in time of sickness or accident, and the association allows each member a dollar for each day he is incapacitated for work. Mr. C. O. Simpson, auditor of the company, joined the association and was instrumental in bringing about its organization.

Col. Dyer, president of the railway company, became interested in the association and guaranteed that the company would build and equip quarters for the men, where they could entertain themselves with their smokers and social sessions. He had built a large hall over the company's car barn and equipped it with the latest gymnastic apparatus, including foils, boxing gloves, parallel and horizontal bars, flying rings, ladders, ropes and punching bags, also a billiard table. The rooms are equipped with lockers for each member, and at his pleasure he can enjoy a bath in a conveniently arranged natatorium.

On August 9th the hall was formally presented to the association



EMPLOYEES' ROOMS, AUGUSTA RAILWAY & ELECTRIC CO.

messengers, operating from district stations which will be established at convenient points, and the number increased as the business warrants. These stations will be placed along the main lines and the express cars will be switched into the station buildings from the tracks, thus avoiding all interference with the passenger traffic or sidewalk travel. The interior of the station will be so arranged as to permit cars to run up to one side of the loading and unloading platforms, the other side of the platforms being used by the electrical automobiles. Most of the heavy hauling will be done at night.

The cars to be used in this service for the present are ten old mail cars owned by the Third Avenue Railroad Co. They have been repainted and all interior fixtures removed, giving an unobstructed space for storing away express material. The cars are 27 ft. in length and are equipped with two 25-h. p. G. E. motors. They are fitted with both a plow for service on the conduit lines and an overhead trolley pole for use on the suburban lines. The change from the underground to the overhead traction can be made in a few seconds by drawing up the plow and fastening it under the car. It is the intention of the company to adopt a system of receipts and way billing that will minimize the clerical work and accrue to the benefit of the patrons as well as of the company.

Mr. Henry Sanderson, president of the New York Electric Vehicle Transportation Co., controls the Metropolitan Express Co., and Mr. Geo. W. Slingerland is general manager in charge of operating details.

•The Cincinnati, Newport & Covington Street Railway Co. has insured its rolling stock and buildings for \$600,000.

by Col. Dyer, and was accepted in a speech by Mr. J. Horton Adams, its president. The occasion was one of much merry-making and an excellent musical program was rendered making the entertainment a thoroughly enjoyable one.

Some views of the new quarters are shown herewith. On one side of the hall is the platform for the president; he sits under the hood of a car. In front of him is the regulation controller box with controller handle on top. There are seven points in this switch box, and as the handle is turned at each point it is connected with a series of electric lamps, and when all seven are turned the hall is brilliantly illumined with vari-colored globes, making a pleasing effect. The president calls his men to order with the gong, which is in its accustomed place, and at his left hand is the swinging bell cord.

The members meet regularly each Tuesday and Friday evenings, where, after the usual opening, papers are read on matters pertaining to the life and work of the motorman, the conductor, the trimmer, the lineman, the gas man and the power house man. The papers are then discussed by the members. The organization has proved a very gratifying success in every way which is largely due to the energy and active interest of its treasurer, Mr. C. O. Simpson.

The Brooklyn Rapid Transit Co. has placed 100 additional cars in service on its surface lines and 50 on the elevated roads. Until plans for improving the mechanical equipment of the system shall be perfected, 24 locomotives will be put back on the elevated lines in order that the electric power may be kept for use at the points where the traffic is greatest.



## FRANCHISES.—III.

BY H. S. COOPER.

It being assumed that the granting of a franchise is for a needed public benefit; that it is free from official venality, political bias or personal benefit on the part of the grantors; that the projected enterprise is one that is reasonably certain of remunerative returns; that it is to be completed and operated in good faith and as an investment and not merely as a speculative scheme—the next step is to arrange the conditions to be observed by both the parties to the contract.

These conditions must be full, complete and specific and they must be reasonable and equitable unless trouble, disputes and litigation are desired later on. In most cases, if both parties to the agreement are honest in their views and demands, there will have to be a lot of compromises made and the adjustment of these points always constitutes the critical point in the transaction, and it is here that it is especially necessary that both sides exercise a conservative business spirit. Any attempt to play "grab" by either side leads, sooner or later, to reprisals by the other, and the fact that one side appears an "easy mark" at the time that the agreement is made is no guarantee that they may not, at a later date, resent having been "struck," nor is it any sign that they may not have a "club under their coat" to be used at some future time. One of the sharpest operators in the country once said, "I don't like it when a man lets me get the better of him too easily; he's either a great fool or a great rascal, and it keeps me watching him after that to find out which, for they're both dangerous!" There is no surer way to be cheated than to try to cheat and, in the long run, the best way to obtain honest and equitable treatment is to offer the same. While there may be venal officials on the one side or unscrupulous speculators on the other, as a rule it is seldom that either side will be worse off for having treated the other with strict and equitable honesty. In all of the writer's experience with civil officials he has found few cases where an honest regard for the rights of the other parties and at the same time a firm stand for right and justice on his own side has not resulted in an equitable and mutually satisfactory agreement.

Such conditions as are incorporated in any franchise should be absolutely specific and clear cut; such phrases as "of the best material and workmanship," "shall be done in a workmanlike manner," "must be completed at as early a date as possible," "as shall best accommodate the public," "within a reasonable time," etc., are trouble-breeders; they mean absolutely nothing until a judge or a jury have passed on the law or the facts and such legal proceedings are not only costly but they are generally the outcome of equally costly ill-feeling, loss of time or traffic, or of accidents caused by two opposite readings or understandings of such vague, equivocal and absolutely useless and nonsensical phrases as the above. There is no condition of time, space, quality or quantity that cannot be either exactly limited, specified or described; an absolute maximum or minimum can always be agreed on if both parties are reasonable, and at the worst, where a positive agreement cannot be reached at that time, or where the condition is contingent on uncontrollable future circumstances it can always be arranged for reference to mutually chosen or satisfactory third parties.

In a franchise now before the writer it states that "the rails shall be T-rails or others more desirable," that the machinery, cars and equipment "shall be of the latest designs and finish," that the schedule shall be such "as to accommodate all reasonable demands of the public," that the work on track and line shall be done "in a workmanlike manner" and "completed within a reasonable time," that the rates charged for express and freight "shall be reasonable and just," that the speed of cars shall be "such as shall be safe for the general public," that the running and stopping of cars shall be such that the ease and convenience of the general public are not unreasonably interfered with," that all cars shall be provided with "suitable" fenders, etc. Every one of these phrases are indefinite, many are ambiguous and many unnecessary. All that are necessary can be absolutely and clearly specified, the others are best left out, as their incorporation is only the unnecessary opening of so many more doors for later disputes and litigation, and of these doors there are always plenty with willing hands to open them on the smallest excuse. Where certain conditions are

pertinent and necessary they should be explicitly defined at the beginning if it is any way possible; if it is not possible to do it at that time, provision should be made in the agreement for such definition at a later time. Nothing need be left for later dispute, when one-sided opinions and untechnical prejudices will probably rule, there is not a single condition that cannot either be fixed at the beginning or so arranged that it may be amicably fixed at a later and proper time. If this is not done, and thoroughly done, trouble will walk in and engage board and lodging for the full term of the franchise.

Where there are any general laws relating to any points that will come up in either construction or operation, they should be incorporated in the franchise, if it only be a reference to them. In some states there are laws in regard to rates of fare within incorporated cities, provisions as to paving, etc.; in such case it should be stated in the agreement that such matters are "subject to the terms and provisions of such a section of such a law." This shows conclusively that the matters so referred to have had consideration, locates the authority for the limitations of those points and prevents the later passing of redundant ordinances and resolutions by over zealous civic officials.

Where, however, certain powers of regulation are either negatively or positively given to the officials granting the franchise, these should be definitely fixed for all time. If, on account of unknown conditions in the future, there are points that cannot be fully fixed at the time of making the agreement, it should be particularly specified in the agreement as to who or what will decide as to those particular points when the occasion comes to decide them. Purely technical matters such as the system of electrical distribution, the voltage, the character of cars, equipments and type of overhead or underground construction, etc., should be left entirely to the constructors and operators; as matters which are purely technical and have no relation—or only a sentimental one—to the general public, are much better left in the hands of those who have had practical technical experience and who are to have the trouble and expense of their operation, and this point should be insisted on at the start. Especially should the "city engineer" or the "city electrician" be debarred from having any finger in the matter, as at the present time, in this country, if he is not without the necessary practical experience he is too often incompetent, and owes his position—not to his ability or fitness for it—but to political influence or friendship with the dominant political party. Even if he is fully competent both technically and experimentally he may be totally lacking in grasp or executive ability, and at the most, granting that he is the very man for the place, a change in politics or a bigger "pull" may oust him from his position at any moment and put in an incompetent man, one of totally opposite views or one of those "new brooms" who consider all the work of their predecessors as so much dirt to be swept away without any regard to results.

Points which are entirely untechnical and which more or less strongly affect or interest the general public are peculiarly the province of the civic officials, and unless their decision, either one way or the other, very unfavorably affects the present or future interests of the grantee, such points should be left entirely to the unbiased decision of those authorities.

Points which are only partly technical, and those non-technical ones which do or will influence the cost or risk of construction or operation should be fully arranged by mutual agreement either between both sides in full or by selected and authorized representatives on either one or both sides. In nearly all cases the latter is the better arrangement, both as regards the original agreement and also in respect to those points whose final decision has to be postponed for uncontrollable causes. In many civic bodies certain fixed committees have permanent jurisdiction over certain parts, property or departments of the civil division, such as highways, bridges, paving, trees, gutters, sewers and drains; and where this jurisdiction is a fixed one—as by charter—the grantee will have those certain committees to deal with regarding the objects under their control. It will, however, wherever possible, be found much better to have a fixed standing committee appointed and empowered for the especial purpose of treating with the grantee on all disputed or unsettled points, and in the original agreement to specifically state that all unsettled points in it are to be left to the final decision of this committee and the representative or rep-

representatives of the grantee by mutual agreement whenever the occasion arises.

If such a committee can be arranged so that all or even a majority of its members do not go out of office at the same time, and if the presiding officer of the civic body be made a member ex-officio, the arrangement will generally be found as satisfactory a one as it is possible to obtain. Such an arrangement makes a court of final resort in which both sides are represented and in which cases may be tried with speed, equity and mutual satisfaction and with a minimum of expense and hard feeling if the question at issue is approached with honest business intentions on both—or even on one—side. The civic members, being more or less familiar with the representatives of the grantee, their actions, policy and the causes leading thereto, are more liable to be favorable towards them and to be broader in their views of the matter in dispute, especially if those actions and that policy have been really honestly business-like, while, at the same time, the representatives of the grantee will, if they are the men for the position, have arrived at a better knowledge of the views, policy and scope of their associates of the committee, and will be better able to obtain what is right and equitable for their company.

So much being arranged as to the method and personnel of the franchise and the parties thereto the matter of the specific terms and conditions will next be discussed and illustrated.

### SUMMER PARK PAYS AT HARRISBURG, PA.

The Harrisburg Traction Co., of which Mr. F. B. Musser is general manager, leases a park of 21 acres situated about three miles from the center of Harrisburg, and has converted the place into a popular pleasure resort. From statistics furnished us by the company it is evident that in this case the money spent in improving the property has been well invested, and the management is strongly of the opinion that pleasure parks of this nature can be made a very valuable feature of a street railway system.

The attractions provided at the resort, which is known as Paxtang Park, include a merry-go-round, shooting gallery, refreshment pavilion, a spring of cool water, and a summer theater. Admission to the park is free to all.

The theater is an inexpensive building, seating about 1,200 people, and cost complete \$3,500. There are two wings, one on either side of the theater proper, as will be seen from one of the half-tone engravings. These are known as the "bleachers" and the seats are sold for five cents each. The covered seats in the center division sell for ten cents. Last year the theater practically paid for itself and the park line carried over 350,000 passengers during the

maintain and police the park, so that the total daily expenses mount to about \$50. Monday night of each week is designated "ladies' night," and on this evening all ladies are admitted to the theater free of charge.

In addition to the theater the company endeavors each year to



THEATER, PAXTANG PARK.

persuade a good traveling circus to locate on the park property and give a series of performances. This innovation has proven decidedly satisfactory. The company gives the necessary location in consideration of a small percentage of the receipts from the sale of seats. Last year Bostock's wild animal show located at the park for the entire season and attracted large crowds.

The performances in the show tent are arranged so as not to conflict with the theater entertainment. That is, the show holds forth



REFRESHMENT PAVILION.

from 7:15 to 8 o'clock in the evening, and the audience is then dismissed in time to attend the theater. Another performance in the tent is frequently given after the theater is out. In this way practically a double bill is secured, but the railway company has the responsibility of running but one attraction. Mr. F. M. Davis is manager of Paxtang Park.

### NEW ENGLAND STREET RAILWAY CLUB.

The June meeting of the New England Street Railway Club was held on the 27th. The club met at the South Union Station in Boston and took a train for Braintree on the New York, New Haven & Hartford, where the party became the guests of Col. N. H. Heft. The club was taken over the third rail system as far as Point Allerton, inspecting the equipment, power station, etc. After dinner at Nantasket Beach, Colonel Heft made an address on "Electricity as a Motive Power."



ENTRANCE TO PARK.

season the theater was open, the revenue from this extra travel being largely clear profit.

Paxtang Park is a member of an amusement circuit including about a dozen Pennsylvania towns and is therefore able to have a different attraction each week. These shows consist of good vaudeville, minstrels, etc. The total cost of running the theater is about \$40 per day and it takes about \$10 additional per day to



## PERMANENT INTERNATIONAL TRAMWAY UNION.

Mr. F. Nonnenberg, general secretary of the Permanent International Tramway Union, has announced that the 12th general assembly will be held in London, July 1 to 4, 1902, the Union having accepted the invitation of the Tramways and Light Railways Association. An exhibition of tramway machinery and apparatus will be a feature of the congress.

The following is the list of the questions for the assembly. Reports will be submitted, based upon the replies received to the first eight of these; the other seven questions are intended to bring out statements of facts not properly subject to discussion:

1. On what conditions do you consider that the use of transfers is useful or desirable?

What is the system of transfer tickets that you employ?

Kindly send a specimen of your tickets.

In what manner does this system insure the supervision of the transfer service?

What are the advantages and disadvantages which you have experienced?

2. What are the advantages and disadvantages of a narrow gage and the ordinary gage for suburban tracks?

3. What basis should one adopt in estimating the power of motors and generators, taking into account the different elements which may enter into this calculation, such as output, speed, torque, heating, etc.?

4. What systems of brakes are fitted to your cars?

Hand-brakes, screw or chain; short-circuit brakes; electro-magnetic brakes; steam brakes, slipper brakes, etc.

Describe the systems you employ:

(a) For electric traction;

(b) For steam traction, compressed air, etc.

State with what systems of brakes your cars are simultaneously equipped:

(a) When motor cars are used alone?

(b) When trailers are used?

Kindly point out in this latter case the system of brakes applied to trailers, and state if the brakes of these cars are worked by the conductor of the motor car or locomotive.

Where you have fitted simultaneously several systems of brakes which brake is employed on ordinary occasions?

Kindly state if you have employed the systems of your own initiation or if they have been required by the authorities.

Kindly state the advantages and disadvantages which you have experienced of the systems which you employ.

What are the instructions given to the staff as regards the working of the brakes?

5. Give the principle on which payment to be made to conceding powers for tramway concessions should be based, in such a manner as to conciliate, as far as possible, the interests of the public, the authorities making concessions, and the concessionaires.

The different systems of payment most generally in use are the following:

A proportional or progressive payment on the gross receipts.

A proportional or progressive payment on the profits from working

A proportional or progressive payment on the net profits.

Payment per car in service.

Payment per track-kilometer.

Payment per passenger.

Payment per ticket sold, etc.

6. What obligations are imposed on tramway companies in respect of the road on which their lines are placed?

7. Arrangement of car sheds with regard to configuration of the track system.

How do you consider the car sheds ought to be placed with regard to the form of the net-work and the services carried out on your lines?

Are you of opinion that the cars should be concentrated in a limited number of important sheds, or distributed in a greater number of less important sheds?

Discuss the question from the point of view of rolling stock, of utilization and inspection of the staff, and of the lost journeys made by the cars at the beginning and end of the day.

How far have you been able to realize your views, that is to say, how are your sheds placed, and what are the advantages and disadvantages which you have experienced in this arrangement?

This question is of so much the more importance as its solution on the one hand influences the cost of working (actual running) by increasing or decreasing the lost journeys of the cars, and, on the other hand, the cost of maintenance of rolling stock. Moreover, under certain conditions, it may happen that the cost of maintenance of rolling stock is equal to the cost of production of the power.

8. Have you any tramways working where the collection of the current is effected by systems other than the overhead trolley as generally employed (underground conduit system, surface contact system, etc., etc.)?

What is the length of the lines on which these systems are employed?

How long has your installation been working?

What are the technical considerations which made you adopt this system?

Give the initial cost of laying down the actual conduit, all the expenses of labor (digging, pulling up pavement, and repaving, etc.), all the material necessary for the installation.

(a) Per kilometer of single track;

(b) Per car in service.

Give the price of rolling stock (price per car with the number and power of the motors, and number of seats and amount of standing room)?

Give the expenses of working:

(a) Consumption of current per car-kilometer, compared with the corresponding consumption in the overhead trolley system;

(b) Cost of maintenance of the conduit and its accessories per kilometer of track;

(c) Cost of maintenance of rolling stock per car-kilometer;

(d) All other expenses of working per car-kilometer.

What observations have you had an opportunity of making from the point of view of the working of the system, and notably from the point of view of accidents which it may have given rise to, on interruptions of service which may have occurred, of maintenance of different parts of the conduit, insulation, etc.?

9. What is the ratio between the number of passengers carried and that of the seats available on your different lines?

(1) Per annum?

(2) Per day, and for the different hours of the day?

Do you consider that reduction of fares could sensibly increase this ratio?

If so, give the maximum value of the ratio which appears to you permissible with good working order, satisfactory alike to the interests of the tramway owners and of the public.

Is there any advantage in employing, over certain networks of urban tramways, cars of different sizes to meet variations of traffic?

10. Give technical information concerning the maintenance, the consumption and output of the boilers, steam engines, gas engines, dynamos and accumulators at your generating station, and of any special apparatus you employ.

A detailed list of questions fixing the conditions under which the consumption and output should be given, will be sent later in order to obtain uniformity in the answers and permit of comparisons.

11. Give the information you possess on the subject of the installation, construction, method of working (steam, electric, or cable traction) of underground railways for the interior service of large cities, also the data from your experience on the subject of organization and working of these railways, and the results which this method of working has given.



12. Point out the new applications or improvements in systems of heating employed for tramways or suburban railways (removable foot-warmers, stoves, heating by brickettes placed in apparatus installed under the floor or under the seats, heating by hot air, steam, hot water, electricity).

13. Give cost of electric energy applied to the traction of tramways as measured at the switchboard of the central station when one employs:

- (1) Steam;
- (2) Producer Gas;
- (3) Water Power.

A.—Give the object of your central station. Is the current produced exclusively for traction, or also for lighting or running stationary motors? What is the output in kilowatt-hours and, where the question applies, what proportion of the current produced is used for traction, lighting, or stationary motors? What is your daily maximum and minimum output?

N. B.—In the case where factories, compressors, pumps, ventilators, etc., are run by electric motors, this part of the energy may be an important fraction of the output of the station.

B.—Give the cost of first installation of your central station and of its dependencies, including all building and equipments for production of the motive power and current up to the switchboard of the central station:

(1) For stations using steam: land, all buildings, boilers with accessories, condensers, pumps, cooling apparatus, piping, etc.; engines, dynamos, storage batteries and all appliances generally up to and including the main switchboard, but not including the feeders conducting the current outside the station.

(2) For stations using producer gas: land, and all buildings, gas producers, purifiers and accessories, piping to the engines, engines, storage batteries, etc., etc., as above, whether serving for the production of gas or for the production of energy.

(3) For stations driven by water power: Cost of purchase of waterfall, land and all buildings with dependencies, including total installation for the collection and disposal of the water, both up stream and down stream, water-wheels or turbines, pipes, dynamos, accumulators, etc., as above, up to and including the main switchboard of the station.

Note.—If your station borrows power from outside parties, give total cost and cost per unit (k. w. h.).

C.—Give the cost of working per kilowatt-hour, analyzing it under the following subdivisions:

(1) Salaries and wages of the manager, employees, and staff of the station and its dependencies, that is to say, concerned with the production of the motive and electric power as defined above.

Note.—For those holding other offices outside the employ of the station, kindly state what percentage of their services is due to the station.

(2) Cost of consumption in fuel, oil, water and everything else used in the production of the motive power and electric energy.

(3) Cost of maintenance and repairs:

(a) Of buildings and complete installation of the stations and its dependencies:

(b) Of the motive power installation, such as boilers and accessories, gas producers and accessories, turbines, water-wheels, dams, etc.;

(c) Of engines, dynamos, etc., with accessories;

(d) Of storage batteries. If the maintenance of the battery is covered by a payment agreed upon, give the amount of this payment per hundred ampere-hours at 500 volts.

Note.—Give the sum reserved annually for repairs and depreciation of the objects named in a, b, c, d.

(4) Rents, way-leaves, general charges and payments.

(5) Miscellaneous expenses. These expenses include all cost of working, maintenance, repairs, etc., not classed in the preceding subdivisions, in order to arrive at the total expense forming the cost of electric energy as defined in the present question.

14. Have you organized on your network of urban tramways a system of carrying baggage, goods or letters?

Give the charges made and describe the manner in which the system is carried out.

15. Do you employ any apparatus for registering fares collected, or tickets sold?

If so, describe the working of this apparatus, pointing out how supervision is effected over receipts.

The council of the Permanent International Tramway Union has also decided to complete, especially from the point of view of electric traction, the general system of accounts established in 1888, and a committee has been appointed which will submit a detailed plan in 1902.

## CONVENTION OF RAILROAD COMMISSIONERS.

At the annual convention of Railroad Commissioners of the United States, held in San Francisco, June 5, 1901, the Street Railway Accountants' Association of America was officially represented by a committee of three. The committee consisted of Messrs. C. N. Duffy, auditor Chicago City Railway Co.; F. E. Smith, auditor Chicago Union Traction Co., and H. C. Mackay, comptroller, the Milwaukee Electric Railway & Light Co.

The business transacted of importance to the Street Railway Accountants' Association was:

1. The Committee on Classification of Construction and Operating Expenses of Electric Railways submitted a report recommending that the president of the Association of Railroad Commissioners appoint a committee to formulate a standard form of report that electric railways are to use in making reports in their respective states to the Boards of Railroad Commissioners; this committee to co-operate and confer with a committee from the Street Railway Accountants' Association of America. The report was unanimously adopted by the convention.

2. A constitution and by-laws were adopted, the Association of Railroad Commissioners never having had them before. This constitution prescribes that the Street Railway Accountants' Association of America and the American Railway Accounting Officers' Association shall constitute a part of the body of the association, to be represented on the floor of the conventions by three members from each association.

3. The next annual convention of the Association of Railroad Commissioners will be held at Charleston, S. C., Feb. 11, 1902; the Street Railway Accountants' Association of America is expected to send three delegates to represent the association.

The committee representing the Street Railway Accountants' Association at the San Francisco Convention is under many obligations officially and personally for the many kindnesses and courtesies extended to the members. The journey from Chicago to San Francisco and return was made by special train, the party, including the ladies and guests in attendance, numbering about one hundred and fifty. Every comfort and luxury was provided, and the trip of over eight thousand miles, occupying twenty-five days in all, was an extremely pleasant one. The party was royally received and entertained everywhere.

Unquestionably these conventions are of great benefit in promoting an acquaintance and a better feeling between the railroads and between those who exercise supervision over them. This is true of the street railways and especially of those who make reports to their respective Boards of Railroad Commissioners.

The Street Railway Accountants' Association of America and the convention of Railroad Commissioners have certainly been brought much closer together than they ever were before. The Accountants' classification of accounts having been officially adopted by the Railroad Commissioners at a prior convention, the next logical step is to formulate a standard form of report that will be uniform and go hand in hand with the classification of accounts. By the action of the San Francisco convention this is the work that will now be undertaken by representatives of the two associations, which should be productive of great good to all interests involved. The Association of Railroad Commissioners will be invited to attend the convention to be held in New York in October.

The Toledo Traction Co., through its president, A. E. Lang, recently donated to the park commissioners of the city \$1,000 to be used for building permanent quarters for the animals of the Walbridge zoo.

## STREET RAILWAY OFFICE BUILDING AT ALBANY.

The buying and merging of independent street railway properties into larger centrally-controlled systems, which has been going on so extensively all over the country, has been attended by a difficulty that in a number of cities has proved to be serious. This has been the selecting of suitable office rooms in which the work of the various executive, financial and operating departments of the consolidated system could be centralized and carried on to the best advantage. With the idea of securing an arrangement of offices suited to their own particular requirements a number of street railway companies have found it advantageous to erect their own

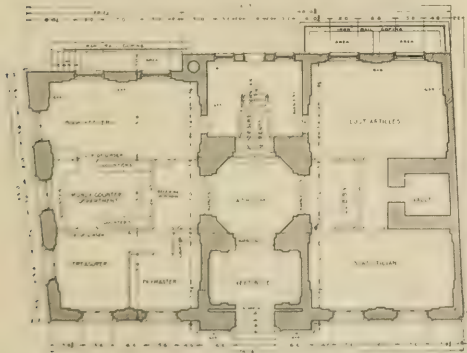


NEW OFFICE BUILDING, UNITED TRACTION CO., ALBANY, N. Y.

office buildings which are used exclusively for transacting the office work of the system.

The United Traction Co., of Albany, N. Y., operating about 77 miles of track, has erected for this purpose a building which is exceptionally elaborate and well arranged. The following description and illustrations may prove suggestive to other companies that are preparing to engage new quarters.

The building, which was completed in May, 1900, is on the corner of Broadway and Columbia Sts., Albany, with a frontage of



PLAN OF FIRST FLOOR.

74 ft. on Broadway and 45 ft. on Columbia St. It has a basement, two stories and a loft under the roof, and is as near fire-proof as modern architecture can make it. The only wood employed in its construction is for doors, window frames and the decorative wainscoting in the directors' room, all other material being stone, brick, mosaics or marble. The walls are of gray brick and Indiana lime

stone, with exterior decorations of columns and bas-relief panels. The building is entered from Broadway through an arch doorway.

The outer vestibule is wainscoted to a height of 10 ft. from the floor with polished red marble and has a highly decorated vaulted ceiling. This vestibule opens into an atrium or central corridor formed of four large archways. The atrium is wainscoted to a height of 10 ft. from the floor in light green polished marble. The entrance takes up one of the archways; the two archways at



ATRIUM.

the sides open upon the two large rooms of the first story, while the one opposite the entrance is filled by the marble stairs leading to the second story.

The atrium is roofed with a dome, the piers which support the ceiling forming convenient chambers for the electric conduits, plumbing pipes, ventilating flues, warm air flues, etc. These chambers are open to the basement at the bottom and are large enough to permit the passage of a man, so that all pipes, etc., can be easily reached. At the same time no pipe or flue is visible throughout the building.

The large room at the right of the atrium is used by the statistician and his clerks, whose offices are in the front of the building, while the rear half is devoted to the lost article department. Between the two is a vault and the bank counter restricting the public to the small lobby. Behind and under the platform of the main stairs is a passage which permits the clerks to pass from one side of the building to the other without going through the atrium. The front room to the left of the corridor is devoted to the office of treasurer and paymaster and to a compartment for the counters of money, both of which are under the eye of the treasurer whose office is in one corner. Here also is the room devoted to the bookkeepers, thus placing the bookkeeping department in close touch with the staff whose duty it is to count the receipts. It may be remarked that access to the money counting chamber is to be had only by passing through the bookkeeper's department or through the treasurer's room. These two large rooms, each 28 x 42 ft., have coved ceilings, into which the arched openings form symmetrical penetrations. The railing and bank counters forming the partitions are about 7 ft. high.

A symmetrical double staircase, opening through the central arch of the atrium, leads to the second story. Here, directly op-



posite the staircase is the room for the general manager, lighted by a window which opens upon a balcony. On one side of the room of this official is the directors' room, which is handsomely finished in mahogany, with a highly decorated ceiling whose design is echoed in the pattern of the floor. On the other side is the

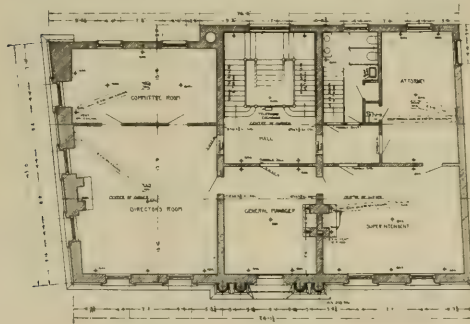


DIRECTORS' ROOM.

superintendent's room which communicates with the general manager's office.

Opening from the directors' room is a large committee room used as the office of the secretary of the board. Opening off the superintendent's room is the legal department and the offices of the attorney.

A staircase leads to the third story, which is one large room, lighted by three skylights. This is utilized as a drafting room by



PLAN OF SECOND FLOOR.

the engineer of the company and for storage of maps, working drawings and other material pertaining to the construction of the road.

In the basement are the toilet rooms and lockers for the clerks, boilers and large storage rooms for the storage of the accumulation of papers pertaining to the road. The architect for the building was Mr. Marcus T. Reynolds, of Albany, to whom we are indebted for the accompanying floor plans.

### FREIGHT CARS IN CINCINNATI.

The Cincinnati & Eastern Electric Railway Co., of which Mr. G. R. Scrugham is president and general manager, has been granted permission to run into the city of Cincinnati to Fountain Sq. over the tracks of the Cincinnati Traction Co. Efforts are being made to secure the right to bring freight cars into the city over a part of this route.

### FUNERAL CARS AT HARRISBURG, PA.

The Harrisburg Traction Co. for the past two years has made a practice of furnishing special cars for conveying funeral parties from any point on its lines to the city or suburban cemeteries. This service has been carried on with results satisfactory alike to the company and to the public, and the number of funerals carried in the trolley cars now averages over 20 a month.

The company has a special funeral car which is merely an ordinary compartment car, of the type frequently used for carrying passengers and baggage or express matter on interurban roads. The passenger compartment has 12 Hale & Kilburn walkover seats, giving a seating capacity of 24. The compartment in which the casket is carried is about 9 ft. long, inside measurement, and has a raised platform in the center on which the coffin is placed. Movable benches are placed along the sides of this compartment for the pall bearers or immediate friends of the deceased. The exterior and interior of the car are finished in the ordinary way, there being no black trimmings or decorations.

No difficulty has ever been experienced in getting the casket from a residence to the nearest car line. Usually the coffin is carried by pall bearers, but if the distance is too great a wagon or hearse is engaged to take the body to the point where the car is in waiting.

Harrisburg is a city of 50,000 population and has eight cemeteries, all of which are within two blocks of some one of the company's lines. When the funeral car is engaged arrangements are made to have the service over, and the funeral party waiting at some convenient point at a stated time, and although most of the lines operate on a 7½ minute schedule there is seldom any delay to the regular travel. For the use of the funeral car the company makes a flat rate of \$10, and if additional cars are desired a charge of \$6 per car is made. The undertakers of the city are friendly to the company and are unanimously in favor of the funeral by trolley.

When the car is not engaged the management frequently uses it in making inspection tours over the lines.

### PUBLIC ACCOUNTING AND PUBLICITY.

Of all the multitude of suggestions for the regulation of "trusts" publicity is pre-eminently first in the estimation of the intelligent. Every proposition for the better regulation of public service corporations is based upon publicity to be secured through public accounting and auditing. Every manufacturer, farmer and merchant who has felt himself injured by arbitrary changes in freight rates and classifications, or by the more subtle and injurious method of secret rebates and discriminations, knows that a remedy for these evils is to be found only in correct public accounting and publicity. It is doubtful, however, if any citizen, even though he may have devoted years of study to these special questions, has an accurate conception of the extent and many ways in which the public welfare suffers through the failure of the people to require an accurate and well devised system of public account for all public business, as great business corporations are compelled to use in order to finance their undertakings successfully. It is idle for the people to dream of regulating trusts and great public service corporations successfully until they have demonstrated their ability to successfully regulate the public business that is now their own. The people must create standards of excellence in accounting before they can hope to reach the stage of efficient administration that will enable them to regulate or to own and operate public service industries successfully.—Public Policy.

### CHEAP FARES ON HOT EVENINGS.

The officers of the Rockford (Ill.) Street Railway Co. have inaugurated a special cheap fare for three evenings in each week so that poor people will be able to enjoy outings on the street cars during hot weather. Three evenings each week the company will sell eight tickets for 15 cents. The tickets will be good Monday, Wednesday and Friday evenings between the hours of 7:30 and 12 o'clock. The service was begun June 26.

Employees of street railways at Saginaw, Mich., have been granted an increase of wages of 15 cents per day.





# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

## SOME EXPERIMENTS ON BOILER SCALE.

We note in the Railroad Gazette for June 14, 1901, an article by Mr. Edward C. Schmidt in which are given the results of experiments on the transmission of heat through scale-covered boiler tubes. The tubes were furnished by various railroad companies, being taken from the locomotives and tested in the laboratory of the University of Illinois where special apparatus had been provided for the purpose.

The dimensions of the tubes and the general character of the scale are given in the table together with the decrease in conduc-

## ADVANTAGES OF MECHANICAL DRAFT.

In the summary of advantages of mechanical draft presented in the treatise on that subject published by the B. F. Sturtevant Co., it is stated that to a great extent they are interdependent, and the possession of one advantage is evidence of the possession of others of similar character. In a brief summary, however, these may be more readily brought into accord. Thus the very adaptability of mechanical draft is indicative of the fact that it is more flexible than that produced by the chimney, is more readily controlled, and less influenced by climatic changes; while the apparatus for its

DESCRIPTION OF TUBES TESTED.

Tube Number	Furnished By	Length of Time in Service, Months.	Dimensions of Tube, Inches.		Average Thickness of Scale, Inches.	General Character of the Scale, Etc.
			Inside.	Outside.		
1	L. C. R. R.	10½	1.75	2.00	0.06	Even, hard, dense, mud-colored.
2	P. & E. Ry.	13½	1.75	2.00	0.14	Soft, porous, mud-colored, removed in places.
3	P. & E. Ry.	3½	1.75	2.00	0.02	Even, hard, dense, white.
4	C. M. & St. P.	.....	1.75	2.00	0.03	Hard, dense, white.
5	C. M. & St. P.	.....	1.75	2.00	0.13	Even, hard, dense, mud-colored.
6	L. C. R. R.	5½	1.75	2.00	0.07	Mileage during service, 19,690.
7	P. & E. Ry.	.....	1.75	2.00	0.04	Hard, dense and rough, one end; soft and porous at the other.
8	C. B. & Q.	31½	2.25	2.50	0.013	Even, hard, dense, mileage 35,688, not tested.
9	C. B. & Q.	.....	1.75	2.00	0.11	Hard, porous, gray; mileage 50,889.
10	C. B. & Q.	.....	2.00	2.25	0.07	Soft, porous, mud-colored, mileage 42,190, not tested.
11	L. C. R. R.	21	1.75	2.00	0.09	Soft, porous.
12	C. M. & St. P.	54	.....	.....	.....	Not tested.
13	C. M. & St. P.	30	.....	.....	.....	Not tested.
14	P. & E. Ry.	.....	1.75	2.00	.....	New and clean tube.

tivity due to the scale, as shown by the average of from two to four tests on each scale-covered tube. The difference in temperature between the water and the hot gases varied somewhat (not more than 5 per cent) in the different tests and due allowance was made for these differences in computing the loss due to the scale.

The decrease in conductivity due to the scale is given in the following table:

Tube No.	Thickness of Scale, In.	Decrease in Conductivity Due to Scale, Per Cent.
2	0.04	6.82
3	0.02	9.10
5	0.13	6.75
6	0.07	0.21
7	0.04	3.07
9	0.11	16.73
11	0.09	10.63
14	Clean tube	Clean tube

The number of heat units transmitted per hour by the bare tube was 29,854.

## THE COST OF POWER PER CAR.

A street railway company operating about 400 motor cars, most of which are of the double truck type, furnishes us the following table of actual cost per car per hour, at the power station, for power used in operating cars:

Average amperes used per car.....	75
Voltage.....	500
Kw. output per car.....	37.5
Cost of power per kw. h. at power house.....	\$.02
Cost of power per hour per car.....	.75

production is more readily transported and has a higher potential value than a chimney. To a considerable extent these stand out as the conveniences of this method, regardless of their economies. When it is shown that increased efficiency can be secured by a method that is more convenient, the advantage of mechanical draft is established.

The actual omission of the chimney is sometimes of far greater importance than would at first appear, while the readiness with which the rate of combustion may be increased is doubly appreciated when it is shown that under proper conditions the efficiency of combustion may be increased thereby. The purely economic features are presented most prominently in the ability to utilize low grade fuels, the resultant economy being shown in numerous examples here presented. The economy in the quantity of fuel consumed has, in its relation to the use of mechanical draft on shipboard, an advantage which is closely allied to that resulting from the decreased space occupied.

The economic results which may be secured through the introduction of mechanical stokers and devices for utilizing the waste heat of the gases are rendered most evident under the conditions of mechanical draft production, as are also the great advantage of preventing smoke and the blessing of good ventilation as they are exemplified on shipboard. The facts that the size of a boiler plant required for a given output can be reduced when a fan is substituted for a chimney, that the cost of the mechanical draft plant is usually far less than that of the chimney draft plant, and that its operating expense is likewise less under proper conditions, all point most conclusively to the purely economic advantages of the method which it is the purpose of this book to present. When these are considered in the light of the convenience and various other advantages of mechanical draft, its evident superiority to chimney draft must be conclusively established in the mind of any one who has read these pages.

## COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION.	MONTH. 1901.	Monthly Output, Kilowatt- Hours.	Cost of Electrical Output per Kilowatt- Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricat- ing Oil per 10,000 k. w. h.	Lb. Water per Lb. Coal.	Lb. Fuel per k. w. h.	Price of Fuel per Ton of 2,000 Lb.	Kind of Fuel
			Fuel.	Labor.	Supplies, Oil, Waste, etc.	Water.	Re- pairs.	Total.						
1.....	Jan.	2,455,060	.322	.111	.029	.029	.044	.535	2.62	.848	10.83	2.45	\$2.63	Bituminous
1.....	Feb.	2,511,280	.334	.114	.036	.027	.025	.536	2.64	.829	10.05	2.54	2.63	"
1.....	Mar.	2,097,160	.337	.123	.037	.030	.040	.567	2.84	.987	11.21	2.55	2.64	"
1.....	Apr.	2,158,660	.344	.129	.039	.032	.043	.587	2.98	.732	11.37	2.61	2.64	"
5. Metropolitan L. Co. go.	Jan.	2,445,161	.408	.110	.013	.011	.016	.558	2.18	1.31	5.51	4.10	1.99	"
5.....	Feb.	2,512,125	.389	.116	.014	.008	.011	.538	2.50	1.08	5.32	3.89	2.00	"
5.....	Mar.	2,352,698	.405	.126	.018	.011	.016	.576	2.52	1.70	5.15	4.33	1.87	"
5.....	Apr.	1,887,029	.347	.149	.020	.011	.036	.563	3.91	1.14	5.22	4.22	1.65	"
6.....	Nov.	827,008	.712	.198	.033	.....	.067	1.010	.....	.....	.....	2.35	.943*	Oil
6.....	Dec.	810,728	.709	.198	.024	.....	.070	1.001	.....	.....	.....	2.36	.937*	"
6.....	Jan.	643,482	.680	.251	.038	.....	.185	1.154	.....	.....	.....	2.24	.945*	"
6.....	Feb.	494,000	.655	.282	.037	.....	.181	1.155	.....	.....	.....	2.25	.905*	"
6.....	Mar.	562,574	.761	.266	.031	.....	.059	1.117	.....	.....	.....	2.42	.976*	"
6.....	Apr.	616,634	.628	.236	.030	.....	.095	.989	.....	.....	.....	2.31	.843*	"

\* Price of oil per barrel.

## PIPE FITTINGS AND VALVES.

The Crane Co., Chicago, has recently issued a 40-page pamphlet giving tables of dimensions of standard flanged fittings from 2-in. to 16-in. suitable for 125 lb. working pressure and low pressure flanged fittings from 12-in. to 36-in. suitable for 50 lb. working pressure. The bolt circles and size and number of bolts for these fittings are the same as those recommended by the American Society of Mechanical Engineers. The pamphlet also includes tables of dimensions of the Crane standard straight way valves, and as the measurements have, in some cases, been changed, it is desirable for those making plans for piping to have a copy of the new circular, which will be sent upon application.

## SCALING BOILERS.

The following is from a memorandum submitted to the Manchester (England) Steam Users' Association by Mr. Stromeyer, Mem. Inst. C. E.:

In my memorandum, dated 1898, and in numerous circulars subsequently sent to firms who were troubled with sedimentary water, the suggestion was made that the usual method of removing scale from boilers was not a satisfactory one; that by opening the boiler for cooling it, the scale, coming in contact with the air, grows hard and adheres so firmly to the plates as to require chipping. It was therefore suggested that the method should be tried of slowly cooling boilers with water in them, and running this out foot by foot while the inside scraping and brushing progressed; for it had been found that the scale would then come off quite easily. The inconvenience of this method is that it takes several days to cool the boiler, and the inside is, of course, quite wet while the men are in it. Some men like this method, while others have protested; but the experiment of providing them with oilskin suits seems to be much appreciated. Where the men are willing, and where time is available, this method is, therefore, to be recommended. Where the men are willing but time is wanting, the following method has been suggested. After drawing the fires, start the feed-pump, if possible through the economizer, and at the same time blow off the boiler, preferably by the scum, if fitted. The boiler will by this means be cooled rapidly, and the air has no chance of coming in contact with the scale, which will then be found to come off easily. This method has been in use for many years in some works under our care, and is satisfactory.

If the men object to clean wet boilers, the following fairly rapid method should be tried.

After drawing the fires, wait till the firebridge is sufficiently cooled down, then blow down the boiler till it is empty. Some recommend a high pressure for this purpose, others a low pressure. When empty, allow the boiler to cool without opening any man-hole doors or valves. When cool, the scale should shell off in large flakes. From boilers provided with low-water and high-pressure

safety valves the air cannot, of course, be excluded, as these valves open when the water falls; but, as will be seen by the following summary of reports by our inspector at Halifax, even where these valves are fitted, the method works fairly satisfactorily. Reports from other works do not as yet give any marked indication as to whether any one of these systems is or is not best adapted for particular classes of boiler scale.

## NOTES FROM TERRE HUATE.

The Terre Haute Electric Co., of Terre Haute, Ind., which operates the electric lighting plant and the street railway in that city, the electric interurban line to Brazil, Ind., and also the electric lighting and street railway system at Brazil, has recently remodeled its power station, and replaced the Willans engines by horizontal engines. There are three lightning units each consisting of a simple engine, made by the Fitchburg Steam Engine Co., of Fitchburg, Mass., direct connected to a Westinghouse two-phase 66 ampere, 220 volt generator running at 150 r. p. m. The railway load is at present carried by one unit, a Fitchburg engine direct connected to a Westinghouse 300-kw. railway generator running at 150 r. p. m. The engines are equipped with the "Monarch" engine stop and speed limit device, made by the Monarch Manufacturing Co., of Waterbury, Conn.

The company has contracted with the Lane & Bodely Co., of Cincinnati, Ohio, for a 900-h. p. cross-compound engine, which will be direct connected to a Westinghouse 600-kw. alternator.

Other improvements at the station include the installation of a water softening apparatus made by the Industrial Water Co., of New York, and a Hunt coal and ash conveyor with bunkers in the boiler room with a capacity of 300 tons of coal.

The company on Dec. 1, 1900, put in operation a freight car which makes two round trips per day between Terre Haute and Brazil, carrying feed, groceries, etc. The rates vary from 5 cents to 16 cents per 100 lb., the ordinary railroad classification being followed.

This is one of the Stone & Webster companies. The officers and operating staff are: President, W. R. McKeen; vice-president, J. G. McNutt; secretary, J. T. Beasley; general manager, J. P. Clark; consulting engineers, Stone & Webster; treasurer, G. E. Tripp; assistant treasurer, P. P. Thomas; superintendent railway department, M. F. Burke; superintendent lighting department, A. Balsley; purchasing agent, E. G. Alden; chief engineer, Frederick L. Ray.

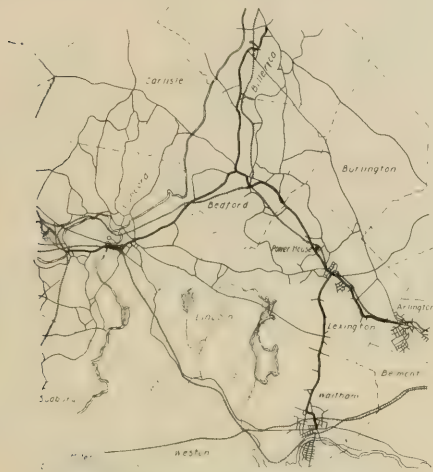
The Portland (Me.) Railroad Co. ran the first car over the newly completed Gorham extension, Jan. 26th.

The new electric line between Miamisburg and Germantown, O., has been put in operation. Connections with Hamilton and Dayton are offered via the Southern Ohio line.

## The Lexington & Boston Street Railway.

The system of the Lexington & Boston Street Railway Co., which operates from the city of Boston to the city of Lowell, Mass., with three branch lines, offers an interesting example for study to those interested in the construction and operation of interurban electric railways. The line has been in operation for over a year, and in

Lexington to Woburn. The territory served has been described as being "a century deep with historic lore." For some distance the line runs upon the road, up which Paul Revere made his ever famous ride. At Lexington the road passes the Lexington battle-ground, where the American farmers met and withstood the British



LEXINGTON & BOSTON SYSTEM.

connection with the physical description of the property we are also enabled by courtesy of the general manager, Mr. Horace B. Parker, to give the power house costs for three months of the busy season of 1900.

The company operates 34 miles of single track, starting at Arlington Heights, where connection is made with the Boston Elevated Railway into the heart of Boston. From Arlington the road runs through Lexington and Bedford to Billerica, near Lowell,



LEXINGTON MONUMENT.

where connection is made with the Lowell & Suburban Ry, now owned by the Massachusetts Electric Companies. This main line is 21 miles long. There are two branch lines in operation, one running from the main line at Bedford to Concord, and one from Lexington to Waltham. An extension is now being built from



LEXINGTON & BOSTON POWER HOUSE.

regulars. These historic associations attract thousands of riders each season in addition to the resident population.

The power house is located just to the north of Lexington, near the center of the system. It is a substantial brick structure about 120x90 ft., divided by a brick wall into two nearly equal divisions, one constituting the engine room, and the other the boiler room, with a long narrow coal bin at the side of the building.

Power is furnished by two units each comprising a 450-h. p. cross-compound Corliss engine made by the Slater Engine Co., of Warren, Mass., direct connected to a 325-kw. generator.

To take care of the load during the parts of the day when travel is light the company is now installing an additional 180-h. p. unit. Room has been left for a fourth unit of 800 kw. to be installed during the coming fall.

The engines are fitted with built-up fly wheels 21 ft. in diameter, the spokes and rim sections being cast separately and bolted together. The valves are the Slater company's special corliss pattern by which, it is claimed, all the advantages of the corliss gear are retained, with the additional advantage of a much quicker cut-off secured by the arrangement of the gridiron admission valves. Lombard governors are used. The engine cylinders are 16 and 30 in. by 42 in. The generators are run at 100 r. p. m., the engines taking steam at about 160 lb. An indicator diagram taken from one of the engines giving the load for about 20 consecutive revolutions shows the cut off to vary from 1-16 to over 1/2 stroke.

The boiler plant comprises two 250-h. p. Cahall horizontal water tube boilers made by the Aultman & Taylor Co. The steam header is supported on rollers carried on brackets bolted to the dividing wall. Cochran separators are used. The piping was put in by the Walworth Manufacturing Co., of Boston.

The engines are run condensing, condensing water being drawn from a small pond in the rear of the boiler room. The pond is limited in capacity, thus making the temperature of the injection water higher than is desirable, and for this reason the condensers are of much greater capacity than is usual with engines of this size. On its way to the condenser the exhaust from the engines passes through a primary heater, and secondary heaters are provided to utilize the heat in the exhaust from the auxiliaries. The condensers are of the Conover independent steam driven type; the



LExINGTON & BOSTON STREET RY. POWER STATION REPORTS.

Month 1900	Outpnt Kw. H.	Cost, Cents per Kw. H.				Kw. H. per Car-Mile	Cost per			Fuel per Kw. H., Lb.	Water per Lb. Fuel, Lb.
		Labor	Fuel	Supplies	Total		Car-Mile	Day	Passenger		
July .....	75,175	.386	.759	.113	1.258	1.680	2.11	\$30 51	.36	4.63	6.38
August .....	91,110	.356	.687	.050	1.092	1.730	1.90	32.11	.35	4 22	5.64
September.....	118,860	.277	.545	.027	.848	2.015	1.70	33.58	.37	3 35	5.69

The fuel used is Pocahontas costing \$4.25 per gross ton mixed with screenings costing \$4.25 per gross ton.  
The coal burned during these three months was:

	July.	August.	September.
Pocahontas, Lb. ....	200,100	194,000	200,400
Screenings, Lb. ....	148,200	190,200	197,400

air pump is single acting and is driven by a compound condensing Corliss engine.

The temperature of the injection water during the past summer was as high as 110°F. for as long as three days at a time, and even during the past winter with the thermometer at the freezing point the injection water frequently was as warm as 70°.

The great variation in load on the main engines also increases the difficulty of maintaining a steady vacuum in the condensers. Notwithstanding these severe conditions, the condensers, with injection water at 100 to 110°, were able to maintain a vacuum of from 22 to 23 in., and during the winter, with the water at from 70 to 80°, a vacuum of 26 in. was maintained.

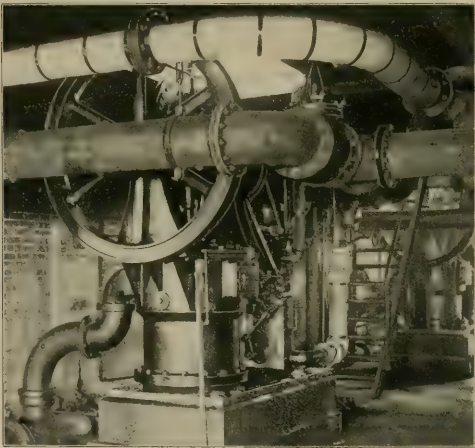
The table herewith gives the cost of running the power house for three months during the summer last year when the road had its heaviest travel.

For these same three months, July, August and September, the

they are laid, so that the inner and outer surfaces of the chimney are even and regular. The decoration obtained by use of vari-colored bricks adds to the appearance.

The station was designed by Sheaff & Jaasted, engineers, of Boston.

The car house, which is near the power station, is of rather unusual design, but is admirably adapted to the requirements. As will be seen, the main portion of the barn is an oblong structure, 200 ft. 8 in. long and 90 ft. 4 in. wide, containing seven tracks and divided by wooden partitions into paint, repair and wash rooms. At the two front corners of this main structure, and forming part of the building, are two tower shaped additions, one devoted to the general offices; the other to the employes' waiting room, toilet, bath and lockers. In the upper stories of these towers are rooms that can be used for sleeping apartments should it ever be necessary

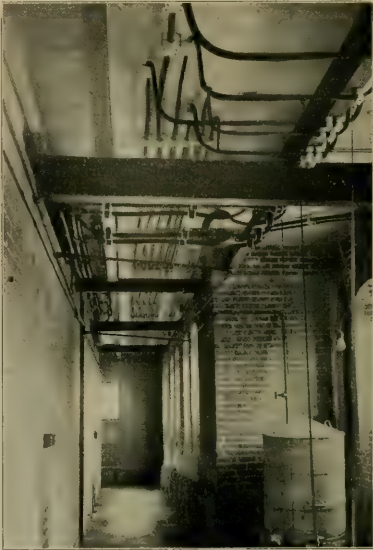


CONOVER CONDENSERS.

total operating expenses for the road were \$14,402, equivalent to 9.20 cents per car-mile.

The chimney was built by the Alphons Custodis Chimney Construction Co., of New York, and is of that company's special type. It is 125 ft. high and is 6 ft. in diameter in the clear. The base or lower 37 ft. of the chimney is built of hard burned red brick, square externally and with vertical circular flue. From a point 2 ft. below the opening provided for the breeching to the top of the base there is a protective sectional lining resting upon a corbeling from the wall of the chimney.

The column, or upper 88 ft. of the chimney, is of circular construction, single shell, built of perforated radial moulded blocks on the Custodis system. The perforations serve to prevent the radiation of heat, beside furnishing additional surface for mortar adhesion, thus insuring maximum structural stability and economy of draft. The bricks are formed to the radii of the circles in which



BASEMENT OF ENGINE ROOM.

to keep several men at the barns over night. At one side of the barn are salt and sand storage bins.

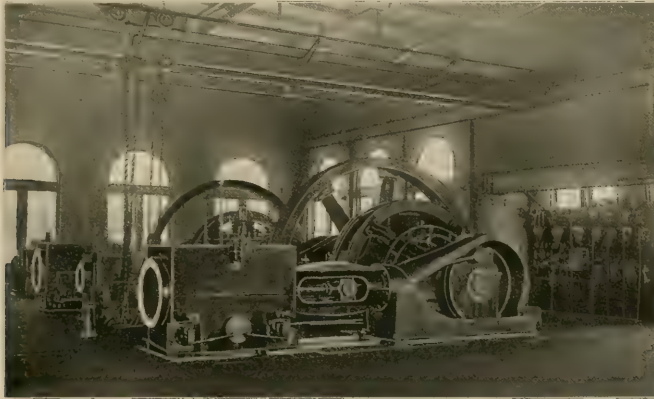
In the rear of the car house and separated from the main room by brick fire walls is an isolated heating plant with its own stack and steam piping to all parts of the building, this arrangement insuring a good supply of heat in the barn at all times, independently of the boilers in the power house. Adjacent to the heating plant is the oil room, also enclosed by brick fire walls.

The main structure is of wood, but ample precautions have been taken against fire. At convenient places near the buildings are hose houses, with hose connected to hydrants, and on the roof at the rear of the building is a 7,500-gallon tank. The tank supplies

an automatic sprinkling system running throughout the building. All rain water falling on the roof is drained into the condensing water pond nearby.

The company was fortunately able to secure ample ground space

The roadbed is laid for the greater portion of the way with 60-lb. T-rails on 7 ft. ties, 2 ft. between centers. In the more closely populated section a 95-lb., 9-in. girder rail was laid. All joints are of the "continuous" pattern, furnished by the Continuous Rail Joint



LEXINGTON & BOSTON ENGINE ROOM.

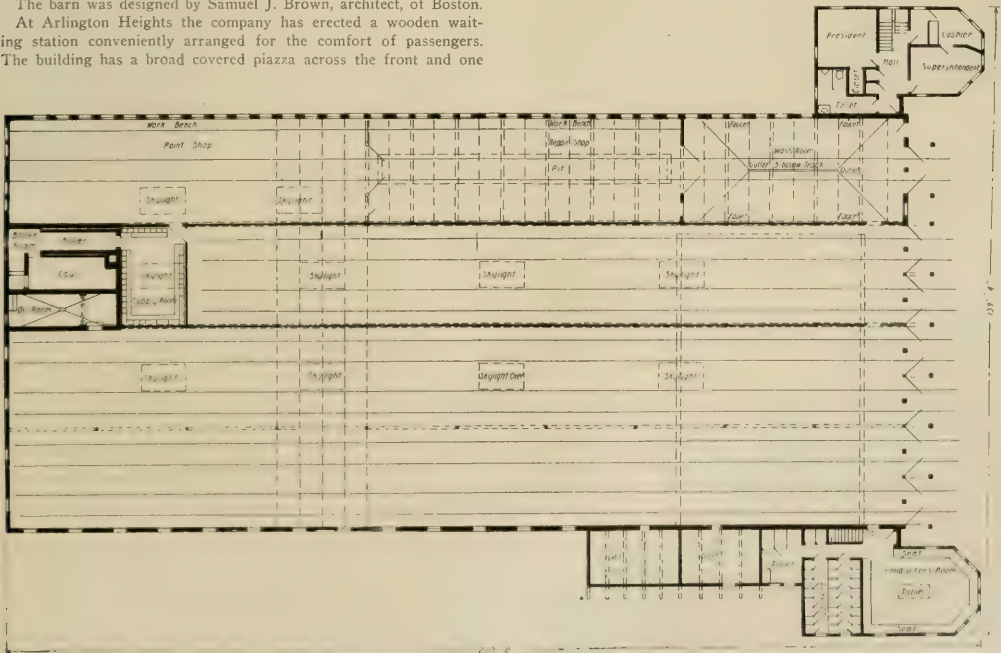
for laying out the entrance tracks, and took advantage of this to put in a very desirable arrangement. All the tracks into the barn lead, not from the main track, but from a spur, thus necessitating but one branch-off switch in the main line.

The barn was designed by Samuel J. Brown, architect, of Boston.

At Arlington Heights the company has erected a wooden waiting station conveniently arranged for the comfort of passengers. The building has a broad covered piazza across the front and one

Co., and bonded partly with "Crown" bonds, and partly with Mayer & Englund bonds under the plates.

At private crossings and at some of the highway crossings where



FLOOR PLAN OF LEXINGTON & BOSTON CAR BARN.

side, which is much appreciated by patrons in warm weather. One corner of the waiting room is utilized as a soda fountain and lunch counter. The floor plan reproduced herewith was also designed by Mr. Brown.

T-rails are laid, two heavy timbers are spiked to the ties on each side of each rail, close to and flush with the head of the rail. The two inside timbers are grooved out to make room for the wheel flanges.

To avoid grade crossings with steam roads it was necessary to depress the street railway tracks and build bridges to carry the steam road. A half section and end elevation for a crossing is shown herewith. The abutments are of granite 7 ft. 8 in. thick at the middle of the base and tapering to 4 ft. at the ends of the base; the width of the abutments for the bottom four courses is 63 ft., and at the top 17 ft. This gives the embankment side slopes of  $1\frac{1}{2}$  to 1. The design for crossings was made by Pierce & Barnes, of Boston, engineers for the road.

The road is protected with the United States Electric Signal Co.'s

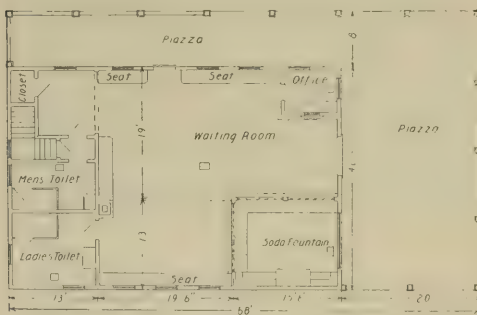


LEXINGTON & BOSTON CAR HOUSE.

block signal system, which is giving excellent satisfaction. Cars are dispatched by a telephone system supplied by Couch & Seeley, of Boston.

At present the company owns 13 45-ft. closed cars and 24 12 and 15-bench open cars, all built by the Wason Manufacturing Co., of Springfield, Mass. The cars are mounted on Bemis double trucks, and each is equipped with four G. E. 67 motors. Part of the cars are fitted with Christensen air brakes. The Wilson trolley catcher, furnished by the Frank Ridlon Co., is used for holding the trolley rope.

The Lexington & Boston Street Ry. comes into direct competition with the Boston & Maine steam road for through traffic from Lowell into Boston. The steam fare is 65 cents for this distance,



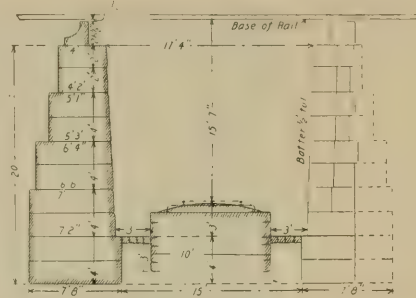
WAITING ROOM.

or 56 cents if a commutation ticket is purchased. The fare by electric road is 30 cents. To take the trip by trolley requires about 45 minutes longer than by steam line, but a much more frequent service is given. At the city limits of Lowell the Lexington & Boston company turns its cars over to the Lowell & Suburban company, a monthly settlement of receipts being made between the two companies on a mileage basis, the Lowell & Suburban taking 7-20 and the Lexington & Boston 13-20. Conductors sell through tickets consisting of five coupons, one of which is surrendered by the passenger at the limit of each 5-cent section.

The officers of the company are: General manager, Horace B.

Parker; treasurer, Charles W. Smith, 53 Tremont street, Boston; superintendent, W. H. Greene, Lexington, Mass.

Mr. Horace B. Parker, general manager and executive head of the Lexington & Boston Street Railway Co., has been actively in-



RAILROAD CROSSING.

terested in street railway development in Eastern Massachusetts for some time. He was president of the Newton Street Railway Co. until 1896; president of the Newton & Boston Street Railway Co. and president of the Wellesley & Boston Street Railway Co. until 1901. He sold his interest in the Newton roads in 1900 and was made general manager of the Lexington & Boston property in 1899. He is a thoroughly practical man and much of the financial success that has attended the roads in which he has been interested is due to his energetic and capable management.

Mr. W. H. Greene, superintendent of the Lexington & Boston Street Ry., has had a long and successful street railway career. He was associated with one of the earliest Thomson-Houston roads built near Boston in 1887, but severed this connection to go with the Boston Elevated system. In 1889 he was made assistant superintendent of the Newton Street Ry. and held this office for 11 years, resigning in 1899 to take up his present duties.



W. H. GREENE.

### BRITISH THOMPSON-HOUSTON CO.

It is officially announced that the General Electric Co. has purchased the German and French share-holdings in the British Thompson-Houston Co., Ltd., of London, England, thereby giving the General Electric Co. the controlling interest. Messrs. C. A. Coffin, president, Eugene Griffin, first vice-president, and W. J. Clark, general manager of the foreign department, General Electric Co., will be members of the British Thompson-Houston board, and the closest co-operation will exist between the General Electric and British Thompson-Houston companies.

The British Thompson-Houston Co. was originally a licensee of the Thompson-Houston Co. of America; the latter some years ago was merged in the General Electric Co. The British Thompson-Houston Co. has been operating under patents of the General Electric Co., but as an independent concern.

### MICHIGAN INTERURBAN RAILWAY LEGISLATION.

A general bill revising the laws relative to the incorporation of interurban electric railways was passed by the Michigan legislature last month. It leaves the companies under the control of the different cities and villages through which they run.



## Late Street Railway Legislation.

### Oregon.

#### REGULATING FARES.

An act, on page 23 of the General Laws of Oregon of 1901, reads:

Section 1. That it shall be unlawful for any person, company or corporation owning or operating a line or lines of street railway within the corporate limits of any city in the State of Oregon having a population of over fifty thousand inhabitants to charge a rate of fare to any passenger exceeding the sum of five cents for any one continuous trip in any one general direction between any two points on the street railway line of such person, company or corporation within the corporate limits of such city.

Section 2. Any violation of the above act shall be punished by a fine of not less than \$50 nor more than \$100.

#### REQUIRING VESTIBULES.

An act, on pages 122 and 123 of the General Laws of Oregon of 1901, reads:

Section 1. Each corporation, company, and individual owning, managing, or operating any street railway or line in the State of Oregon shall provide, during the months of November, December, January, February, and March of each year, all cars run or used on its or their respective roads with good, substantial and sufficient vestibules or weather guards for the reasonable protection of the employees operating passenger cars of such corporation, company or individual.

Section 2. The vestibules or weather guards provided for in section 1 hereof shall be so constructed and so maintained and adjusted upon each car during each of the said months as to reasonably protect the employees of such corporation, company, or individual operating said passenger car from the wind, rain or snow.

Section 3. Any violation of the provisions of this act shall be deemed a misdemeanor and shall subject the owner or manager of such street railway or line to a penalty of \$100 fine for the first offense, and \$100 for each and every subsequent violation thereof, and each car run one day when not so equipped shall constitute a separate violation hereof.

Section 4. Provided, however, that none of the provisions of this act shall be in force or effect until January 1, 1902.

Section 5. It shall be the duty of the prosecuting attorneys of the various districts in this state to see that the provisions of this act are strictly enforced.

### Indiana.

#### INCORPORATION ACT AMENDED.

Chapter LXXIX of the Indiana Acts of 1901 amends section 1 of an act entitled, "An act to provide for the incorporation of street railroad companies," approved June 4, 1861, by prescribing that the articles of association therein provided for show "the city, cities and town or towns in which it is proposed to construct, own and maintain such road or roads," whereas before this the requirement was to show "the city or town in which it is proposed to construct such road."

#### ARTICLES OF ASSOCIATION MAY BE AMENDED.

Chapter CXXIX of the Indiana Acts of 1901 amends the act approved February 24, 1893, empowering street railway companies to increase their capital stock by now authorizing any street railway company to otherwise amend its articles of association by the unanimous consent of its stockholders. This consent must be by resolution in writing, stating the amendment, and upon the filing of a certified copy of the resolution in the office of the secretary of state, the certification being over the hand of the secretary of the corporation, the articles of association of the corporation shall be taken, regarded, and held to be amended as specified in such resolution.

#### CONTRACTS, LEASES, AND GUARANTEES AUTHORIZED.

Chapter LX of the Indiana Acts of 1901 provides, That any street or electric railroad company now or hereafter existing under the laws of this State may enter into a running or operating contract or contracts with, or take a lease or leases of the road, equipment and plant of, any street or electric railroad company of this State, or of any adjacent State, if their lines of railroad, either completed or in process of construction, connect or will connect with each other, and as part of or in connection with such contract or lease, the first mentioned company may guarantee the payment of any of the bonds or liabilities of such other company.

#### REGULATING CONSTRUCTION OF WIRES OVER STEAM RAILROAD TRACKS.

Chapter LXVIII of the Indiana Acts of 1901 provides that all wires of any kind hereafter constructed over the tracks of any steam railroad within the State of Indiana shall be supported by good, substantial wooden poles of a size not less than twelve inches in diameter at the bottom and not less than six inches in diameter at the top, or iron or steel poles not less than five inches in diameter at the bottom and three inches in diameter at the top, such poles to be set in the earth to a depth of not less than six feet, and to be well tamped. All such wires shall clear the top of the rails of such steam railroad at least twenty-five feet, and shall be fastened to said poles in such manner as will properly hold the said wires in place: Provided, That in case of the trolley feed and other wires of any electric railroad extending over the tracks of any steam railroad in this State, the height of such wires above the tops of the rails of such steam railroad shall not be less than twenty-two feet.

It shall be the duty of the circuit or superior courts of the State to see that the provisions of this act are enforced, and such courts shall have the power within their several jurisdictions to require any wires hereafter constructed over the tracks of any steam railroad in the State of Indiana to be constructed according to the provisions of this act.

When any of the provisions of this act shall have been violated by any person, company, or corporation in the State of Indiana, complaint may be filed with the circuit or superior court of any county in the state in which such violation shall have taken place. Upon the filing of a complaint by any person aggrieved, a notice shall be given to the person, company or corporation against whom such complaint shall have been made and ten days' time shall be given such person, company or corporation to answer and defend such complaint. The circuit or superior courts shall have power to hear and determine the said complaint upon such evidence as may be presented, and for the purpose of full investigation shall have power to enforce the attendance of witnesses; said witnesses to be paid the regular fees of witnesses in attending trials in civil cases. The costs of such hearing shall be taxed against the party who makes the complaint if the court shall find his complaint is not sustained, and if the said complaint shall be sustained, then the costs shall be taxed against the person, company or corporation against whom the complaint is made.

#### ADDITIONAL POWERS FOR STREET RAILROADS.

Chapter CCVII of the Indiana Acts of 1901 provides. That any street railroad company heretofore or hereafter organized under the laws of the State of Indiana, and desiring to construct, or having heretofore constructed, any interurban street railroad, or any suburban street railroad, shall, in addition to the rights, privileges and powers already given and granted by law to street railroad companies possess the general powers and be subject to the liabilities and restrictions expressed in the special powers following:

First. To cause such examination and surveys for the proposed railroad to be made as may be necessary to the selection of the most advantageous route for the railroad, and, for such purposes, by their officers, agents and servants, to enter upon the lands or

waters of any person, but subject to responsibility for all damages which they shall do thereto.

Second. To receive, hold and take such voluntary grants and donations of real estate and other personal property as shall be made to it to aid in the construction, maintenance and accommodation of such railroad; but the real estate thus received by voluntary grants shall be held and used for the purposes of such grants only.

Third. To purchase, and by voluntary grants and donations, receive and take, and by its officers, engineers, surveyors and agents enter upon, take possession of, hold and use all such lands and real estate and other property as may be necessary for the construction and maintenance of its railroad stations, depots, and other accommodation necessary to accomplish the objects for which the corporation is created, but not until the compensation to be made therefor, as agreed upon by the parties or ascertained as in this act provided, shall have been paid to the owner or owners thereof, or deposited as this act directs, unless the consent of such owner be given to enter into possession.

Fourth. To lay out and construct its road or any part thereof, not exceeding three rods wide, over and upon any land not within the limits of a street or highway, whenever such company shall deem it advisable to construct such road or any part thereof other than on a street or highway, or shall deem it advisable to construct such road, in whole or in part, on any land adjoining any highway; and for the purpose of cuttings, embankments, and procuring stone and gravel, it may take as much more lands, in the manner by this act provided, as may be necessary for the proper construction and security of the road.

Fifth. To construct its road across any stream of water, watercourse, road, highway, railroad or canal, so as not to interfere with the free use of the same, which the route of the road shall intersect, in such manner as to afford security for life and property; but the corporation shall restore the stream or watercourse, road or highway, thus intersected, to its former state, or in a sufficient manner not to unnecessarily impair its usefulness or injure its franchises. And in case such street railroad company shall cross the tracks of any other street railroad company, or any railroad company, at any place not within the limits of any street or highway, if the two corporations cannot agree upon the amount of compensation to be made therefor, or the manner of such crossing, the same shall be ascertained and determined by commissioners to be appointed, as provided in this act, in respect to the taking of lands.

Sixth. To construct, purchase or otherwise acquire, own and operate street railroad systems and properties appertaining thereto, in the cities and towns into or through which it may run, extend or operate its said railroad and lines connecting said cities and towns; and to take, transport, carry and convey persons and property on its said railroad and railroad systems, by such force and power as it is permitted to use for such purpose in the cities and towns into and through which it shall run and operate its road, and to receive tolls or compensation therefor.

Seventh. To erect and maintain all necessary and convenient buildings, stations, depots, fixtures and machinery for the accommodation and use of its business, and to obtain and hold the lands necessary therefor.

Eighth. To regulate the time and manner in which passengers and property shall be transported, and the tolls and compensation to be paid therefor. Provided, however, That nothing herein contained shall take away from the towns and cities the power to regulate and fix the tolls and compensation for such transportation within such cities and towns; and nothing in this act shall be construed to give any street railroad company the right to construct or operate a railroad in any city or town without first getting the consent of the proper authorities of the city or town to such construction and operation.

Where it becomes necessary for the track or trolley wires of one street railroad company to cross the track or trolley wires of another street railroad company, or the track of any railroad company, the company owning the road last constructed at such crossing shall, unless otherwise agreed to between such companies, be at the exclusive expense of constructing such crossing in a manner to be convenient and safe for both companies. And whenever such railroad crossing is constructed in the manner thus provided for, it shall be the duty of each company, respectively, to maintain and keep in repair its own track, so as at all times to provide a ready,

safe and convenient crossing for all locomotives, trains or cars passing on either road at such point.

In case any street railroad company is unable to agree for the purchase of any real estate in any county, which may be required for the construction of the track, turnouts, and stations, it shall have the right to acquire the title to the same by special proceedings. Such company is authorized to enter upon any land for the purpose of examining and surveying a railroad line, and may appropriate so much thereof as may be deemed necessary for its railroad, including necessary side tracks, material for constructing (except timber) a right of way over adjacent lands sufficient to enable such company to construct and repair its road, and the right of making proper drains. The corporation shall forthwith deposit with the clerk of the circuit court, or other court of record of the county where the lands lies, a description of the rights and interests intended to be appropriated; and such lands, rights and interests shall belong to such company, to use for the purpose specified by making or tendering payment as herein provided. It may, by its directors, purchase any such lands, materials, right of way or interest of the owner of such land, or if the latter be an infant or an insane person then of the parent or guardian, if approved by the court in which the description is filed, and the deed of such owner, parent or guardian will be deemed valid in law. But in case no agreement can be reached, or if the owner or his guardian be not known or do not reside in the county, the corporation on giving certain notice may have three disinterested appraisers appointed by the court to assess the damages, and on payment or tender to the proper party or payment into court of the amount awarded, it shall be lawful for the corporation to hold the interests in such lands or materials so appropriated, and the privilege of using any materials on said roadway and within twenty-five feet on each side of the center of such roadway, and this notwithstanding an appeal may be taken to the court within ten days after the filing of the award for a review thereof. Provision is also made for the court to settle with and between them where there are adverse or conflicting claimants, and it is given power at any time to amend any defect or informality in the special proceedings authorized by this act, as is the company also empowered to proceed anew to acquire or perfect title as if no appraisal had been made if the title once attempted to be acquired is found defective. But nothing in this act is to affect the rights of any person or persons whose lands have heretofore been taken or are now occupied by any street railroad, or who now have any suit or suits pending in any court in the State of Indiana for the taking or occupation of same. Nor shall any street railway company have any right to appropriate or condemn such lands by virtue of any provision in this act contained.

## ELECTRIC RAILWAYS IN SAXONY.

The following statistics in regard to the electric railways in Saxony were compiled by the royal bureau of electric railways for 1900, and forwarded by Consul B. H. Warner, jr., from Leipzig. According to these returns the traffic has increased considerably over that of last year as a consequence of the opening of many new lines in the larger cities.

Name of line.	Length of lines.	Persons carried.		Motor cars.		Trailers.
		Miles.	Number.	Number.	Number.	
Dresdner Strassenbahn.....	31.11	42,577,615	261	106		
Deutsche Strassenbahngesellschaft Dresden.....	16.87	22,740,392	199	46		
Grosse Leipziger Strassenbahn.....	31.54	44,446,153	240	100		
Leipziger Electriche Strassenbahn.....	31.75	18,016,821	130	50		
Allgemeine Local Strassenbahngesellschaft Chemnitz.....	17.27	12,042,499	110	71		
Zwickauer Strassenbahn Actiengesellschaft.....	6.74	2,251,475	39	8		
Sächsische Strassenbahngesellschaft Plauen.....	2.42	450,564	15			
Schandauer Electriche Strassenbahn.....	4.98	110,814	6	6		
Lössnitzbahn.....	4.32	1,548,122	25	10		
Messner Strassenbahn.....	2.79	928,599	8	5		
Dresdner Vorortbahnen.....	2.18	204,341	4	1		
Leipziger Aussehbahn Actiengesellschaft.....	1.11	22,443	(*)			
Total for 1900.....	166.59	147,845,599	1,008	403		
Total for 1899.....	137.54	113,559,390*	731	289		

\* Not given.

The number of persons injured has increased in proportion to the increase in traffic. The fatal accidents numbered 92 in 1900 against 38 in 1899. A number of new lines will be built during the present year, and in consequence large supplies of steel rails and railway equipments will have to be purchased.

## SOME SUGGESTIONS AS TO ECONOMY.

BY G. J. A. P.

The superintendent of a small road should possess, to a certain extent, a creative mind—one whereby he can put material which would be discarded by larger roads to good use. Among such material are old truck bearings, etc., which can be taken to pieces and rebuilt, and by using various good parts of two or more worn out trucks, have one good truck. This of course will diminish the number of trucks on hand, but it is cheaper to work them over than to entirely discard them.

Where brass bearings are used the worn bearings can be turned out and babbitted, so as to make them fit the shafts of armatures, and as these shafts are generally worn down to a considerable extent, new brasses cannot easily be secured, except on special orders; and then it would be almost impossible to get them to fit all the armature shafts, as the wear may not be equal on each one. If a certain size bearing were ordered, it would require the turning down of all the shafts to fit these bearings.

I have found the most economical method under these circumstances to be as follows: Take your old brass bearings and have one eighth of an inch turned out of them, and, at the same time have catch holes bored into the shoulders to hold the babbitt in place; then use your armature shaft for the core, putting narrow strips of babbitt metal which have previously been gaged to the right thickness between the brass and the shaft. This gives an exact fit. By suitably warming the brass and shaft, when the hot babbitt metal is poured it will unite with these strips and make a very smooth good fitting bearing. It is best to pour each half (upper and lower) bearing for each end of the shaft, separately as this gives you an opportunity of scraping and properly adjusting the bearings to the shaft.

The same method can be followed with journal and motor axle bearings as it will be found very cheap and will give excellent results.

Old trolley wire can be used for bonding purposes, by cutting it into suitable lengths and then using either a bonding cap or finger clips to secure them to the rails. This makes a very serviceable bond and a corresponding saving in new bond wires.

Where a line is permitted to furnish power to shops and small factories, a very ready sale at fair prices can be found for old street car motors, to be used as power motors. It often requires considerable time to get them to work at the proper speed, however, but by either changing the field or armature windings the proper speed can be secured. Often the consumer is satisfied to have the necessary change in speed made by means of counter shafting.

As a small road does not as a rule operate very heavy cars and the service is not very frequent, the track does not readily get in bad condition, but low joints will come and splice plates will wear. Sometimes the plates become so worn that they do not help to hold the rails up. To make such joints more permanent, sink two ties (or three, if one tie is directly under the joint) down to a depth of four or six inches below their normal height, then saw an oak plank of four or six inches thickness, to such a length that it will reach over and rest on these ties. Place this piece under, and lengthwise with the rail and tamp up the ties. This will make a very solid joint out of an otherwise loose and low joint. These pieces can very easily be cut out of old ties which have been removed because either the ends or the centers only are worn out.

Where broken joints are used it will be necessary to put chair blocks under the rail opposite the joints. In this way you get service out of otherwise useless ties.

Old poles should not be cut up and burned as frequently happens. These should be properly stored and disposed of for posts, gate supports, etc. It does not speak well for a superintendent's economy to see a broken pole left where it is taken out, only to be hauled away by some person who sees a value in it.

The use of large, heavy cars in a town or city, where the average riding is not sufficient to more than half fill the capacity of the cars is a constant loss to the company.

The writer took charge of a road at one time where 16 ft., 8 ton cars were being operated. The traffic did not require cars of half that size. In the barn, idle, were a number of 10-ft., side seat open trail cars. By cutting down old 6½-ft. base trucks to a 5½-ft.

base, and fitting these cars with motors, the line was operated with cars having 15-h. p. single motor equipments and the service was all that could be desired, while the expense for repairs, power required, etc., was correspondingly reduced. The cost of changing these cars amounted to \$21.35 each, the principal item being the cost of changing the trucks.

These cars were then closed in for winter use and made very comfortable and serviceable closed cars.

The old saying is, "necessity is the mother of invention," but the superintendent of a small road should not wait for the necessity to arise before inventing, but should be at it constantly and thereby save a penny whenever it is possible to do so.

## AMERICAN ADVERTISING IN RUSSIA.

Consul-General W. R. Holloway, at St. Petersburg, advises that American exporters who desire to circulate advertising matter printed in the Russian language in Russia must address a petition to His Excellency Count Alexander Mouravieff, chief of the central committee of foreign censorship, describing the character of the publication and its purpose, to which must be attached two copies of the publication for which admission is desired, praying for permission to admit and circulate the same in Russia. To this petition must be attached two Russian revenue stamps of the value of 1.60 rubles (84 cents), preferably two of 80 kopecks (42 cents) each. This petition will be more likely to receive immediate attention if written in the Russian or French language, though the same would be translated and forwarded if sent direct to the United States ambassador or consul-general at St. Petersburg, if accompanied by the amount necessary to purchase the revenue stamps.

Incendiary matter has been circulated in every form in Russia; hence the authorities censor everything that is printed as rigidly as they did a century ago. Several catalogs of American exporters have been refused admission to Russia because they did not comply with these legal requirements.

## ELECTRIC RAILWAYS IN THE CANARY ISLANDS.

An electric railway which was recently completed connects the port of Santa Cruz with the town of La Laguna, and besides carrying passengers it is equipped with special cars for moving freight. This is principally fruit, which is the chief export of this island. The power house is situated near the center of the line at La Cuesta, at an elevation of 960 ft., La Laguna being 1,800 ft. above the sea level.

The cars start from the mole at the port and run through the principal street up the main road, which is built on a zigzag plan on account of the grade. It is but a single track, with switches at every kilometer, except in the town of Santa Cruz, where it runs up one and comes down another street. It is an overhead-trolley system, the wires being strung on poles, some of wood and others of iron. In the towns it is strung over the street from house to house by rivets driven into houses opposite each other and connected with a wire.

The franchise for the road includes the entire distance from Santa Cruz to Orotava, and from the present terminus a regular service of automobiles to Orotava has been established to continue until the tramway is finished. The total length of the completed line will be 27 miles, and the franchise provides that the road must be finished in five years.

There is also a concession for an electric tramway of double-track system between the ports of Luz and Las Palmas, in the island of Grand Canary, which has been granted to a Belgian company. The road will run along the seashore front and will extend from four to five miles. It will be a great improvement and no doubt a better-paying investment than the Santa Cruz-La Laguna road, as Las Palmas is now virtually the principal town of these islands, and is doing about double the business of Tenerife.

The Conestoga Traction Co., Lancaster, Pa., has removed its offices from North Duke and Chestnut streets to a spacious suite on the third floor of the Woolworth Building.



### NEW CARS FOR TOLEDO.

The illustration herewith shows one of the new 28-ft. cars built for the Toledo Traction Co. by the J. G. Brill Co. They are in many respects of novel design and are well worth study in the points where they depart from standard practice. The platforms are 5 ft. long and are open on one side only. The doors are placed at diagonally opposite corners. The entrances are next the doors, that in the rear being on the right hand side as the car goes forward. The object of this peculiar arrangement is to leave a large space for passengers on the platform. At the same time those entering or leaving the car do not interfere with those occupying the platform.

The cars are 38 ft. long from vestibules, and 7 ft. 1 1/4 in. wide at the widest part. They are mounted on "Eureka" maximum



BRILL CAR FOR TOLEDO TRACTION CO.

traction trucks. These have 33-in. driving wheels, with 20-in. pony wheels. The inside is finished in solid cherry, with three-ply birch decorated head linings. The hand poles are also of cherry. The windows are fitted with spring roller curtains and an electric headlight is placed upon each hood.

These long cars, with their nearly enclosed vestibules, will, it is believed, be found very satisfactory for city suburban and interurban service. The platforms are carried sufficiently low to make them suitable for city use, while the large motors enable them to make a high speed in the country.

### STREET RAILWAY MAIL SERVICE.

In the "Review" for February, page 90, we gave the statistics concerning the street railway mail service as reported by the general superintendent for the fiscal year ending June 30, 1900. As was there explained the apparent decrease was due to the fact that in many cities the street railway service had been transferred to the jurisdiction of the local postmasters.

In the railway mail service proper (under the direction of its general superintendent) there were reported for 1900, 20 street railway postal car routes aggregating 202.86 miles, making 566,858 car-miles annually.

From the report of the postmaster general we find that in addition the 20 routes mentioned there were 22 postal car routes under the local postmasters. These aggregate 430.70 miles in length and made 1,472,222.73 car-miles during the year.

The postal car routes under local postmasters are thus classified:

Apartment,	6 routes,	180,397 car-miles.
Trailer,	4 routes,	320,070 car-miles.
Independent,	6 routes,	437,360 car-miles.
Separate,	6 routes,	534,395 car-miles.

We quote from the report of the postmaster general as follows:

"The street car collection service, now in operation in several cities has passed the experimental stage and is becoming a popular feature of the free-delivery service. It has been found that where a good electric car system is maintained and the street car companies are disposed to co-operate with the Department, the dispatch of mail can be greatly expedited by this system of collection at a very slightly increased expense. In order that this service may be extended where practicable, I ask for an increase of car fare allowance slightly in excess of the increase in other items.

"The electric cars have been found a most advantageous means of providing expeditious transportation of mails, particularly for suburban towns. The greater part of the electric car service, established last year was for such towns. At the same time good results are being obtained from electric car service in many cities, saving the establishment of wagon service, which would otherwise be necessary. In one city it was found possible to so arrange the electric car mail routes as to entirely discontinue the wagon service in that city, the cars not only covering all that had been previously done by wagons, including the carrying of the mails to and from the railroad stations, but also furnished supply for a number of newly established mail stations.

"The appropriation for the current year is the same as that for the last fiscal year, and will not admit of granting all of the applications now pending that seem to be meritorious. The considerable

increase asked for next year is by reason of these, and also in view of negotiations now pending which it is hoped will result in the arrangement of such a complete system on the electric car lines is one of our most important cities as will admit of discontinuing a large part of the very expensive wagon service now in operation in that city, for which the contract will expire at the close of the current fiscal year."

The quadrennial report of the Chicago Post Office for the period between Apr. 1, 1897, and March 31, 1901, issued by Charles U. Gordon, postmaster, contains the following:

"The policy of decentralizing the postal service by the establishment of new postal stations, sub-stations and street car lines, so as to avoid the re-handling of mail, has been quite successful in preventing congestion in the down town office. The outcome of this policy, too, presents some interesting phases of postal and general business. For instance, the money orders issued at the down town or general office numbered 68,482, valued at \$851,660.12, while the money orders issued at stations and sub-stations numbered 377,002, valued at \$4,034,431.53. In the payment of orders the contrary holds good, due almost wholly to the fact that the orders paid are mainly in settlement of bills for goods bought of Chicago's down town houses."

### SUMMER RESORT OF THE UNION ELECTRIC RAILROAD.

Central Park, the summer resort of the Union Electric Railroad, of Dover, N. H., has been entirely remodeled for the present season and was reopened to the public on June 16. The changes have been made under the direction of Mr. Frank M. Blaisdell, of Albany, a well-known landscape gardener, and the park is now one of the prettiest in the state.

The Casino has been remodeled to such an extent that it is practically a new building. A large double-decked veranda has been built entirely round the outside. The upstairs hall on the inside has been materially enlarged. A new stage has been constructed for theatrical purposes and is to be equipped with a supply of new scenery.

A handsome bandstand with a bell shaped roof, finished in the Japanese pagoda style, has been erected near the Casino.

There is also a rustic theater which has been enlarged to twice its former size and an old pavilion has been converted into a bowling alley, shooting gallery and pool and billiard hall. All of the buildings have been painted a dark red color with cream trimmings, and present a very attractive appearance.

### CINCINNATI, NEWPORT AND COVINGTON.

The Cincinnati, Newport & Covington Railway Co. publish the following statement of its business for the month of May, 1901, with comparative figures for the corresponding month last year: Gross receipts, \$59,841; May, 1900, \$64,424. Operating expenses, \$28,876; May, 1900, \$26,948. Net earnings, \$40,964; May, 1900, \$37,475. Tolls, taxes, damages and rent, \$12,562; May, 1900, \$12,479. Net profits, \$28,401; May, 1901, \$24,996. Ratio of expenses to earnings, .4134; May, 1901, .4182. Same, including taxes, damages, etc., .4809; May, 1900, .4914.

## DIAGRAMS AND FORMULÆ FOR THE WEIGHT OF BRIDGES.

BY C. H. TYRRELL, C. E.

It is frequently necessary or convenient to find quickly the approximate weight of a steel truss or plate girder, sufficient to sustain a given load. Curves and formulas have been published in the engineering papers from time to time, giving the weight of these for special cases. It is believed, however, that these diagrams are the first yet produced, giving the weights for all cases of span, load and unit stress. To find the weight in any special case by actual design, may require an hour or more, while with the aid of my diagrams, this may be had in a few moments by inspection.

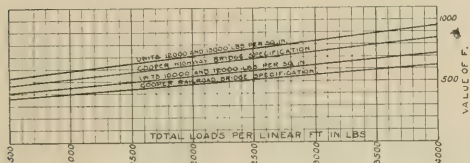


Diagram Showing Weight per Foot of Plate Girders. Compiled from 163 Separate Cases. All Lengths in Feet.

Wt. = Span, c to c, ÷ Total Load per Lineal Ft. of Girder Factor (Taken from Diagram)

And even in cases where the sizes are required, the curves form a useful check.

As the diagrams have been drawn from a large number of actual cases, they may be taken as correct.

It will be noted that the loads include both dead and live load per lineal foot.

In the case of concentrated loads, the equivalent uniform load may be used instead.

The curves apply to either pin connected or riveted trusses, with inclined end diagonals. For spans exceeding 180 ft. in length, it will be economical to curve one chord, and insert a sub-panel.

Suppose, for example, it is required to know the weight of a steel roof truss, with parallel chord, and 80-ft. span, to carry a total

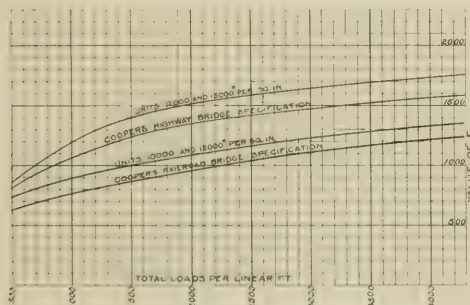


Diagram Showing Weight per Lineal Foot of Trusses. Compiled from 418 Cases. All Lengths in Feet.

Wt. per ft. = Span ÷ Total Load per ft. Factor Taken from Diagram.

load of 2,000 lb. per lineal foot. In this case it will be safe to strain the metal up to 15,000 lb. per sq. in. in tension. Then the weight of steel per lineal foot of truss is:

$$W = 80 \div 20000 \times 15000 = 107 \text{ lb.}$$

Total weight of truss =  $80 \div 107 = 8560 \text{ lb.}$

A plate girder for the same case would weigh:

$$W = 80 \times 2000 \div 700 = 227 \text{ lb.}$$

Total weight of plate girder =  $80 \times 227 = 18160 \text{ lb.}$

### Railroad Bridges.

All weights are per lineal foot of single track bridge. Steel only. Live loads two engines, 100 tons each, and 4,000 lb. per lineal foot of track, units 10,000 lb. and 12,000 lb. per square inch. L represents length of span in feet, center to center of bearings.

Deck-plate girder bridge	100 + 9 L
Deck lattice girder bridge	100 + 8 L
Half through plate girder bridge	300 + 12 L
Half through plate girder bridge ties on shelf angle	200 + 8.5 L
Half through plate girder bridge with solid steel floor	600 + 10 L
Riveted through truss bridge	400 + 6 L
Riveted deck truss bridge ties on top chord	200 + 7 L
Through pin bridge	400 + 5.5 L
Deck pin bridge with stringers	400 + 6 L
Deck pin bridge ties of top chord	300 + 6 L

### Railroad Trestles.

Loads as above.

Weight of spans as above.

Weight of bents and bracing = 9 lb. per square foot of side profile, from ground to base of rail.

### Electric Railroad Bridge.

To carry 25-ton cars, or 2,000 lb. per lineal foot of track, units 10,000 lb. and 12,000 lb. per square inch.

Weight of steel per lineal ft. of single track bridge are for:

Beam bridges	50 + 5 L
Deck plate girder bridges	50 + 4.5 L
Pony truss bridges	250 + 1.5 L
Through truss bridge	250 + 1.3 L

### Electric Railroad Trestles.

Weight of spans as above.

Weight of bents and bracing = 6 lb. per sq. ft. on side profile, from ground to base of rail.

### Highway Bridges, With Wood Floors.

Dead weight of floors = 40 lb. per sq. ft. Live loads, 100 lb. per sq. ft., and units 10,000 lb. and 12,000 lb. per sq. in.

Weights are per sq. ft. of floor, and include steel only, without joists.

Girder bridge with sidewalks	3 + (L ÷ 4.4)
Girder bridge without sidewalks	3 + (L ÷ 3.4)
Truss bridge with sidewalks	3 + (L ÷ 8)
Truss bridge without sidewalks	5 + (L ÷ 7)

### Highway Bridges With Solid Floors.

Dead weight of floor = 150 lb. per sq. ft.:

Deck-plate girder bridges	3 + (L ÷ 2.6)
Half through bridges	3 + (L ÷ 2.4)
Truss bridge	3 + (L ÷ 4)

## REORGANIZATION OF THE WASHINGTON TRACTION AND ELECTRIC CO.

The appointment of a receiver for the Washington Traction & Electric Co., which was noted in the "Review" for June, has been followed by a plan of reorganization which is in the hands of a committee consisting of Geo. W. Young, chairman; John Crosby Brown, W. H. Hollister, Gardiner M. Lane and James Simpson. Although complete plans have not yet been fully formulated it has been substantially agreed that the bondholders will receive in lieu of their present collateral trust bonds new mortgage 4 per cent bonds to the par value of 55 per cent, and preferred 5 per cent stock to the par value of 55 per cent, thus giving the bondholders in fixed charge and preferential securities 110 per cent of their present holdings.

A petition is being circulated by the minority stockholders of the City & Suburban Railway Co. calling upon the management of the Traction company to curtail the system of transfers now in operation on that line and also to make a change in the present arrangement, whereby the other companies in the Traction company use considerable trackage of the City & Suburban Company. The petition contains the further request that the minority stockholders be allowed representation on the board of directors.

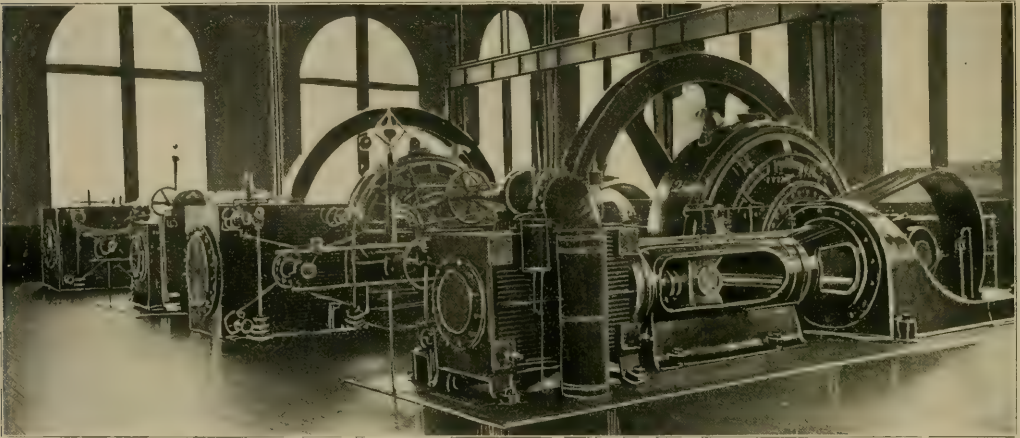
It is hardly expected that this petition will be granted, but it is more for the purpose of giving the minority stockholders a standing in the court in case, as it is not improbable, a separate receiver will be petitioned for to take charge of City & Suburban lines.

### JOHNSTOWN (PA.) PASSENGER RAILWAY.

The street railway system of Johnstown, Pa., now a thriving mining and manufacturing town, is controlled by the Johnstown Passenger Railway Co., of which the Hon. Tom L. Johnson, mayor of Cleveland, is president. The road forms an excellent example of a medium-sized, well-managed, well-paying street railway enterprise, but in this connection it might be well to mention that the system is still operated on a 5-cent fare basis, although some of the Johnstown citizens have on several occasions ventured to suggest that there is an excellent opportunity for Mr. Johnson to carry into effect some of his altruistic theories by instituting a 3-cent fare on his own road. The suggestion does not seem to meet with Mr. Johnson's approval.

The company was organized in May, 1882, and has an authorized capital stock of \$800,000, of which \$596,450 is issued; the funded debt authorized is \$800,000, of which \$519,000 in bonds have been issued. The total miles of track in the city system is 21, and the company is now building a 12-mile extension to Winber, a near-by town. The roadbed is laid with 70 and 78-lb. girder and T-rails, rolled by the Lorain Steel Co. The railway company paves between

generators. Steam is taken at 175 lbs. pressure from four 266-h. p. Heine boilers. The engines, which are run non-condensing, have cylinders 22 and 36 in. by 48 in.-stroke, and were supplied by the St. Louis Iron & Machine Works, through the Frank M. Pierce Engineering Co., of New York, eastern agent. They are fitted with double eccentrics, whereby the cut-off is regulated automatically at any point of the stroke up to 76-100, the dash pots are of the enclosed, silent, dust proof type, and are especially efficient in action, under all pressures and changes of load. The automatic safety stop is positive, never allowing the engines to race, while one of the best features is that not a single key nor a strap is used, all of the adjustments being made by the wedge and stud on large pins, while those on the smallest connections, such as valve rods are adjusted by the set screw and jamb nut, thus insuring the least possible lost motion, with greatest accuracy in the adjustments. They are supplied with a gravity oiling system, by means of which all bearings are automatically kept thoroughly lubricated. The fly wheel is 18 ft. in diameter. The switchboard is of marble and comprises two generator panels, one station panel, and eight feeder panels, supplied with the usual complement of instruments, these being of the Weston and Westinghouse make. At present the company is burning



ENGINE ROOM, JOHNSTOWN PASSENGER RV.—ST. LOUIS CORLISS ENGINES.

its tracks and for 1 ft. on each side of tracks, using in all cases the same paving material as used by the city for the rest of the street. Under ordinary conditions 10 men are kept for repairing and maintaining the tracks, these employes working 10 hours a day at an average wage of \$1.50 per day.

At present the rolling stock consists of 16 open motor cars, built by St. Louis Car Co., and 30 closed motor cars, built by John Stephenson Co. The cars are mounted on trucks made by St. Louis Car Co., and the Lorain Steel Co., and are equipped with Steel and Westinghouse motors. The long double truck cars for the new interurban extension will be fitted with four Westinghouse No. 59 motors on each car. The company uses McGuire heaters, New York Car Wheel Co.'s wheels, and St. Louis Car Co.'s sand boxes and brakes. The rolling stock also includes two snow plows and one tower wagon.

City cars are operated without conductors. Motormen are paid 20 cents an hour.

On the city system wooden poles are utilized, the trolley wire being No. 00, supplied by the J. A. Roebling Son's Co., and Ansonia Brass & Copper Co., with overhead material of Ohio Brass type.

The power station is exceptionally well-designed and neat in appearance, but as it was built to take care of the growth of the system for some time to come, and is now carrying only a portion of its rated capacity, it is not yet working at its maximum efficiency. The building is constructed with steel framing and walls of brick laid in cement. It contains two 800-h. p. St. Louis corliss cross-compound engines, direct connected to two 500-k. w. Westinghouse

at this station about 15 tons of bituminous coal per day, costing \$1.10 per ton.

The system has three brick car houses, the general dimensions being respectively, 160x42 ft., 200x73 ft., and 280x45 ft.

The officers of the company are: President, Tom L. Johnson; vice-president, John B. Hoefgen; secretary and general manager, S. E. Young; treasurer, Herman Baumer; chief engineer, A. H. Walker; electrical engineer, C. J. Devine.

### RAILWAY ASSESSED FOR SEWER.

The Brattleboro Street Railroad Co. has petitioned the court to appoint a commission to determine whether an assessment of \$50 levied against it on account of a sewer laid in one of the city streets last year is legal, and to re-assess if the company is found liable. The company denies the right of the bailiffs to levy such an assessment and also claims the amount to be excessive.

### BOSTON SUBWAY BILL VETOED.

The bill passed by the Massachusetts Legislature embodying the provisions of proposal from the Boston Elevated Railway Co. to construct a subway under the direction of the rapid transit commission provided the company should have the sole use of it for 40 years, was on June 18th vetoed by the governor. June 19th the legislature voted to sustain the veto.



### A 4,417-FT. TRANSMISSION SPAN.

The Bay Counties Power Co. is now operating its entire load in the counties of Contra Costa, Alameda and Santa Clara, California, over cables which span the straits of Carquinez. These cables are over a mile in length and cover a clear horizontal span of 4,417 ft., which is undoubtedly the longest power cable span in existence. A description of this piece of engineering work is given in the May issue of the Journal of Electricity, Power & Gas, with illustrations of the towers, anchorages and other features. The span has a clearance of 206 ft. above extreme high tide and the highest tower is 225 ft. in height. The towers do not set directly on the water's edge but are some distance back from the shore, thus taking advantage of considerable rise in the ground. Behind the north tower the land falls away to a marsh near sea level, making it necessary to divert the anchorage at an angle with the span, and this change of direction made a third tower necessary, which was built at an angle of 13 degrees from the vertical and is known as the leaning tower.

The means for supporting the cables from the towers and for insulating them from their anchorages are of interest, for it must be borne in mind that the cables themselves carry 40,000 volts, and that this pressure will soon be raised to 60,000 volts. Beyond this, when it is remembered that each cable exerts a pull of 12 tons on its anchorages, the fact will at once be appreciated that the problem of securing adequate insulation, coupled with sufficient mechanical strength, was by no means one of easy solution. The headwork, or cable supporting methods of the three towers, are identical in design, dimensions and materials. The timbers are of Oregon pine, thoroughly kiln-dried, puttied and then given two coats of oil, after which they are covered with two coats of the best spar varnish. Two main cross-arms support three cross timbers, upon each of which are mounted the two steel insulator pins that in turn carry large porcelain insulators. These insulators were made by Fred M. Locke, Victor, N. Y., and weigh approximately 50 pounds each, and those installed withstood long continued tests of 120,000 volts.

The upper platform of the towers, upon which the cable saddles are mounted, is covered with the heaviest canvas, painted with P. & B. paint, and wooden spouts are provided to carry rainwater well away from the insulators. Individual anchorages, well separated, are provided for each cable, and they consist of masses of concrete, each having a base 9 by 10 feet and being 5 feet high, set into the bedrock. Embedded in the concrete blocks are crossed channels and plates from which extend steel eyebolts with pin connections, first, to two sets of steel car springs, then a turnbuckle, then two tandem yokes connecting with heavy micanite insulators in copper cases containing transformer oil; and lastly, a 24-in. sheave around which the cable is turned and secured with clamps and clips.

### NOTES FROM UTICA, N. Y.

Since the purchase of the Utica Belt Line Street R. R., and the Utica Suburban Ry., in March last, by Mr. H. E. Andrews, of Cleveland, representing a syndicate, a number of changes have been made in the personnel of the management. The two companies are still in independent operation, but the following new officers have been appointed for both: Auditor, A. L. Linn; general manager, J. J. Stanley; superintendent, G. L. Radcliffe.

The combined properties now comprise about 30 miles of track, and several suburban extensions are under way. One of these running to Frankfort is nearing completion. Other new work in process includes the building of a loop at the rear entrance of Casino Park, which will greatly facilitate the handling of the park crowds.

The general offices of the companies have been moved to the Y. M. C. A. building, where commodious and well lighted quarters have been fitted up for the various departments.

A short time ago the management increased the wages of motormen and conductors to 25 cents an hour, and this month it announces an increase of 10 cents per day in the wages of laborers. These employees, of which there are about 450 working on the city lines and extensions, have heretofore received \$1.25 per day, but will now be paid \$1.35. This action was entirely voluntary on the part of the companies.

### NEW YORK TUNNEL STRIKE ENDED.

The settlement of the New York tunnel strike last month came about through the relinquishing of the unreasonable demands of the strikers which was the original cause of the strike. An agreement was in force between the contractors and the men by which the latter agreed to submit any question or dispute which might arise in connection with the tunnel work to arbitration before ordering a strike, and the contractors in return paid the full union rates of wages and worked only eight hours a day. With the prospect of several years' work ahead of them the men deliberately broke their agreement to indulge in a sympathetic strike on a question in which the tunnel workers had no concern. The strike would have been a flagrant breach of contract on the part of the men even if there had been any dispute in regard to the tunnel work, and in the absence of any such dispute the strike was still more blameworthy. It is generally considered that the occasion was a most opportune one for the contractors to have successfully defied the unions on a large scale, and it was only the conciliatory attitude of the contractors which saved the union from a hard blow.

Close upon the settlement of the strike come rumors of still more labor troubles on the tunnel work. A delegate of the Rock Drillers' union reported that several of the contractors were violating the agreement recently entered into between the Central Federated union and the Rapid Transit Tunnel Contractors' association by employing non-union men. It is also asserted that the rock drillers are not all getting union wages, and that a large number of them are being forced to work as laborers and are getting laborers' pay. The men threaten to declare the agreement off unless the union clause is adhered to.

### CHICAGO FRANCHISES IN COURT.

On June 25th William L. Elkins, of Philadelphia, a stockholder in the North Chicago Street Railroad Co. and the West Chicago Street Railroad Co., both of which companies have leased their roads to the Chicago Union Traction Co., filed two bills in equity in the United States Circuit Court, by which he seeks to have the court determine the relative rights of the city of Chicago and of the street railways named, under the so-called 99-year act passed by the Illinois Legislature in 1865. The city of Chicago, the Chicago Union Traction Co. and certain of the companies that have leased their roads to the Union Traction are named as defendants.

The bills are similar, except as the history of the North and West Side companies differ, and contain averments that the complainant had previously applied to the boards of directors of the two companies and asked them to file the bills, which they had refused to do.

If the court should find that the companies are entitled to the rights claimed under the 99-year act, injunctions are asked to restrain the city from attacking these rights, either by declaring the franchises void, by the use of force to prevent the running of cars, or by granting other persons or companies the right to lay tracks in the streets now occupied by the Union Traction Co. No temporary injunction is asked except in the event that the litigation shall not have been disposed of by June 30, 1903.

### NASHVILLE CONSOLIDATION UPHELD.

June 20th several suits brought in the name of the state of Tennessee to forfeit the charters of the Nashville Railway Co., and the Nashville Street Ry., the Nashville & Suburban Ry. and the Citizens' Rapid Transit Co., which were on Jan. 23, 1900, consolidated with the Nashville Ry., were all decided in favor of the companies. The claim made in behalf of the state was that the ordinance purporting to give the consent of the city of Nashville to the consolidation was one disposing of a "public utility" and therefore required by statute to be submitted to a popular vote. The court held that in the statute in question "public utility" meant something owned by the public and that the railways being private corporations were in no sense public utilities within the meaning of the statute. The consolidation was therefore perfectly legal.

It was also decided that the franchises of the Nashville Railway Co. are perpetual, which places the company in a position greatly to be envied.

### NEW CAR HOUSE FOR CHICAGO UNION TRACTION.

The accompanying illustration gives a view of the new car house of the Union Traction Co., of Chicago, which has recently been completed and which was briefly mentioned in the "Review" for November, 1900. It is a substantial brick structure one story high in the rear and two stories in front. Its plan dimensions are 127 ft. 3 in. wide by a depth of 1,006 ft. on one side and 981 ft. 9 in. on the other. Four rows of posts which support the roof are spaced 18 ft. apart and divide the building into five bays, each of which contains two tracks. At each of the five entrances to the building is a Kinnear steel rolling car house door 24 ft. wide by 18 ft. high, made by the Kinnear Manufacturing Co., Columbus, O. In addition to the doors in front the building is also provided with a dividing partition near the center, which in case of fire divides the building into two large rooms. The same style of Kinnear doors is used for the partition. All of the side walls have been built heavy enough for eventually supporting a second story, which will be utilized for car storage.

The second story over the front of the building is utilized for offices for the superintendent and other officers as well as for lockers and toilet rooms for the uniformed force. The front of the building is of pressed brick, terra cotta and ornamental iron and presents a very neat appearance. The building is situated on North

sale of the preferred stock will cover all of the expenditures to be made during the present year, and that it will not be necessary to sell any of the \$1,000,000 of bonds authorized until next year. The balance of the bonds (\$1,500,000) will remain in the hands of the trustee of the mortgage, and will be subject to issue from time to time for the acquisition of additional property and for new construction, improvements and betterments, under conditions to be stated in the mortgage, which will properly protect the bondholders.

The company will purchase new rails, new cars and new power station equipment.

### THREE-CENT FARES AT LORAIN, O.

The Lorain Street Railway Co. started on a 3-cent fare basis on June 21st. This road which connects Lorain and Elyria, Ohio, is the first one in the state to adopt this rate of fare and it is admitted to be somewhat of an experiment. Mayor Johnson, of Cleveland, is a small stockholder in the road but disclaims any responsibility in reducing the rate of fare, stating that it was due entirely to the board of directors. The new rate of 3 cents will carry patrons anywhere within the corporate limits of either Lorain or Elyria, but a 9-cent fare will be charged between the two places.

The arrangement is this—3 cents fare in Elyria, 3 cents in Lo-



NEW CAR HOUSE, CHICAGO UNION TRACTION CO.

Clark St. near Devon Ave., and covers an area of nearly three acres. The barn tracks are reached from a second track parallel to the main track the centers of which are 10 in. apart. The special work was done by the Falk Co., of Milwaukee.

### IMPROVEMENTS AT ROCHESTER, N. Y.

Mr. T. J. Nicholl, general manager of the Rochester Railway Co., has sent us a copy of the resolutions adopted by the stockholders of that corporation, at a meeting held May 24th last. At this meeting it was decided to issue \$2,500,000 of new 5 per cent preferred stock, and \$2,500,000 of new 5 per cent general mortgage bonds.

The present stockholders are to have the privilege of subscribing for the new preferred stock in the ratio of one share of preferred stock for every two shares of the present stock owned. Subscriptions for the new issue are to be paid, 40 per cent in cash and 60 per cent in the present stock of the Rochester Railway Co., at a valuation of \$60 per share.

It is the purpose of the directors to use immediately the \$1,000,000 realized by the issue of preferred stock for the liquidation of the debts of the company and the improvement of the property. The total expenditure contemplated will require about \$2,000,000, including the payment of the collateral trust bonds, floating debt, paving claims and the cost of fully equipping and improving the property so that the system may be put in first-class condition and operated most economically. It is expected that the money realized from the

rain, and 3 cents between the cities. By this arrangement Lorain people who work for the Lorain Steel Co. can get to work for 3 cents, while the employees who live in Elyria have to pay 9 cents. The former rates were 10 cents between the two towns and 5 cents from either town to the steel works.

It is reported that this arrangement has caused considerable dissatisfaction especially to the Elyria employees of the Lorain Steel Co. Special cars have been provided for the office men, the company charging the passengers 5 cents fare and paying the difference of 4 cents per man. It is rumored that unless a change is made special cars will be run on the C., L. & W. railroad, to take employees from Elyria right to the steel plant, at a 5-cent fare.

### RIGHTS OF WAY LIABLE TO TAXATION.

An important decision touching the rights of trolley lines in New Jersey was handed down last month by the supreme court. The ruling is that street railway companies have such an interest in the soil of the highways over which the railway passes as is taxable as real estate.

The court says: "The street railway company has a grant of a part of the public estate as its own for permanent, exclusive use, and that is an interest in real estate; the part must be of the same character as the whole.

The North Jersey Street Railway Co. will take an appeal to the Court of Errors and there may not be a final decision until next fall.

## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### NEED NOT ANTICIPATE CHILD BEING UNDER DELAYED CAR.

*Siacik v. Northern Railway Co. (Md.), 48 Atl. Rep. 149. Jan. 10, 1901.*

The court of appeals of Maryland practically suggests here that if a street car is delayed on the street for half an hour that it is not incumbent on those in charge of it to look under the car to see whether a child is there, unless there is something to show that they have cause to believe that such might be the case.

### CONTRACT TO TRANSFER SPECIAL CHARTER ILLEGAL.

*Simonds v. East Windsor Electric Railway Co. (Conn.), 48 Atl. Rep. 210. Feb. 6, 1901.*

A contract by parties getting a special charter from the general assembly for building and operating a railroad upon the public highway to transfer the charter and franchise to another to build the road, the organization to be forthwith put into the hands of persons to be named by him, the supreme court of errors of Connecticut holds is illegal, and, being illegal, they cannot force a re-transfer to themselves of the charter after having so transferred it and the party referred to failed to carry out his part of the agreement. Nor can they claim a cancellation of their subscriptions on the ground that they were induced by his fraud.

### PRIORITY OF CLAIM FOR RAIL JOINTS AND TRACK BOLTS.

*Lee v. Pennsylvania Traction Co. (U. S. C. C., Pa.), 105 Fed. Rep. 405. Dec. 24, 1900.*

A claim for rail joints and track bolts furnished to a traction company within six months before the appointment of a receiver, the United States circuit court, eastern district of Pennsylvania, holds, is superior in equity to a mortgage previously given by the company and is therefore entitled to a preference on the mortgage being foreclosed, such supplies having been dry by day supplies necessary to keep the property a going concern, and not used for the reconstruction of the road. The insolvent company, it thinks, may, in such a case, properly be regarded as having been the agent of the bondholders in keeping the railway a going concern, and to this end in contracting for the needful material.

### LIABILITY FOR EJECTION AND SUBSEQUENT ARREST OF PASSENGER ON JOINT-CONTRACT TRANSFER.

*Jacobs vs. Third Avenue Railroad Co., 68 N. Y. Supp. 623. Jan. 18, 1901.*

The general term of the city court of New York says that the contract to carry the plaintiff as a passenger was a joint one on the part of both railway companies (the defendant and another street railway company), and that each was responsible for the acts of the other in the performance of the same. Plaintiff having paid his fare and received a transfer ticket, entitling him to ride, in accordance with the contract between the railway companies, over both their lines, was properly a passenger upon the defendant's car, and the conductor thereof had no right to eject him therefrom. The fact that the plaintiff was not arrested until after he had alighted from the car was immaterial. The ejection and subsequent arrest constituted one continuous act, and that act being unlawful, the defendant, the court holds, was liable therefor.

### INJURY TO PASSENGER AFTER ALIGHTING CAUSED BY CONDUCTOR STANDING ON HER SKIRT.

*Citizen's Street Railway Co. v. Shepherd (Ind. App.), 59 N. E. Rep. 119. Jan. 25, 1901.*

The case an action for damage against the street railway company. It was alleged in the complaint that the party bringing it was a passenger on one of the company's cars. It was a dark night, and raining. She was accompanied by three small chil-

dren, one of whom she held in her arms. When she arrived at the point where she desired to leave the car, she helped her children out, and the conductor helped her alight. Upon inquiry by her he instructed her as to the direction to go, and stepped back upon the car step. In some manner, her skirt had not been removed from the car step, and was stepped on by the conductor. The car moved away with the conductor standing with one foot on her dress skirt, and pulled her to the ground, inflicting the alleged injuries for which she brought this action. The appellate court of Indiana holds that the facts stated were sufficient to show a cause of action, and that there was no error in overruling a demurrer to the complaint.

### RATES OF FARE GOVERNING INTERURBAN ROAD.

*Coy v. Detroit, Ypsilanti & Ann Arbor Railway (Mich.), 85 N. W. Rep. 6. Jan. 29, 1901.*

Certain rates of fare having been fixed for each of the several townships through which an interurban electric railway runs, the supreme court of Michigan holds that a through passenger, so called, is entitled to ride, without having previously procured a ticket therefor, at the sum of the fares fixed for the townships in whole or in part traversed, and cannot be charged extra for passing through villages in such townships, although perhaps an additional fare may be collected for transportation through a city in one of the townships. It also holds that where a village which has authority to enter into such a contract, which authority was taken to be conceded in this case, contracts for the carriage of any single passenger for a continuous trip between any two points on the line between certain cities at say the rate of 1½ cents per mile, though no fare should be less than 5 cents, any member of the public, without regard to his place of residence, may claim the benefit of that rate, and it is not essential to entitle a passenger to that rate that he should have a ticket.

### SUSPENDING FEED WIRES OVER LAND BY POLES OUTSIDE VIOLATES INJUNCTION.

*Alcorn v. Newark & Hackensack Traction Co. (N. J. Ch.), 48 Atl. Rep. 235. Feb. 4, 1901.*

An injunction restraining a company "from erecting poles and stringing wires or other electrical conductors upon said land and premises, or any part thereof," referring for example to a farm, the court of chancery of New Jersey holds is violated by the company stringing and suspending two feed wires across the premises although the poles from which they are suspended are placed outside the farm boundaries. It holds, furthermore, that an injunction against erecting poles and stringing wires is an injunction against either of the acts, and that "stringing wires upon the land" in a preliminary injunction designed to preserve the status quo or existing conditions pending a final hearing and until condemnation proceedings means stringing wires over the land. Besides, the court says that it seems to it that such wires suspended across a farm and used for conducting the motive power of a railway which is in operation on both sides of the farm as a continuous line are part of the construction of an electric railway across the farm, and, as such construction of an electric railroad are a clear violation of an injunction against constructing a railroad upon or across the premises without compensation first made. Then, it holds that a company cannot assume to decide for itself that rights subsequently acquired by it terminate an injunction which on its face is expressly valid until a hearing on the record or until the court otherwise orders.

### WHEN LOOKING SOME TIME PRIOR TO ATTEMPTING TO CROSS TRACK IS SUFFICIENT.

*Hays v. Tacoma Railway & Power Co. (U. S. C. C.), 106 Fed. Rep. 48. Sept. 14, 1900.*

The United States circuit court, in the state of Washington, thinks that the better reason is with the courts that incline to the



view that the rule of looking immediately before crossing a street railway track its not a fixed one, but that if one looks at such a time prior to crossing, and takes such observation as will justify him in assuming that no collision can occur provided the cars are running at a lawful rate of speed, he is not necessarily guilty of contributory negligence if he fails to take further precaution, or if he proceeds on his way relying upon the presumption that the street car company will comply with the law. In line with this, it refuses to hold here that the plaintiff was guilty of contributory negligence, which would preclude his right to recover damages, in attempting to cross a single street railway track without looking at the time for an approaching car when he had driven in a covered wagon 400 feet from the point where he had looked, having an unobstructed view for about 1,400 feet, and saw no car in sight, and there was evidence tending to show that the car which struck him came up at a speed of 24 miles an hour, or double the authorized rate of speed, and that if the car had conformed to the ordinance limiting speed no collision could have occurred.

#### RIGHT TO INJUNCTION AGAINST PASSENGERS ENDEAVORING TO RIDE WITHOUT PAYING DISPUTED FARES.

Milwaukee Electric Railway & Light Co. v. Bradley et al. (Wis.), 84 N. W. Rep. 870. Jan. 8, 1901.

This was an action to restrain the defendants from interfering with the company's business by endeavoring to ride upon its street cars without paying the fare demanded pursuant to its alleged lawful regulations, and to judicially establish the validity of such regulations; also to enjoin the prosecution of numerous suits brought against the company growing out of its enforcing such regulations, and to enjoin the commencement of further suits of the same character. It appeared that the right of the company to collect the disputed fares depends upon questions of law arising on undisputed facts. The supreme court of Wisconsin says of it that it was engaged in quasi public work that could not be disturbed by daily contests with patrons over its right to the fares demanded, without great and irreparable injury to its interests if it was acting in the right, and great prejudice to the traveling public desiring the benefit of its service, as well. Then, for the purposes of this case, without any intention of deciding it on its merits, the court looked to see if the record disclosed that the right claimed by the company might probably be vindicated by the final decree in the case, and, finding that it might be, the court holds that it was error to vacate the temporary injunction granted, the damages that might probably result to the defendants by reason of the injunction, in case the company finally failed in the litigation, being trifling and easily indemnified against by the bond on its part given as a condition of the injunction. In other words, the court holds that if it be clear that the plaintiff may probably recover, and that if it be left at the mercy of its adversaries the purpose of the litigation may be defeated or it may suffer irreparable loss, it is within judicial discretion to so control the situation as to prevent that result so far as practicable, having regard for the rights of the defendants as well as those of the plaintiff.

#### CARE REQUIRED IN REMOVING SNOW FROM TRACK.

Newport News & Old Point Railway & Electric Co. v. Bradford (Va.), 37 S. E. Rep. 807. Jan. 17, 1901.

From the necessity of the case, it would seem, the supreme court of appeals of Virginia says, that a street car company, in operating its cars upon a street, would have the right to remove snow from its track to another part of the street; but in doing so it would not have the right to bank up the snow so as to make it dangerous to use or cross the street, unless the work of cleaning the track necessarily obstructs passage, and then the company is bound to do all that ordinary care requires in removing the obstruction. Furthermore, the court pronounces misleading, if not erroneous, an instruction which said, in effect, to the jury that if they believed that the snowstorm causing the deposit of snow on the track was an extraordinary one, then it was the duty of the company to use extraordinary exertions not to create obstructions at street crossings. It was the duty of the company, the court holds,

to exercise ordinary care and prudence in removing the snow from its track. What was ordinary care depended upon the facts of the particular case. That which would be ordinary care in one case might be gross negligence in another. But the mere fact that the deposit of snow upon the track was caused by an extraordinary snowstorm did not require the company to use extraordinary exertions to avoid obstructing street crossings in removing the snow, but only required it to use that degree of care and prudence which ordinarily prudent persons exercise under like circumstances.

#### SUPERIOR RIGHT OF WAY OF STREET CARS.

North Chicago Street Railroad Co. v. Smadraff (Ill.), 59 N. E. Rep. 527. Feb. 20, 1901.

The supreme court of Illinois holds that it is not true that street cars have, "at all times and under all circumstances, a superior right of way along their lines except at street crossings," because, it says, although street cars have a superior right of way to the general travel on streets at places other than crossings, to the extent that those traveling by other means must get off the tracks and give the right of way to moving cars, for the reason that they can get off the track, whereas the cars cannot, still the general public have the right to use and travel upon the entire street, including that portion of it on which the car tracks are laid, and are in no sense to be treated as trespassers for so doing. Again, it says, with regard to this case, that the fact that the company had generally a superior right of way along its line at places other than at street crossings in no way tended to prove that the gripman in charge of the car at the time and place of the accident was not negligent, nor would that fact lessen the amount of care and diligence incumbent upon the company with respect to the welfare and safety of the party who brought this action or of other persons rightfully upon the public street.

Mr. Justice Magruder, dissenting, says that he does not agree to that part of the opinion which holds that "street cars have a superior right of way to the general travel on streets at places other than crossings." The public streets belong to the people, and the humblest teamster has as much right to travel thereon, or on any part thereof, as the cars of any street railway company. There is no such thing as a "right of way" in a public street vested in a street car company.

#### STATUTORY LIABILITY FOR PAVING CANNOT BE CHANGED BY AGREEMENT—WHAT IS ROADBED.

City of Shreveport v. Shreveport City Railway Co. (La.), 29 So. Rep. 129. On rehearing, Jan. 31, 1901.

Louisiana Act No. 10 of 1896 authorizes the assessment of street railway companies for the paving of streets through which their roads run, and, in specific terms, establishes the basis upon which the liability of such companies is to be ascertained; and, the supreme court of Louisiana holds, it is incompetent for a municipal corporation and a railway company, by convention, to change the basis so established so as to reduce such liability below that properly arising under the statute.

Furthermore, in this case, an obligation with respect to street maintenance, entered into prior to the passage of the act of 1896, and predicated upon a franchise for a single-track road, having been superseded by a compromise, also relating to a single-track road, and entered into and after the passage of that act, and such compromise having been thereafter annulled by a contract providing for the construction and maintenance of a double-track road, the fact that the stipulation in the last contract, with respect to the liability of the railway companies for paving, could not be enforced, because repugnant to law, the court holds, did not revive the pre-existing convention on the subject, inasmuch as the surrender of the franchise for the double track was neither demanded upon the one hand, nor tendered upon the other, but, on the contrary, said franchise was used for the purpose for which it was granted. Under these circumstances, the court holds, the liability of the companies for paving, as far as concerned both tracks, should be determined by the statute, and, as thus determined, was in proportion to the space occupied by their roadbeds as compared with the entire space to be paved. It also holds that the graded and prepared soil, the cross-ties laid thereon, with the ballast and surfacing, made up the roadbed, and that its width was represented by the length of the

cross-ties, and not by the space between the outer edges of the rails, nor yet by such space, plus "clearance space," upon either side of the track.

#### INEFFECTIVE NOTICE FORBIDDING RIDING ON FRONT PLATFORM.

*Sweetland v. Lynn & Boston Railroad Co. (Mass.), 59 N. E. Rep. 443. Feb. 26, 1901.*

An electric car from which a passenger riding on the front platform thereof was thrown and injured had a sign attached to its hood which read as follows: "Notice. All persons are forbidden to be on the front platform of this car, and this company will not be responsible for their safety. Per orders of the directors." This, the supreme judicial court of Massachusetts says, purported to be a prohibition of passengers from riding on the front platform, and not a notice stating the terms on which they might ride. And it holds that the jury was rightly instructed that such a rule would be reasonable, and that, if the passenger was intentionally violating the rule, he could not recover damages for his injury. But it also sees no error in that the jury was permitted to find that, notwithstanding the sign, the rule, if it ever was intended to be a rule, had been allowed by the company to become a dead letter, so that in effect the case was as if there never had been such a rule. The court says that it has no doubt that a railroad company, after making a rule in regard to the conduct of passengers, may waive and abandon it, and treat passengers as if it had never existed, and thus lead them to believe that the rule is no longer in force. If a railroad company does this, it cannot set up the rule to defeat the rightful claim of a passenger who has acted in the well-warranted belief that the rule is not in force. If such signs as this are placed over the front platform of cars, and if afterwards the persons in charge of the cars are accustomed to receive passengers upon the cars in such numbers as to crowd the front and rear platforms, as well as the other parts of the cars, and the passengers are permitted to ride freely and without question upon the front platforms, paying for so riding the usual fare, the passengers may well believe, and the jury may well find, that the notice was not intended as a rule to be obeyed, and that the front platforms were intended by the company to be used by passengers. The officers of the company might be supposed to know the habitual methods of their servants in managing their cars. Exceptions to a judgment in favor of the plaintiff overruled.

#### RIGHTS OF DRIVER OF WAGON ON TRACK IN CITY STREET.

*Cohen v. Metropolitan Street Railway Co. (N. Y. Sup.), 68 N. Y. Supp. 830. Feb. 25, 1901.*

The appellate term of the supreme court of New York holds that a dismissal of the complaint in this case could not be justified on the ground that "the plaintiffs, in entering upon the defendant's tracks and driving thereon for a distance of two blocks, or over four hundred feet, were guilty of such contributory negligence as to entirely preclude a recovery for the damages sustained." This, it declares, is not the law. A driver of a vehicle in a city street has a right to expect that street cars will be managed with reasonable care, and with a proper regard for the rights of others lawfully using the public thoroughfare. And it is said here that it is apprehended that the true rule is that a driver of a wagon in a city street may drive along the track in full view of an approaching car, and that the fact that he so proceeds for 400 feet or any other distance will not charge him with contributory negligence, if, under all the circumstances, his conduct is consistent with ordinary prudence. The only limitation of the driver's right is that he must not necessarily interfere with the passage of the car, which, although entitled to a preference, does not possess the exclusive right to the use of the tracks.

It cannot be held, in the situation disclosed by the record in this case, the court says, that it was negligence per se or in and of itself for the driver to fail to look behind him for an approaching car. The accident occurred in a populous city street in the daytime. The horse and wagon were lawfully upon the street. The wagon was covered on the sides and rear. It was very difficult for the driver to look to the rear. He had just reached the inter-

secting street, into which he was turning from the track. At the time of the collision the horse and the greater part of the wagon were off the track. While turning out of the track he was required to exercise reasonable care, and he had a right to assume that those in charge of the car would employ the like degree of care to avoid injuring him. As both were approaching a street crossing, the motorman, if he was looking ahead, as he was especially required to do at such a time, could not fail to note the presence of the wagon, while the driver of the wagon at the same time was required to be vigilant in observing the crosswalk, where he should anticipate the presence of pedestrians. Under these conditions, the court holds, it was peculiarly a question of fact as to whether reasonable care required the driver to look towards the rear or do anything else before he proceeded to turn out of the track. Wherefor the dismissal of the complaint was erroneous, requiring a reversal of judgment.

#### RIGHTS AND DUTIES RELATIVE TO STOPPING, STARTING, AND BOARDING CAR, ON SIGNAL.

*Citizens' Street Railway Co. v. Merl (Ind. App.), 59 N. E. Rep. 491. Feb. 20, 1901.*

A portion of the north track on an east and west street where there were double tracks being torn up, all cars were at that point run on the south track. This necessitated a passenger desiring to take a west-bound car there to board the same on the side next to the poles between the track. The car in question was an open summer one, with the seats on the front end and in the middle of the car crowded, and while he was going along the running board to the rear of the car to obtain a seat or standing room he was struck in the back and head by coming in contact with one of the poles, the car having in the meantime been started rapidly forward. The appellate court of Indiana affirms a judgment in his favor.

Part of an instruction given the jury was as follows: "Negligence of the defendant [company] in running past the plaintiff [Merl] upon the street, whether he had signaled or not, or whether he was at a station for receiving passengers or not, would not authorize or make it right for the plaintiff to commit an act of negligence in getting upon the car to prevent being left behind. And if you are of the opinion that, at the time of his accident, plaintiff voluntarily threw himself upon a known or perfectly apparent danger, or assumed a perfectly clear or palpable risk, he cannot now recover damages of the defendant, even though the servants of the defendant were also negligent." This, the court says, was a plain and correct statement of the law.

When a person desires to take passage on a street car, and signals such car, indicating his intention, if such person be at a point or place on the line where such car is required to stop to receive passengers, if the car is stopped, or its speed slackened, the company, the court holds, thus extends an invitation to such person to become a passenger, and he has a right to enter. He becomes a passenger, under such circumstances, as soon as he steps upon the running board or steps of the car, and the company is bound to treat him as a passenger. This proposition presupposes the fact that the employees in charge of the car are aware of the facts stated. A person about to take passage upon a street railway car, he himself being without fault, has a right to rely upon an opportunity being given him to enter it in safety, or of being notified of any apparent danger foreseen by employees. It is also well settled that carriers of passengers are required to give passengers ample or reasonable time to get on and off cars.

Then, the jury was told that if it found that the plaintiff signaled the car, and that its speed was slackened at or near a crossing where the company was accustomed to receive passengers, and that it was apparently safe for him to board the car, it was not necessarily negligence, as a matter of law, for him to attempt to get on the car while it was in motion. It was also told that he had a right to rely upon the watchfulness and care which it was the duty of the conductor to bestow towards persons about to take passage, and that he was not bound to anticipate that the car would start rapidly, or that he might be thrown against the pole, etc. The court holds that this was a correct statement of the law. And it adds that when a person enters a street car as a passenger,



it is the duty of the conductor in charge of the car to see that he is in a place of safety before he gives the signal to start.

Again, the jury was instructed that if it found that the plaintiff got on the car at a place other than a proper stopping place, while the car was in motion, and without the knowledge of the employes in charge of the car, he could not thus become a passenger; and that under such facts, if the employes, after they learned such facts, immediately attempted to stop the car to prevent an injury to him, by using the care and diligence required by law, then the company would not be chargeable with negligence, and the verdict should be for the company. This instruction, it was urged was erroneous because it said that it was the duty of the company to exercise the highest degree of diligence towards a trespasser after he was discovered. But the court is unable to see how such a construction could be put upon the instruction, the sum and substance of which, it thinks, was but the Indiana rule that a common carrier owes a trespasser no protection against negligence, and owes him only reasonable care to avoid injuring him, when his presence and his own inability to avoid injury are known to it.

#### CONSTRUCTION AND VALIDITY OF STATUTE REQUIRING SCREENS FOR MOTORMEN IN WINTER.

State v. Whitaker (Mo.), 60 S. W. Rep. 1068. Feb. 12, 1901.

While it is obnoxious to verbal criticism, the supreme court of Missouri, division No. 2, nevertheless does not think inoperative for indefiniteness and uncertainty the act of 1897, entitled "An act requiring persons, associations and corporations, owning or operating street cars to provide for the well-being and protection of employes." Section 1 provides: "That every electric street car, other than trail cars, which are attached to motor cars, shall be provided during the months of November, December, January, February and March of each year, at the front end, with a screen composed of glass or other material which shall fully and completely protect the driver, motorman, gripman or other person stationed on such front end and guiding or directing said car from wind and storm." The court thinks that the act quite plainly imposes upon every electric car company or association of persons operating electric cars the duty of providing screens on their cars in the winter months named for the protection of their motormen, and such, it takes it, was the plain intent of the legislature. Or, as it states it in other words, the court thinks that the act obviously imposes upon the corporation or person owning or operating electric cars the duty of providing said cars with screens.

Then, having construed the first section to require the corporation, association, or person owning the car to equip it with the screen required by the act, the court thinks that the statute makes it penal for "any person" who owns or operates an electric railroad car to operate such cars without the screens required by the statute, and any agent or officer of any association or corporation operating or owning such cars who violates said act is also punishable under the act; and by such "agent or officer" is meant one whose duty it is to see said cars are provided with said screens before they are operated; not the motorman for whose protection the act was passed. The managing executive officers represent the corporation or association, and the law, the court continues, will presume they know whether the cars operated under their direction are provided as the statute requires, and hold them responsible for operating them without first complying with the statute. To this it adds that it is not necessary, in charging a misdemeanor like this, to aver that it was knowingly omitted.

Nor does the court think the act unconstitutional on the ground that the title gives no indication of the character of the act itself. On the contrary, it holds the title both definite and broad enough to include the provisions of the act, all of which it holds were germane to the purpose expressed.

Neither does the court consider the act offensive to the provision of the state constitution which ordains that no local or special law shall be enacted "when a general law can be made applicable." It thinks that the legislature had the right to make the classification it did in making the act apply only to electric cars and for the protection of motormen thereon, and it not only justifies it when considered with reference to horse cars but with

reference to cable cars as well, on which latter it is generally known that the gripman stands near the center of the car, in a box which protects the lower half of his body, and where he is protected by the roof of the car in rainy or snowy weather, while the motorman stands in front and is much more exposed to the cold and inclement weather of winter than is the gripman on the cable car.

This being a public prosecution by the state of an offense against the public, the court declares it difficult to discern the relevancy of the argument that this statute deprives the motormen on electric cars of their liberty of contract. It pronounces it a plain, just, and commendable police regulation, and adds that not only has the state a direct interest in the health of the motormen, but in the passengers, whose lives and limbs may be imperiled if the motormen are allowed to become numbened from exposure. But the record here, it says, did not contain any facts upon which it could properly decide the effect of a waiver by a motorman of his right to the protection secured to him by the act.

The penalty imposed for a violation of the act of a fine of from \$25 to \$100 for each day that any car belonging to or used by such person, association or corporation is permitted to remain unprovided with the screen required by section 1 the court does not think an imposition of a cruel and unusual punishment. The way to avoid the cruelty, it says, is to obey the law, and avoid these accumulated fines.

#### TAXATION OF PROPERTY AND FRANCHISE TOGETHER—IMMUNITY CONTRACT ASSIGNABLE.

Detroit Citizens' Street Railway Co. v. Common Council of City of Detroit (Mich.), 85 N. W. Rep. 96. Feb. 12, 1901.

The supreme court of Michigan holds that it may take judicial notice that a certain street railway has a large market value, much in excess of any amount that could be obtained for the same if it were to be dismantled, and its rails, cars, motors, wire, etc., sold separately. Then, the legislature having provided that the track should be assessed as personal property, it holds that this term should be construed to include not only the ties, spikes, rails and switches, but also the right to use the bed upon which they are placed. Nor does it agree with the contention that if a franchise—i. e., an intangible license to do an exceptional business—is not made taxable property by express statute, it cannot be taxed indirectly by associating it with tangible property, thereby increasing the valuation of the latter. It insists that property should be taxable at its cash value, whatever it may be that causes the value. In other words, whatever may be the rule as to the assessment of privileges in the abstract, not connected with tangible property, the court maintains that the latter may be assessed for what it is worth, without reference to the cause of such value, and without analysis to see if some intangible element of value does not enter into it, which should be eliminated upon the theory that intangible things are not taxable. For example, if the property of a street railway company is worth, and would bring, with the franchises that are inseparable from and necessarily go with it, somewhere from ten to fifteen million dollars, its owners, the court holds, have no right to expect it to be taxed on a basis of one and one-half million dollars. Whether the property is worth such a sum, is for the assessors and board of review to decide, and their determination cannot be disturbed, if regular, and not fraudulent. Moreover, the court holds that there is nothing to prevent property of this character from being assessed as a unit. It says that the practice of taxing the property and privilege together is nearly or quite uniform, and that the propriety of assessing such property as an entirety is well supported by authority. It does not deem it an insuperable obstacle to assessing the property as a unit that the street railway system consists of several power plants, situated at different places along the line, which extends through or into several taxing districts. But, it being lawful for the city to make a percentage contract, fixing the rate of city taxation which should be binding upon the city and be efficacious to relieve the street railway from paying its share of the general tax for city purposes, the court holds this immunity from taxation assignable with the property of the company, the statute permitting an assignment, and all rights resting in contract being included.



### E. G. CONNETTE AS A BRIDGE BUILDER.

Mr. E. G. Connette, general manager of the Syracuse (N. Y.) Rapid Transit Co. has of late had to turn his attention to repairing and rebuilding bridges and has been eminently successful as is shown by the following extract from an editorial in the Syracuse Post-Standard of June 12th:

"Mr. Connette, personally and materially interested in a speedy restoration of street-car service through James St., concluded that this easy-going, procrastinating plan of the state officials was nonsensical and said, 'Give me authority and I will build a bridge in ten days that will bear street-cars and fire engines, and carry all the traffic of the street.' As a matter of fact, he did it in six days—did it in the face of opposition and almost prohibition at the hands of the state authorities. But the people of Syracuse got the bridge, and for it they have Mr. Connette to thank.

"While the debris of the old James St. bridge was yet lying at the bottom of the canal, the state officers sufficiently stirred themselves to make inspection of the Warren St. bridge and, finding it unsafe for ordinary traffic (a fact that had been well known to the people of Syracuse for many months) peremptorily ordered it closed, yet made no move whatever to give to the crowding traffic of the city some substitute convenience. Nothing whatever was planned or suggested concerning a new bridge, and had the matter been left to officials at Albany it is probable that Warren St. as a thoroughfare over the canal would have remained in disuse for a year or more.

"Again the general manager of the Rapid Transit company, acting primarily in his company's interests, said, 'I will bridge Warren St. and will have a new structure capable of carrying the city's heaviest traffic open for service inside a month.' Then he went to work; and the Warren St. bridge improvement now in progress promises to be completed inside of ten days.

"For a third time within a single month, more or less, the modest Connette again came up smiling and suggested to the state engineers in a fashion indicating that he meant business, 'Repair and strengthen your broken bridge cylinder thus and so, and you can have the structure in reliable working order again within forty-eight hours; if the method of repair I suggest isn't successful, the Rapid Transit company will pay the bill.' His suggestion and advice were heeded, and within twenty-four hours thereafter the Salina St. bridge was successfully in operation and the interrupted traffic of the street was resumed."

### CHICAGO, MILWAUKEE & KENOSHA.

The Chicago, Milwaukee & Kenosha Electric Ry. Co. has been incorporated in Wisconsin with the following officers: President, Alexander Clark, of Evanston; vice-president, G. S. Rhodes, of Evanston; treasurer, George Rhodes, of Evanston; secretary, James Cavanaugh, of Kenosha. The object is to complete an electric line from Waukegan to Milwaukee. It has not been announced whether the line now in operation from Kenosha to Milwaukee will be used. Between Evanston and Waukegan the Chicago & Milwaukee Electric Ry. has been in operation for nearly two years, and it seems probable that the long talked of through line will be completed within a short time. The new road is to be operated by the Chicago & Milwaukee.

### NEW DENVER CARS AND SPECIAL WORK.

The accompanying illustrations show some interesting views of the shops and equipment of the Denver City Tramway Co., of Denver, Col. Figs. 1 and 3 are general views of the company's special work yard where during the year 1900 some 550 frogs,



SHOPS AND YARDS OF THE DENVER CITY TRAMWAY CO.

Fig. 1.—Special Track Work.

Fig. 4.—Electric and Steam Crossing.

Fig. 2.—Power Rail Curver.

Fig. 5.—View in Shop.

Fig. 3.—Switches, Crossings, Etc.

Fig. 6.—View in Shop.

"Last of all, so far as the interesting record has been made up, the ponderous, expensive state bridge over the Erie Canal at Salina St. suddenly gave out on Friday last, and local state officials having examined the break, made announcement to the exasperated people of the city that necessary repairs would require six weeks, and for that period of time the principal city bridge on the busiest city street must remain closed to all traffic.

mates, switches, crossings and other pieces of special track work were built. The product was mostly of 65-lb. and 72-lb. rails, and was all to meet the company's own needs. Fig. 4 is a double electric and single three-rail steam railroad crossing, made from 100-lb. A. S. C. E. standard steel rails. This crossing is shown "taken down" and piled up ready for loading.

In Fig. 2 is shown a home-made power rail curver, which is

driven by an electric motor. By throwing the lever (overhead in the center of the picture) the motion of the gearing is reversed. The rails are run forwards and backwards until uniformly curved. The rolls are changeable, so that any weight of rail may be curved, from 30-lb. to 100-lb. by changing the rolls. It requires

cold weather, and in the summer, with the blinds up, the glaring Colorado sun is excluded, and those not bent on sight seeing find it a most comfortable place to enjoy the cool breeze that almost invariably is wafted through the car, from the near-by range of snowy peaks. Fig. 11 is interior view of this car.

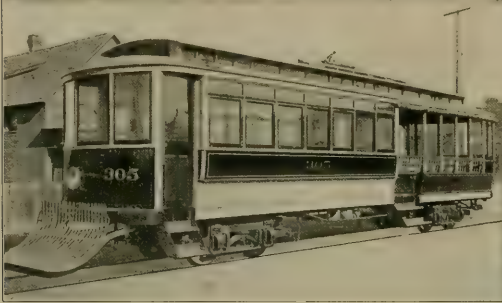
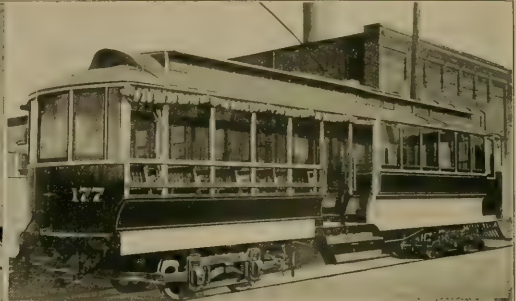
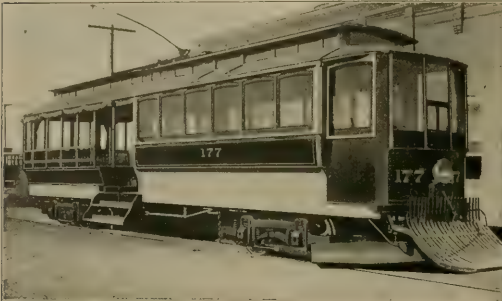


Fig. 7.  
Fig. 8.

DENVER CITY CARS.

Fig. 9.  
Fig. 10.

two men about five minutes to curve a 72-lb. rail, where formerly it required six men nearly thirty minutes, by hand power.

Figs. 5 and 6 are views of the interior of the special work shop showing planer, rail saws, etc.

Figs. 7 and 8 are exterior views of a 39-ft. double truck combination car, some 80 of which type have been recently constructed by joining an open trailer to a closed motor, or cable car. This style of car has proved very popular with the public. Denver is

In Figs. 9 and 10 is shown a 40-ft. car, designed especially for the company. This car is said to be one of the most elegant and complete cars ever turned out in the West, and will, it is believed, prove a particularly popular type. Interior views are shown in Figs. 12 and 13. This car seats 48 persons.

A bill has been introduced in the St. Louis city council providing that all street cars operating within the city shall be equipped



FIG. 11.

FIG. 12.

FIG. 13.

peculiarly situated regarding climatic conditions. With the mild winter weather, many people prefer the open portion of the car the year around, while, of course, others prefer the closed portion in winter and summer; the closed portion is heated electrically in

with improved fenders and wheel guards if the ones in present use be adjudged ineffective by the board of public improvements. The board will be empowered to prescribe a penalty for violation of the proposed ordinance.



## PENNSYLVANIA RAPID TRANSIT BILLS.

Two rapid transit bills, known as the Focht and Emery bills, were introduced in the Pennsylvania Senate May 29th, and aroused special interest on account of the speed with which they were made laws. Ten minutes after their introduction they were reported favorably from committee and they passed first, second and third readings without the loss of a moment's time, all amendments being rejected.

On June 4th these measures came up in the House and it required only about three hours for them to pass that body, although a small but very determined opposition was met. Only ten days elapsed from the time these measures were introduced until they were signed by Governor Stone, thus becoming laws on June 7, 1901.

The first of these, No. 250, was to amend certain sections of the street railway act of 1889 as amended by the act of 1895 and the section of this act as now amended are as follows:

Section 1. That any number of persons, not less than five, may form a company for the purpose of constructing, maintaining and operating a street railway for public use in the conveyance of passengers, by any power other than locomotive, on any street or highway upon which no track is laid, under any existing charter, and in constant daily use, for the transportation of passengers at the time of the application by another company for a charter to use such street, with the privilege of occupying so much of any other street, highway or bridge as is hereinafter provided; but whenever a charter, after the approval of this act, shall be granted to any corporation to build a road, as provided by this act, no other charter to build a road on the same streets, highways, bridges or property shall be granted to any other company within the time during which, by the provisions of this act, the company first securing the charter has the right to commence and complete this work: Provided, That the consent of the local authorities shall be promptly applied for, and shall have been obtained within two years from the date of the charter; for the purpose of such formation said persons may make and sign articles of association, in which shall be stated the name of the company, the number of years the same is to continue, the length of such road, as near as may be, the streets, highways and bridges upon which the said railway is to be laid and constructed, showing also the circuit of the route, the amount of the capital stock of the company, which shall not be less than \$6,000 to every mile of road proposed to be constructed, and the number of shares of which said capital stock is to consist, and the names and places of residence of a president and not less than four nor more than twelve directors of the company, who shall manage its affairs until the first annual meeting thereafter and until others are chosen in their places, etc. \* \* \* \* \*

Fourth. To take, hold, purchase, operate, lease and convey such real and personal property, estate and franchises, as the purposes of the corporation shall require. \* \* \* \* \*

Seventh. To sell or lease their road and franchises, or parts thereof, to traction or motor power companies, or to other passenger railway companies, or to acquire the roads, property and franchises of other passenger railway companies by lease or purchase.

[The portions omitted as indicated by asterisks deal with the routine of filing applications for charters, and the usual powers of corporations to sue and be sued, to use a common seal, to make by-laws, etc.]

Section 4. [This section was amended so as to permit companies to build over bridges as well as highways and the proviso that no company should construct an extension in any street or highway on which a track is laid or authorized was altered to read "on which a track is laid and in constant daily use for the transportation of passengers, at the time of the filing of such simplification."]

Sec. 14. Any passenger railway company, incorporated under this act, shall have the right to use such portion of the single or double tracks of, or the streets, highways and bridges occupied by, any other passenger railway company or companies, incorporated under this or any general or special act, and already laid down and in constant daily use, and all of any streets, highways and bridges included in the route of any other company or companies, when the tracks are not laid down or are not in constant daily use, or are only in temporary use, as it may require, either to construct a circuit upon its road or upon any of its branches or extensions, or to connect its road with any and all its branches or extensions or with the road of any other passenger railway company. The length of tracks

to be used of any other road already laid down shall be used only with the consent of the local authorities of the city, borough or township in which the same are laid, and in no event shall exceed two thousand five hundred feet in length of street or highway, in which measurement no bridge to be crossed, or the approaches thereto, shall be included; and shall have the further right to use all bridges and the approaches thereto, in use by any other company, in addition to the two thousand five hundred feet of track therein-before provided for; and said company shall have the right to replace, at its own expense, such tracks with new tracks and appliances necessary for the proper operation of the cars of both companies over and upon said tracks. Before any such use occurs, compensation shall be paid or secured to any person or corporation injured thereby. In case the parties cannot agree as to the amount of compensation to be paid, then the court of common pleas of the proper county, upon the petition of the corporation seeking the privilege, shall appoint five persons to view and assess the compensation for the use of the tracks already laid and in constant daily use, or the streets, highways or bridges on which the same are laid, whether the said corporation owning said tracks shall or shall not have the exclusive right to lay tracks in said street or highway, either by virtue of their charter or any other legislation claiming to confer such exclusive privilege. The jury so appointed shall hear the testimony, and shall make a report to the court, assessing the damages which the corporation claiming the privilege of laying or using tracks shall pay for the said privilege; and if no appeal shall be taken to the said report, the court shall, at the expiration of thirty days, confirm the said report; and the amount so fixed by the jury shall then be due and payable: Provided, however, That either party shall have a right of appeal, within the said thirty days, from the award of the jury, as now provided by law. If the damages due are to be secured, such security shall be given, in such amount, as the court having jurisdiction thereof shall direct, and shall be approved by said court; whereupon, upon such security being entered, the company so entering the same shall have the right to the immediate use of such streets or tracks. If an appeal shall be taken, it shall be competent for the party against whom an award has been made to pay into court the amount of such award, upon which payment the right to lay or use said tracks shall vest, and said sum shall await the final judgment on said appeal.

Sec. 15. No street passenger railway shall be constructed by any company, incorporated under this act, within the limits of any city, borough or township, without the consent of the local authorities thereof; nor shall any street railway be incorporated hereunder, which shall not have a continuous route, including branches and extensions, from the beginning to the end, including connections made with each of its branches and extensions or they with each other, and including the use of bridges and the approaches thereto, and the two thousand five hundred feet authorized to be used under section fourteen as amended by the provisions of this act.

Section 4 of the street railway act of 1895 is amended so as to permit companies to abandon portions of their tracks and to permit the tracks so abandoned or such as may be in temporary use only to be occupied and used by other street railways upon obtaining the consent of the local authorities and making compensation to the owner as provided in section 14 of the street railway act of 1889 as amended by this act.

This act also authorized companies incorporated under it to acquire property, by purchase or otherwise, when it deems it necessary in order to make connections with any portion of its track; street passenger railways are prohibited from connecting their tracks with the tracks of railroads organized to carry both passengers and freight.

Unless a company organized under this act shall apply to local authorities for consent to build within two years, and shall commence building within two years after the consent is granted, and have the line in complete operation within five years after the consent is granted, it will be deemed to have abandoned its rights to occupy the streets, highways and bridges for which it made application.

The second act, No. 251, provides for the incorporation and government of passenger railways, either elevated or underground, or partly overhead and partly underground, with surface rights. Some of the principal provisions of this act are as follows:

That any number of persons not less than five, three of whom shall be citizens of this Commonwealth, may form a company



for the purpose of construction and operation of passenger railways, either elevated or underground, or partly elevated and partly underground for the transportation of passengers and with power and authority to contract for and to locally gather, carry and distribute the mails of the United States, and with power to construct such portion thereof upon the surface as may be reasonably necessary for terminals or connections between the underground and elevated sections thereof: Provided, however, That the surface so occupied shall not exceed two thousand five hundred feet in length, in any one place which said railways may be constructed and operated upon, over, under, across, through, and along any street, highway or bridge in this Commonwealth, upon which no railway incorporated under this act is already erected or constructed, and in constant daily use for the transportation of passengers, or authorized to be erected or constructed under any existing charter issued under this act, and for which permission to erect or construct the same has been obtained from the local authorities of the city, borough or township in which the same is to operate, within two years, with the privilege of occupying so much of the said streets, highways or bridges mentioned in their charter as may be necessary for the erection and operation of said railways for public use, in the conveyance of passengers, by such motive power, other than steam, as may be adopted from time to time; and said companies may build and operate on, over, under, across, through, and along streets, highways and bridges on which passenger railways are constructed or authorized to be constructed on the surface of the street and may use and occupy the surface to the extent of two thousand five hundred feet, as herein provided.

That the capital stock shall not be less than \$50,000 per mile; that a company may sell or lease its road and franchises or parts thereof, or acquire the roads and franchises of other passenger railways; that a company organized under this act may not connect its tracks with the tracks of a company organized to carry both passengers and freight.

That articles of association may not be recorded until \$25,000 per mile has been subscribed, and 10 per cent thereof paid in.

That the capital stock of a company may be increased at the option of the directors.

That companies organized under this act shall have the right of eminent domain and may use the property of the state for tracks and stations.

That any company proposing to construct a railway or any branch or extension thereof, under the provisions of this act, shall in good faith commence the construction thereof within two years after the consent of the proper local authorities of the city, borough or township, within which the same is located, shall have been obtained; and the same shall be completed within five years thereafter, unless the time shall be extended by the authority aforesaid. Whenever a charter shall be granted to any corporation to build a road as provided by this act, no other charter to build a road on, over, under, across, through, or along the same streets, highways, bridges or property shall be granted to any other company, within the time during which, by the provisions of this act, the company first securing the charter has the right to commence and complete its work: Provided, That the consent of the local authorities shall be promptly applied for, and shall have been obtained within two years from the date of the charter.

Immediately upon the signing of these bills, there was a rush at the state department to take out charters. Over 100 applications were filed within three hours, principally for franchises in Philadelphia and Pittsburgh. In the week following the passage of the bills, applications for 13 franchises for the same number of street railways in Philadelphia were in the hands of the councils, and these proposed lines are planned to cover nearly all the city. The surface lines include practically all the desirable streets not now taken, while the elevated lines will diverge from a central point of the city, use all the busiest thoroughfares and reach all the outlying sections.

The incorporators of all the companies are John M. Mack, Robert H. Foerderer, Michael Murphy, Clarence Wolf and Joseph P. Mack. John M. Mack is president of all the companies. All of the surface road companies have as their secretary and treasurer, Edwin McCoy, who is a manager for President Mack in other business enterprises. The secretary and treasurer of the elevated roads and the Broad street underground line is J. Edward

Ryan, formerly cashier in the International Revenue office and now in the insurance business.

The following are the thirteen companies and their authorized subscribed, and paid in capital:

Northern Rapid Transit Street Railway Co.—Capital, \$228,000; subscribed, \$76,000; paid, \$7,600.

Eastern Rapid Transit Street Railway Co.—Capital, \$540,000; subscribed, \$180,000; paid, \$18,000.

Southern Rapid Transit Street Railway Co.—Capital, \$90,000; subscribed, \$30,000; paid, \$3,000.

Western Rapid Transit Street Railway Co.—Capital, \$360,000; subscribed, \$120,000; paid, \$12,000.

Central Rapid Transit Street Railway Co.—Capital, \$60,000; subscribed, \$20,000; paid, \$2,000.

Broad Street Rapid Transit Street Railway Co.—Capital, \$150,000; subscribed, \$50,000; paid, \$5,000.

Chestnut Hill & Glenside Rapid Transit Street Railway Co.—Capital, \$288,000; subscribed, \$96,000; paid, \$9,600.

Broad Street Subway Passenger Railway Co.—Capital, \$1,250,000; subscribed, \$635,000; paid, \$62,500.

Market Street Elevated Passenger Railway Co.—Capital, \$1,500,000; subscribed, \$750,000; paid, \$75,000.

Germantown Avenue Elevated Passenger Railway Co.—Capital, \$900,000; subscribed, \$450,000; paid, \$45,000.

Ridge Avenue Elevated Passenger Railway Co.—Capital, \$850,000; subscribed, \$425,000; paid, \$42,500.

Frankford Elevated Passenger Railway Co.—Capital, \$750,000; subscribed, \$75,000; paid, \$7,500.

Passyunk Elevated Passenger Railway Co.—Capital, \$375,000; subscribed, \$187,500; paid, \$18,750.

Of the capital of the surface lines one-third has been subscribed in each case, and of the elevated and Broad street subway lines one-half, the amount paid being 10 per cent of the amount subscribed.

The capitalization of the thirteen companies amounts to \$7,341,000, of which \$3,384,500 is subscribed and \$338,450 paid in. The capital of the seven surface lines is \$1,716,000, of the four elevated roads, \$4,375,000, and of the Broad St. underground road, \$1,250,000.

In addition to these franchises there was also a bill offered in the Councils that provides for revoking all privileges to lay tracks, erect poles and string overhead wires where such permission has heretofore been granted and advantage not taken of such privilege within the time limit provided by such ordinance, and granting permission to the Consolidated Rapid Transit Co. to occupy those streets.

Besides the opposition of a legal nature that will probably be made by the Union Traction and the Johnson interests, it seems probable that there will be a fight by property owners against the occupying of Diamond St. by railway tracks, the land for a part of that thoroughfare to the park having been dedicated with the understanding that no tracks should ever be laid upon it.

Mr. John Wanamaker made an offer to the city of \$2,500,000 for these franchises. Again on June 21st an offer of \$3,000,000 cash, was made by him by letters addressed both to Mr. Foerderer and Mayor Ashbridge. Mr. Wanamaker stipulated also that he would charge only 3 cents fare during the heavy morning and evening traffic. His offer provided that \$2,500,000 of the consideration should go to the city, and be used for harbor improvements and public schools. He proposes to give the franchise-holders a bonus of \$500,000 for the privileges.

Mr. Foerderer subsequently made a statement in which he practically pledged the companies to 3-cent fares if it could be demonstrated that dividends can be earned with fares at that low figure. Mr. Foerderer criticised Mr. Wanamaker's motive in offering \$2,500,000 for the franchises, and says his offer was merely an advertising scheme.

Among the charters granted under the Focht-Emery laws in other parts of the state is one for the Central Rapid Transit Co., of Pittsburgh, for a partly underground and partly elevated road to the East End. The capital stock is \$212,500, and the incorporators are: Thomas S. Bigelow, Henry W. Oliver, George T. Oliver and Thomas J. Crump of Pittsburgh, and Richard R. Quay, of Sewickley.

Charters were also granted to the Camp Hill & Harrisburg Street Railway Co., with a capital of \$21,000, to build a line from Camp Hill to Harrisburg; president, M. C. Kennedy.

The Sharon & New Castle Street Railway Co., capital stock, \$120,000, to build one mile of road in New Castle. The incorporators are Francis S. Guthrie, Nelson E. Young and F. W. Roberts, Pittsburg; W. C. Brown, Oakmount, and William M. Wherry, jr., New York.

The New Bedford & State Line Street Railway Co., New Bedford, capital, \$12,000.

The Mellon Brothers of Pittsburg, who are heavily interested in street railways in the Monongahela Valley, have filed application for charters for several surface roads in that locality.

June 20th two bills supplemental to the above were signed by the governor. One of them constitutes the governor, secretary of state and attorney general a board to pass on future applications for rapid transit charters, and the other removes ambiguity from the original bill by providing that under one charter either an elevated or an underground road, or both, or one partly elevated and partly underground, may be constructed.

### CANTON-AKRON RY.

The Canton-Akron Railway Co., which has its general offices in the Folwell Bldg., Canton, O., is rapidly pushing the construction of its line, the work being under the direction of the L. E. Myers Co., of Chicago, Thomas Dorwin, superintendent. There are about 80 teams at work and the grading and structures for 12 miles were completed July 1st.

Girder rails for the loop in Canton are all on the ground and delivered. The ties are arriving and being distributed along the line. Twenty-three cars of 70-lb. T-rails were received the latter part of June. All material such as rails, ties, spikes, angle bars, etc., will be distributed from Canton by means of a locomotive and flat cars. The pole lines are being erected under the direction of Mr. John F. Scott, who has charge of the electric overhead work.

The power house and car barns will be located at Mimishillen Creek where the company has bought a tract of ten acres. Coal is close at hand and can be delivered to the furnaces at 80 cents per ton. The Myers company has contracted for the machinery. The Allis-Chalmers Co. will furnish two cross compound corliss engines of 750 h. p. each.

### STANDARDS.

Mr. T. E. Crossman, 1829 Park Row Bldg., New York, who is the secretary of the committee on Standards of the A. S. R. A., has made the following announcement concerning the plans of the committee:

A meeting was held at Niagara Falls in June for the purpose of mapping out the preliminary work. An abundance of material, which had been gathered by the secretary, was placed before the committee for consideration. It was apparent, from the data in the hands of the committee, that both street railway operators and manufacturers of street railway appliances are much interested in the work of standardizing street railway equipment. It was decided that the best results could be obtained by apportioning the work among the members of the committee, each member to act as a subcommittee on certain parts of the work assigned to him, with power to incur reasonable expense in the preparation of plans and specification, and to report at the next meeting of the committee. The following assignments were made:

To consider two forms of rail, the T-rail and a grooved girder rail, each with a modified form of head; to consider two forms of wheels, one a cast chilled wheel, with either spokes or plate center, the other a steel tired wheel, with either spokes or plate center, tread and flange of wheel to conform to the rail to be recommended; to consider the wearing parts of trucks, the center bearing swing bolster for double trucks to be recommended; to consider a standard for axles, journals, journal brasses, oil boxes and brake-heads such as will fit the trucks of different makers, Col. N. H. Heft, Meriden, Conn.

To consider electric motors with a view to standardizing all parts of the motor, including suspension, lead wires with connector boxes and ventilation, Mr. W. J. Hield, Minneapolis, Minn.

To consider single truck and double truck car bodies, including open cars, in order to determine wherein such cars can be stand-

ardized to meet the requirements of various conditions of operation, with due regard to proper ventilation, Mr. John R. Graham, Boston, Mass.

To consider the standardizing of overhead material as far as practicable along the following lines: trolley wire, trolley wheels, trolley ears, trolley hangers, span wires, pull-off wires, section insulators, cut-outs, overhead frogs and switches, lightning arresters and all parts that go to make up the overhead system, Mr. C. F. Holmes, Kansas City, Mo.

The secretary of the committee requests that all parties interested in these subjects will send him any communications they are desirous of having presented to the committee.

### SPECIFICATIONS FOR CEDAR POLES.

Mr. T. E. Mitten, general superintendent of the International Traction Co., of Buffalo, suggests the following specifications for cedar poles:

All poles to be cut of white live cedar, peeled, sound at top and not more than 15 per cent rot at butt; base area to taper gradually and be free from large knots; a crook of  $\frac{3}{4}$  in. to 5 ft. in length will be allowed.

Poles must be free from wind twists and large cracks, and measure as follows:

Length.	At Top.	6 ft. from butt.
12 ft.....	4 in.....	7 in.
20 ft.....	5 in.....	8 in.
25 ft.....	6 in.....	10 in.
30 ft.....	8 in.....	14 in.
35 ft.....	7 in.....	14 in.
40 ft.....	7 in.....	15 in.
45 ft.....	7 in.....	16 in.
50 ft.....	7 in.....	17 in.
55 ft.....	7 in.....	18 in.
60 ft.....	7 in.....	20 in.
65 ft.....	7 in.....	20 in.
70 ft.....	7 in.....	21 in.

### NEW PLANT FOR STURTEVANT COMPANY.

After a most careful consideration of sites the B. F. Sturtevant Co. has recently completed the purchase at Hyde Park, Mass., of a tract of land containing some 15 acres and is preparing plans for the erection thereon of a large up-to-date plant for the manufacture of blowers, engines, motors, forges, heating apparatus, etc. This purchase, although hastened by the recent fire which damaged the works at Jamaica Plain, Mass., and which will be eventually abandoned, is the natural outcome of the rapid growth of this concern during the past few years and of the congested condition of the present plant, in which increased facilities could not be advantageously provided. The new site is on the same railroad line, the N. Y., N. H. & H. R. R., only five miles from the old plant and less than ten miles from Boston. It is admirably located; 1,300 ft. along one side abut upon the railroad with all desired switching facilities, an ample stream of water marks the boundary on another side, a noted spring of remarkable purity is within the area, the high ground which is practically on a level with the tracks will accommodate buildings having a floor area of 750,000 sq. ft., ample for all needs of the immediate future, the lower land furnishes abundant area for dumping. The new plant will be arranged to reduce to a minimum the labor cost of handling material, and will provide for its direct progress through the shop from foundry to shipping room. It will be equipped throughout with new modern tools and labor saving devices.

The Granite City & Edwardsville (Ill.) Electric Ry. was under construction from Venice to Horseshoe Lake when a dispute arose over the matter of the electric line's crossing the Clover Leaf and the Chicago, Peoria & St. Louis Ry. tracks. Four locomotives on the steam lines were made to perform the duty of patrol, effectually preventing the construction of a grade crossing for the electric line. The Chicago, Peoria & St. Louis Ry. at length procured an injunction restraining the promoters of the electric line from crossing its tracks.



### LUNDELL GENERATORS.

The Lundell split pole generator, so named because of the peculiar construction of the pole pieces, was a decided advance in the manufacture of dynamos introduced a few years ago by the Sprague Electric Co. This ingenious invention for overcoming the distorting effect on the field by the current in the armature has



SPLIT-POLE WITH WINDINGS.

proved very successful in practice and the makers are now designing the split pole machine in sizes up to 1,000 kw.

Various attempts have been made to so construct machines that the position of the commutation shall not be changed owing to the distorting effect of the current in the armature, and some of the remedies employed are exceedingly complicated and expensive. The polepiece is divided into two parts of about equal section wound with the same coils of wire for exciting. One of these parts has a large polar extension so that the area of armature opposed

smaller polar extension has its magnetism much more largely increased; the result being the distortion of the field is effectively diminished, and can be so arranged that the point of commutation is not materially altered. This device in actual practice successfully avoids the necessity of shifting the brushes, and is claimed to be the simplest expedient which has yet been proposed to attain this desirable end. It not only completely remedies this difficulty, but at the same time permits of a realization of the logical advantage of a fixed point of commutation, viz., a general reduction of total weight, dimensions, etc.

The poles are built up from sheet-iron punchings and are so designed that they may readily be turned around in case it should be desired to run the armature in the other direction. The split-pole generator is capable of withstanding sudden violent changes of load without detrimental sparking and without material change of potential.

Not only are these generators of the highest type of design, but the labor and material used in their construction are first-class in every respect, and they are finished in an attractive style. The remarkable endurance of the apparatus under the most exacting conditions of practical use in all classes of current generation gives them a very high commercial value.

### CORROSION OF IRON DUE TO ELECTRICITY.

An experimental study of the corrosion of iron under various conditions was recently made by Mr. Carl Hambuechen, B. Sc., at the University of Wisconsin and his experiments seem to point to the conclusion that all corrosion of iron is due to electrolytic action, as it has been determined that the conditions necessary to corrosion are the same as the conditions which are necessary for electrolytic action.

The conditions of electrolytic corrosion are (1) two or more conducting substances in contact with an electrolyte, (2) a difference of electrical potential set up between such bodies and (3) connection between the conducting substances furnishing a path for the flow of current.

These conditions are all found to be coexistent with the corrosion of iron. The electrolyte consists of moisture, which may be in contact with the iron body. It is known that iron in dry air will not rust, this being due presumably to lack of an electrolyte.

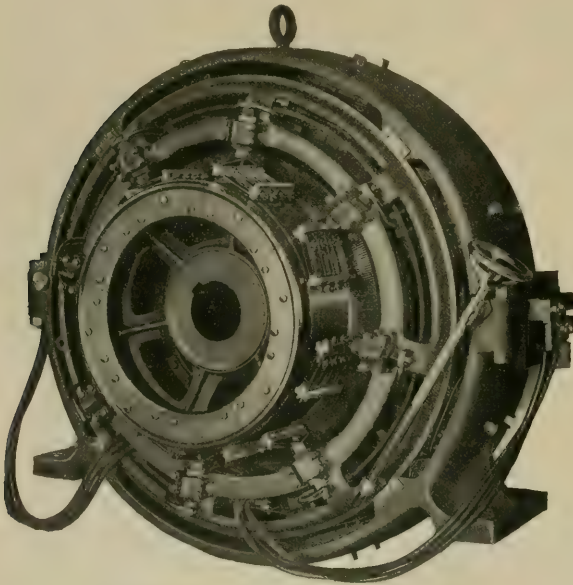
The difference of potential may be set up in various ways. The iron which is never absolutely pure, may have in electrical contact on its surface foreign materials such as particles of carbon, graphite, various metals, and some metallic oxides which will conduct. Each of these substances sets up an electric potential peculiar to itself when immersed in an electrolyte, and as these potentials are different for different substances, differences of potential exist between the particles of the various foreign substances and the iron. These differently charged bodies being in contact, a flow of electricity is set up, the circuit being completed through the electrolyte. An electric current thus set up, flowing from the iron to the electrolyte, causes the eating away of the iron.

There may be metals in contact with iron which instead of promoting, will actually prevent corrosion of the iron by reversing the direction of the flow of current.

Cast iron plates 3 in. in diameter and  $\frac{3}{4}$  in. thick were polished on one face by a fine emery wheel and the remaining surface was lacquered. In the center of the polished surface a hole  $\frac{5}{8}$  in. in diameter was drilled, and plugs of either copper, zinc, lead or carbon were firmly inserted. The specimens were then placed in sand, saturated with a solution of ammonia chloride. After an exposure of one month the specimens were examined and it was found that the polished iron surface had been

badly corroded excepting in the case where the zinc plug had been inserted, the surface here having its original bright appearance.

The reason for this difference is that in each case with the one exception, the current flows from the iron to the solution, as explained above, and the iron is corroded, while in the exceptional case where the zinc plug was used the direction of the current



LUNDELL ENGINE TYPE SPLIT-POLE GENERATOR.  
No. 200 Frame. 200 Kw. 200 r. p. m.

to it is considerable. The other part has a smaller extension. The result is that a comparatively small current will fully magnetize the part with the larger polar extension, but will not fully magnetize the part with the smaller polar extension. On increasing the current the part with the larger polar extension has its magnetism increased to a moderate extent only, while the part with the



is from the solution to the iron, and corrosion, therefore, does not take place.

In general it may be stated that any substance in contact with iron which, in the electro-chemical series is more electro-positive than iron, will tend to protect it, while the more electro-negative substances will promote the corrosion of the iron. Among the former substances are: magnesium, aluminum, zinc, and cadmium, and among the latter: lead, antimony, tin, copper, silver, carbon, some of the metallic oxides, etc.

It has been found that other factors influence the rate of corrosion, such as the difference in the physical character of different parts of the same piece of iron, such differences being caused by differences in temperature, variations in homogeneity, and differences in strain to which the metal has been subjected.

The peculiar changes which cast iron undergoes when acting as the anode are worthy of note. If the current density is not excessive, the iron may not undergo any material change in appearance, even though subjected to the action of the current for a long time. But, although the general form and outward appearance may remain the same, the fact that its structure has been materially altered may be readily shown by cutting or scraping it with a knife. It will be found to be softened to a certain depth, and the material which may be removed by scraping has the appearance of fine iron filings and graphite.

Some particular cases of corrosion are explained by this hypothesis for which hitherto no good reason has been offered.

### RELATIVE COST OF CONDUIT AND TROLLEY SYSTEMS.

The report of Mr. E. Manville, consulting engineer, to the Leicester (England) corporation, contains some figures on the relative cost of overhead and conduit systems. In addition to the overhead and open conduit systems on which estimates are made Mr. Manville reported specifically upon several systems of closed conduits at the request of the local railway committee. Two of these—the British Schuckert and the Union—have been applied to a limited extent on the Continent, though not on a large scale; probably the most notable feature in both these systems is that the apparatus which makes the surface contacts alive is not placed beneath the roadway, but in chambers placed at the side of the track. Though this is an advantage in a sense, it is not the most important essential in such a system, because in the original Westinghouse and the Claret-Veuilleumier systems the actuating devices were placed in boxes which were quite independent of the track. The Dolter and the Lane systems are based on the principle of the actuating magnets which operate the switches being carried on the cars, the latter bearing a striking resemblance to the Lineff system, which was experimented with some years ago on the London United Tramways, now wholly given over to the overhead wire. The Lane system is, however, new in the fact that it consists of a gas-tight metallic conduit, in which is contained a flexible magnetic conductor resting in its normal position upon insulators. Underneath the car is carried a short collector, which can be magnetised by coils permanently fixed under the car, and when thus magnetised the flexible conductor in the closed conduit would be attracted so as to make connection with the contact studs over which the car happened to be passing. In this system it is necessary that the stud contact-plates should be placed at distance of about 8 in. apart. While such a system may have much to recommend it on the grounds of simplicity, the fact that it has not been employed on a practical scale places it out of court as far as a municipality is concerned. Some reference is made in the report to the working of the Diatto surface-contact system in Paris, and the results are not such as to recommend its use in its present method of construction. From June 15, 1900, to February last there were no fewer than 120 accidents, in consequence of which certain regulations have been imposed on the tramway companies with regard to its construction and operation.

Mr. Manville concludes that any closed conduit or surface contact system, however theoretically attractive, would be an experiment, the burden of demonstrating which would be liable to result in a waste of money. With the systems narrowed down to the overhead and the open conduit types the following estimates on the cost of each is given:

#### Conduit System.

Cost of constructing 9 miles of single line of tramway complete, including conduit, together with the electrical equipment therein, and allowing for the points and crossings at junctions, but exclusive of feeders, £97,077, or £10,786 per mile.

Cost of constructing 19½ miles of double line of tramway complete, including conduit, together with the electrical equipment therein, and allowing for the points and crossings, and also a sufficient number of cross-over roads, but exclusive of feeders, £447,342, or £22,941 per mile.

Adding 10 per cent. for engineering and contingencies, the total cost is £598,861.

Estimated cost of alterations to water mains, sewers, manholes, hydrants, bridges, etc. (but exclusive of alterations to the two Midland main line bridges at London-road and Welford-road), as estimated by the borough and water engineers, say £46,064.

Total cost, £644,925.

#### Overhead Trolley System.

Cost of constructing 9 miles of single line of tramway complete, including points and crossings, bonding and overhead electrical trolley equipment, but exclusive of feeders, £54,711, or £6,079 per mile.

Cost of constructing 19½ miles of double line of tramway complete, including points and crossings, cross-over roads, bonding and overhead electrical trolley equipment, but exclusive of feeders, £217,385, or £11,148 per mile.

Adding 10 per cent. for engineering and contingencies, the total is £299,306.

Difference in cost on the complete system between overhead and conduit systems, exclusive of feeders, £345,619.

### THE STOPPING PROBLEM.

From the number of accidents occurring on street railway lines it would seem that the matter of stopping a motor car quickly and smoothly is still troublesome in some quarters. There appears to be no good reason why this should be so because there are plenty of good brakes to be had.

The well known Sterling brake has been in use for six years and during this period has been put in service on many large roads where it has given great satisfaction. Some of the managers who have given the brake question careful consideration express the belief that there is a distinct advantage in having a brake with which the motorman at the handle "can feel the shoe on the wheel," as it is found that the motorman will operate such a brake instinctively, just as a bicyclist manages the handle bar of his machine.

The Sterling-Meaker Co. takes much pains to assist its customers in properly adjusting the brakes when first applied, which is a very important point if satisfactory results are to be expected. The company invites the severest tests in practice and will also be glad to furnish references, blue prints and full information on request.

### PROPOSED CONSOLIDATION IN OMAHA.

A plan is now under discussion for consolidating the street railway, water, gas and electric companies of Omaha, Neb., but nothing definite has been decided, at least so far as the street railways are concerned. The plan is said to include cutting a canal to the Platte River and developing a water power at a point 40 miles from Omaha, transmitting electric current to the city.

### WAGES RAISED AT CLEVELAND.

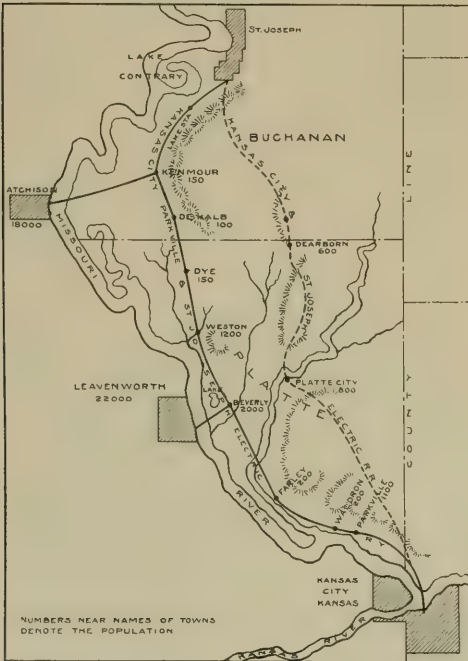
June 26th Mr. Ira A. McCormack, general manager of the Cleveland Electric Railway Co., issued the following notice to motormen and conductors:

"The board of directors recognizing the loyal support and interest of its conductors and motormen in the welfare and prosperity of the company shown by the reduction of accidents, damage to cars and property, have voluntarily ordered an increase in pay, effective July 1, 1901, as follows: First year men, 18 cents per hour; second year men, 20 cents per hour; all over two years, 21 cents per hour."

### KANSAS CITY, PARKVILLE & ST. JOSEPH ELECTRIC R. R.

Some time ago Messrs. Denison, Prior & Co., bankers, of Boston and Cleveland, organized the Kansas City, Parkville & St. Joseph Electric Railway Co. for the purpose of building a line between Kansas City and St. Joseph, Mo. By courtesy of Messrs. J. L. Brown & Co., of Kansas City, who represent Denison, Prior & Co., we have received a map showing the proposed route, and also the proposed line of the Kansas City & St. Joseph Electric Railroad Co., which was mentioned in our issue for January, 1901, page 55.

It will be noted that the route for the Kansas City, Parkville & St. Joseph passes through a more thickly settled territory and also that it lies nearer the river, this location having been chosen with a view to securing easy grades and thus reducing the expense for power and maintenance. The towns on this road exclusive of the terminals are: Parkville, 1,100 population; Waldron, 200; Farley, 200; Beverly, 2,000; Weston, 1,200; Dye, 150; De Kalb, 100, and Kenmours, 150 population. The power house will be located near the Beverly coal mines, so that fuel can be furnished direct from the shafts. The line will have a station at Lake Contrary, which



MAP OF KANSAS CITY - ST. JOSEPH ROADS.

is one of the most attractive lakes in the west, and thus will be assured of a good traffic between the Kansas City and that resort.

The company has already secured by purchase and gift a private right of way over almost seven-eighths of the route, has franchises through all the towns, and has made arrangements with the St. Joseph Street Ry. to use that company's tracks for entrance to St. Joseph. The company is now only waiting for the county courts of Buchanan and Platte Counties to grant permission to construct the line across county roads; just so soon as these franchises shall be granted the work of construction will be commenced. The designing of the bridges has been placed with Wadell & Herrich, consulting engineers, of Kansas City.

The officers of the Kansas City, Parkville & St. Joseph Electric Ry. are: President, George W. York; treasurer, George B. Denison; secretary, N. B. Hasbrock.

July 1st a dispatch from St. Joseph, Mo., stated: "The Kansas City & St. Joseph Electric Railway Co. today filed a plat of its route through Buchanan county with the County Court. The bond of the company for \$20,000 for the fulfillment of the term of the franchise granted to the company by the County Court was filed late this afternoon."

Messrs. J. L. Brown & Co. have sent in the following explanation in order that contractors who contemplate bidding on the work may make no mistake in regard to the matter. The bond was not given as a guarantee to construct any railway, but as a guarantee that in the event of constructing a railway or laying tracks on what is known as the King Hill road, the company will macadamize same within a period of 18 months thereafter. The bond is thus only binding at the option of the company.

### PURCHASE OF SAN FRANCISCO AND SAN MATEO LINE.

The San Francisco & San Mateo Electric Ry. has recently been purchased by a syndicate of Baltimore capitalists who have elected directors for the road as follows: Josiah L. Blackwell, George R. Webb, S. W. Huff, C. Murdock and G. E. Starr, all of Baltimore. Mr. Blackwell was elected president, Mr. Webb vice-president, Mr. Huff general manager and Mr. Starr secretary and treasurer. The directors decided to start work at once on the proposed extension to San Mateo. The material is on the way and work was commenced about July 1st. The extension must be completed by the terms of the franchise before July 1, 1902.

### SYRACUSE-UTICA INTERURBAN.

An injunction preventing the Auburn Interurban Electric Railroad Co. from extending its lines from Skaneateles to Syracuse, which was obtained on the petition of the New York Central, was dismissed by Justice Andrews in Syracuse last month. The justice holds that the New York Central has no property rights involved, even should such extension be made, and that the power of the State Railroad Commission in the premises is an open question. The interurban, it is understood, will soon extend its line now running from Auburn to Skaneateles on to Syracuse, while the existing trolley lines will be extended to give an unbroken line from Syracuse to Utica.

The decision questions the right of the State Railroad Commission to grant permits.

### RIOTS DUE TO INCREASED FARES.

Serious riots took place in Rio de Janeiro, Brazil, last month on account of an increase in street car fares on the Sao Christevar Street Railway. A mob set fire to a number of the company's cars and tore up the rails. Cavalry charged the rioters wounding many and killing one man. Onvinder St. a prominent business thoroughfare was barricaded and the business houses were all closed. The rioting continued for several days.

### SUNDAY EXCURSIONS CANCELLED.

The Chicago, Milwaukee & St. Paul Ry. has cancelled the rest of the Sunday excursions scheduled for Sioux City this summer owing to an impression which has been created by an association of ministers that these excursions were abnoxious to the business men of the city. Pres. Joseph S. Lawrence of the Sioux City Traction Co. has stated that this action on the part of the C., M. & St. P. will cause a loss of from \$7,000 to \$10,000 to his company. Mr. Lawrence recently visited Chicago to confer with the officials of the railroad in regard to the Sunday excursions, which he asserts are not opposed by the business men of the city.

The San Bernardino (Cal.) Traction Co. is making rapid progress toward the completion of its new belt line. At a recent meeting of stockholders the following officers were elected: Henry Fisher, president; A. C. Denman, vice-president; Henry B. Ely, secretary, and Edward S. Graham, treasurer.

## IMPROVEMENTS AT DANVILLE, ILL.

The Danville Street Railway & Light Co. operates the street railway, the gas and electric lighting plants and the steam heating plant in Danville, Ill., is also interested in a project to build an electric interurban line from Danville to Georgetown, a distance of 10 miles. The interurban company is the Danville, Paxton & Northern Ry., of which Mr. A. C. Daniel, who was largely interested in the Danville company, is president. Material for completing the interurban line to Westville, six miles, has been bought. The rails are 60-lb. T section in 30 ft. lengths, and will be laid on 6 x 8 in. oak ties; the Ohio Brass Co. will furnish the overhead material. There are a number of bridges which will have to be built, the most important being a double track bridge in Danville. The interurban has a private right of way consisting of 32 ft. of a 100-ft. right of way now owned by the Danville, Paxton & Northern company chartered about two years ago to build a coal road through this territory.

The Danville Street Railway & Light Co. is contemplating double tracking about two miles of the main line through the city and building some short extensions which will bring the total up to 14 miles of track, of which five miles will be double track. Important changes are now being made at the power house, and two 450-h. p. Geary water tube boilers made by the Oil City Boiler



S. L. NELSON.

Works, Oil City, Pa., and Green traveling link grates, made by the Green Engineering Co., Chicago, are now being installed; later this equipment is to be duplicated.

The present engine equipment comprises six high speed automatic shaft governing engines and two Buckeye engines, which latter have 20 x 30 and 26½ x 36 in. cylinders, respectively. The two large engines and two of the small engines will be retained and a new Hamilton-Corliss heavy duty engine, 28 x 48 in. cylinder installed, replacing the smaller engines. The equipment will then be as follows: One 300-kw. direct current G. E. generator direct connected to the Hamilton-Corliss engine for carrying the railway load (this generator will replace three M. P. 80 machines now used); this engine will have a pulley mounted outside the out-board bearing which will drive a 110-kw. G. E. 500-volt generator for the commercial power circuit (it is the intention, in case the power load increases as expected to replace the pulley by a clutch which will drive a 150-kw. generator). Two S. K. C. alternators, 250-kw. and 300-kw., for the incandescent load; one 75-kw. Ft. Wayne alternator for the day load at the Soldiers' Home; two "Excelsior" arc machines and one Ft. Wayne machine for commercial arc lighting; these will be driven from the Buckeye engines. Two No. 13 Brush machines for city lighting driven by Ideal engines; the city lamps are now being changed from the open to the enclosed type.

The company supplies steam heat to 150 customers, using the American District Steam Co.'s system of distribution, and will spend \$15,000 in extending the steam heating mains.

The Danville properties were purchased by the McKinley syndicate in July, 1900, possession being taken October 1st. For the first five months of 1901 the increase in the business of the company, in-

cluding all departments, was 22 per cent. There are 15,000 incandescent lamps, 240 city arc lamps, and 150 private arc lamps supplied.

One of the best paying street railway lines is that running to the National Soldiers' Home, about 2½ miles from the center of Danville. The company has built a handsome station at the home. It is a building 20 x 40 ft., of red pressed brick and Bedford stone, with a tile roof projecting 8 ft. on all sides. Inside there are two rooms separated by a narrow passageway which is occupied by a news stand and candy booth, the proprietor taking care of the station in consideration of being allowed his booth rent free.

The rolling stock has recently been increased by ten 9-bench open cars built by the Brownell Car Co.; six are mounted on Peckham and four on McGuire trucks. The motors are G. E. 54.

The officers and staff of the Danville Street Railway & Light Co. are: President, W. P. Cannon; vice-president, George F. Duncan; treasurer, Edward Woodman; secretary, W. B. McKinley; manager, S. L. Nelson; engineer, L. E. Fischer; superintendent street railway, Michael Conner; superintendent lighting, O. J. Penwell; superintendent gas department, W. A. Mires; auditor, L. W. Johnson.

Mr. S. L. Nelson, the manager of the companies at Danville and at Wichita, Kan., has for years been closely identified with the McKinley properties, which now include the electric lighting and street railway companies at Wichita, Kan., and Quincy, Champaign and Danville, Ill., and the electric lighting plants at Peoria, Decatur, Galesburg and Kewanee, Ill., and Michigan City, Ind. Since last October Mr. Nelson has been dividing his time between Wichita and Danville; as evidence of his good work at Wichita it may be said that the receipts for last year were about twice what they were in 1899, and this year are again doubled as compared with 1900. Mr. Nelson was born on a farm near Hicksville, O., June 23, 1859. In 1874 he learned telegraphy; in 1875 he began work with a construction gang on the Baltimore & Ohio and worked up to an operator's position. In 1881 he went with the Illinois Central as train dispatcher at Champaign; the next year he went into telephone work at Champaign, going to Springfield, Ill., in 1884 and later to Dayton, O., returning to Champaign in April, 1885, as superintendent of the water works and electric light plant for Mr. McKinley. Since 1885 Mr. Nelson has been engaged with the McKinley interests at Champaign; Defiance and Springfield, O.; Bay City, Mich.; Port Jervis, N. Y.; Joliet, Quincy, Peoria and Danville, Ill., and Wichita, Kan.

## VICTORIA HOTEL FOR THE CONVENTION.

Street railway and supply men who are planning to attend the forthcoming convention of the American Street Railway Association at New York in October, will find very satisfactory accommodations at the Hotel Victoria, Broadway and 27th St., New York. This is one of New York's leading hotels and as it is situated but two blocks from Madison Square Garden, the convention's business headquarters, it will be more desirable in a number of ways than any one of the hotels farther up town.

The regular rates will be maintained and the Victoria management promises to do all in its power to make the stay of the convention delegates a pleasant one while they are in New York. The Victoria has for some time been very popular with the street railway trade and has come to be known as a sort of supply men's headquarters. As the Broadway hotels are usually crowded during the fall season, it will be well for intending visitors to engage rooms at the Victoria as early as possible.

An objection was recently made to the Southfield Beach Railroad Co.'s building an electric line between South and Midland beaches, on Staten Island, on the ground that the company held no franchise or consent along that route; the construction crew was placed under arrest for obstructing a public highway, and two representatives of the Highways Department and five police were detailed to guard the disputed territory. The following morning, however, the contractor produced copies of a temporary injunction which restrained the officers of the city of New York, the Highways Department and the Police Department from interfering, and the work on the line was resumed without further interruption.



### SUSPENSION RAILWAY AT LOSCHWITZ, SAXONY.

The following information is furnished the State Department by Mr. Charles L. Cole, United States Consul General at Dresden:

This new railway was opened to traffic on May 6 and is, I am informed, the first mountain railway of its kind for the conveyance of passengers in the world. It runs from Loschwitz, a village on the banks of the River Elbe about five miles from Dresden, to the top of the Rochwitz heights, which command a most beautiful view of the Saxon capital. The railway is 250 meters (820 ft.) long, with a gradient of 32 per cent, and is constructed according to the "Langen" system. Thirty-three iron piers of different height, weighing about 300 tons, the highest being 15 meters (49.2 ft.), carry the rails on which the cars are hung.

Each car holds 50 passengers, and weighs, when occupied, 12.8 tons. Their shape and construction differs entirely from all other railway cars, and even from those used by the Barmen-Elberfeld suspension railway. A steel cable 44 millimeters (1.7 in.) in diameter connects the two trains and locks them firmly together. It is



LOSCHWITZ MOUNTAIN RY.

operated by two machines of 80 h. p. each, stationed at the top terminus of the road. Particular attention and care has been given to devices to insure the safety of the passengers and to regulate the running of the cars. A most ingenious signal system—with visible and audible signals—serves to regulate the arrival and departure of the trains, and is operated from both the lower and upper stations. Each car is provided with a danger-signal apparatus, consisting of an alarm and a telephone, which enables the conductor to communicate from any point of the road with the engine house. The car is provided with three brakes—system Bucher-Dürer—two of which work automatically at the least slackening of the tension of the cable and stop the car. The third brake can be operated by hand from the platform of the car. From a hand attached to the disk upon which the cable is rolled, the engineer can always determine the exact position of the cars on the road, and an automatic bell warns him if the train is running too fast.

The greatest safety consists in an automatic brake, both at the lower and the top station, which is put into action by the arriving car and stops it, no matter how careless the engineer may be.

The fare is 20 pfennigs (4.76 cents) up and 10 pfennigs (2.38 cents) down; return ticket, 25 pfennigs (5.95 cents). Reduced rates are allowed institutions, societies, school children, laborers, etc. The

journey takes three minutes, and 15,500 passengers can be carried each way per day, or a total of 31,000.

The iron work and cars were supplied and the construction superintended by the Maschinenbauactengesellschaft, Nuremberg, Bavaria, and the road is the property of the "Elektra" Aktiengesellschaft, Dresden.

The accompanying illustration gives a good view of the new suspension railway.

### CONTRACTS BETWEEN INDIANAPOLIS AND INTERURBAN ELECTRIC RAILWAYS ENTERING THE CITY.

The Board of Public Works of the city of Indianapolis has entered into franchise contracts with the various companies operating electric interurban railways having the city as a terminus. These contracts are not effective until ratified by the city council. The companies with which the board has made agreements are the Union Traction Co. of Indiana, the Indianapolis & Greenfield Rapid Transit Co., and the Indianapolis, Greenwood & Franklin Railroad Co.

The provisions of the contract are as follows:

The city grants the interurban company the right to run over certain lines of the Indianapolis Street Ry. (arrangements with the city company having been made by the interurban company for use of tracks, power, etc.), provided that the exact route may be changed at any time after July 1, 1907, upon these conditions:

1. Interurban cars shall stop at street intersections to take up or put down passengers, but no baggage except hand baggage, nor freight or express shall be taken on board or unloaded at such points.

2. Single fares within the city limits shall be 5 cents, but there shall be no discrimination against Indianapolis in favor of other towns as regards passenger or freight tariffs.

3. The urban cars shall not be interfered with. The city reserves the right to regulate schedules, and it is provided that the company shall run at least one car every two hours between 6 a. m. and 11 p. m.

4. Interurban cars shall not stop, save to avoid accident, at points other than street crossings and the terminal stations or depots of the company.

5. "The said company, party of the second part, may at all times carry on its passenger cars, or in suitable compartments thereof, provided for such purpose, or in express cars of a style and pattern to be approved by the Board of Public Works such baggage belonging to its passengers being transported in such passenger cars, as is usually allowed to be carried by passengers on steam railroad companies' cars, and also the United States mail, and such express matter and merchandise as may be enclosed in boxes, crates and parcels, so as to be easily handled and so as not to be unsightly in appearance or offensive to sight or smell, and also such packages and parcels as are usually carried and delivered by messenger service: Provided, that no live animals (except hunting dogs) shall be carried on any such cars or in any such compartment at any time: and, provided further, that all baggage (other than hand baggage), express matter, parcels, and articles of merchandise carried as aforesaid shall be delivered at the depot or station of said company hereinafter referred to, for distribution, and that in no case shall any such baggage (other than hand baggage) or any express matter, parcels or merchandise be loaded or unloaded in or upon any of the streets, alleys, avenues or public grounds of said city, except at lay-over point: Provided, also, that fowls, properly secured in boxes or coops, may be carried in such cars between the hours of 12:30 a. m. and 4:30 a. m."

6. "The said company, party of the second part, shall not be permitted under any circumstances to transport on its cars through or over the streets, alleys or avenues of such city live animals of any kind, other than hunting dogs, except between the hours of 12:30 a. m. and 4:30 a. m., and as hereinafter provided. Said company shall be permitted to haul and handle freight other than that designated in sections 5 and 7 as hereinafter provided, when it shall have provided and established a freight depot in said city at some point which shall be approved by the Board of Public Works. After having provided and established such depot, the said company may deliver freight, other than live animals, not of a character offensive to sight or smell, into the said depot, where the same may be held

for delivery to any part of said city, or for transfer to steam railroad lines, or to the lines of other suburban or interurban companies, which may be able to transport the same under any ordinance regulating such transportation. Said company shall have the right to carry live horses, mules, swine, cattle or sheep, only between the hours of 12:30 a. m. and 4:30 a. m., and then only over so much of the line of said company as lies between the corporation line of said city and the line of the Belt Railroad. When the line of said company does not cross the line of the said Belt Railroad, then said company shall not haul live animals of the classes last above mentioned in said city."

7. "The said company, party of the second part, shall provide in the central part of said city, at some point to be approved by the Board of Public Works, a depot or station in which baggage, express matter, merchandise in boxes, crates or parcels, garden marketing, dairy products, properly enclosed and secured, hauled or to be hauled in the cars of said company through said city, shall be loaded and unloaded, and for the purpose of reaching its said depot, the right is hereby granted said company to lay its tracks across such streets, alleys or sidewalks, under the direction of the Board of Public Works, as may be necessary to run from its main line to said depot. Any such depot shall be kept clean and free from all noxious odors, and shall at all times be under the supervision of the Board of Health of said city, for the purpose of making and enforcing all necessary regulations to insure the cleanliness of the same: Provided, however, that until the 1st day of January, 1902, said company, for the purpose of loading and unloading its cars, shall have the right, by first securing the consent of the Indianapolis Street Railway Co., to stand said cars upon some line of "dead track" of said Indianapolis Street Railway Co.: Provided, that the selection of such "dead track" shall be first approved by the said Board of Public Works: and, provided further, that such cars shall not be allowed to stand more than fifteen minutes at any one time in loading or unloading.

"The right is hereby expressly reserved by the Board of Public Works and Common Council of said city, to regulate by order or ordinance the carrying of freight, baggage or merchandise, or property of any kind through the streets, alleys and avenues of said city, or if by them deemed necessary to the public health or comfort, or the convenience of public travel in said city, to prohibit the carrying of freight of any or all kinds through any of such streets, alleys and avenues."

8. The power shall be electricity or such other power as the urban company may adopt.

9. The most approved methods of preventing electrolysis shall be adopted.

10. Construction shall be approved by the city engineer.

11. The company shall give good service and shall use and provide cars equipped in the most approved manner.

"In further consideration of the grant herein and hereby made, the said company, party of the second part, agrees and binds itself to pay to the said city on the 1st day of January, 1902, and annually thereafter during the first seven years of this franchise, the sum of 3 cents per round trip for each and every round trip made by any car of said company over the streets of said city, during the year preceding said date; and thereafter annually during the next 10 years the sum of 4 cents per round trip for each and every round trip made by any car of said company over the streets of said city during the preceding year; and for the balance of said period for which said franchise is granted, said party of the second part agrees and binds itself to pay as aforesaid the sum of 8 cents per round trip for each and every car as above described.

"The president of said company, or other executive officer thereof, shall at the time of such payment, file with the city comptroller a sworn statement as to the total number of round trips made by each car aforesaid within such city during the year or period preceding.

"This contract shall take effect and be in force from and after the date of its approval and ratification by an ordinance of the Common Council, until the 7th day of April, 1933."

The contract may not be assigned without the consent of the city. The interurban company shall not permit cars owned by other persons or corporations to operate under this agreement until the consent of the city shall be obtained and compensation to the Indianapolis Street Ry. agreed upon or fixed by the proper court.

12. The interurban company shall give a bond in the sum of \$10,000.

We are indebted to Mr. C. H. Spencer, secretary of the Board of Public Works, for copies of this contract.

## CONSOLIDATION AT BIRMINGHAM, ALA.

A consolidation of the Birmingham Gas Co. and the Consolidated Electric Light Co. with the Birmingham Railway, Light & Power Co., of Birmingham, Ala., has recently been effected. Robert Jamison succeeds Col. A. M. Shook as president of the company. The board of directors is as follows:

T. T. Hillman, H. M. Atkinson, B. F. Roden, R. H. Pearson, N. E. Barker, William A. Walker, Gordon Abbott, Nat. Baxter, jr., A. T. Loundon, William H. Kettig, G. B. McCormack, J. K. Newman, M. V. Joseph, Robert Jamison and Col. A. M. Shook. The organization of the board is entirely local with the exception of Messrs Abbott, Atkinson and Newman. The old Colony Trust Co. is the financial agent and trustee of the bonds to be issued. The sum of \$1,000,000 has been set aside for the improvement of the properties upon which work will be commenced at once.

The Birmingham Railway, Light & Power Co. was one of the first railroads to adopt the suggestion of the "Street Railway Review" in regard to park attractions for producing artificial travel. For eight years it has operated a summer theater with highly satisfactory results and this year another park has been opened and the old one has been given a thorough overhauling and beautified in many respects. Myriads of incandescent lights have been distributed all over the grounds among the trees and shrubbery, and besides this merry-go-rounds, "sea waves," electric launches, shoot the chutes and other attractions are to be installed. Already the advantage of these improvements is making itself manifest. The pleasure travel is also being greatly increased by large black type advertisements in the daily papers such as "Take the children for a ride on new Highland Ave. cars," "Go to East Lake where the air is pure. Double track, Fast Schedule," and others.

The company expects to spend \$750,000 in the next six months for rebuilding its tracks and purchasing new and larger cars than it has ever had. It will build a brick barn 250x190 ft., which will have an iron roof and a cement floor to reduce as far as possible the probability of its being destroyed by fire.

A line of two miles in length is being rapidly completed from Ensley to Wylam, a growing suburb of Ensley, and which one day promises to be part of Greater Birmingham. Around the side of Red Mountain two miles of the most picturesque railway line to be seen is being rebuilt. This line is far up on the mountain side and commands a splendid view of the city in the valley beneath. The track will run along a boulevard 100 ft. in width, 30 ft. of which will be occupied by the railway. This boulevard will be sodded with grass and shade trees planted along the edge and will be known as the neutral ground, very similar to the neutral ground of New Orleans.

The company is having eight air brake equipments installed by the Knell Air Brake Co., of Battle Creek, Mich. One was put on for trial several months ago and its service was so satisfactory that others are being added. The cars so equipped will be put on the Ensley division, a line seven miles in length; the cars have already been fitted with air headlights. Ten additional cars, making 20 in all, have been purchased from the Metropolitan Street Railway Co., of Washington, D. C. These cars are 38 ft. long, mounted on double trucks, and are first class in every respect.

Mr. G. H. Davis, of the firm of Ford, Bacon & Davis, with offices in New Orleans and New York, will go to Birmingham as engineer in charge of the improvements. Mr. J. B. McClary will remain in charge as manager of the street railway system, Mr. Timothy Byron as superintendent of the gas company and Mr. J. M. Bradley as superintendent of the electric light plant.

The Clinton (Mass.) Hudson Street Railway Co. employs for the protection of its cars at grade crossings, the services of the railroad gate-keeper, who is paid to go down on the track and signal if it be safe for the car to proceed. By this arrangement safety is assured, and the conductor does not have to leave the platform of his car.



## BALLAST.

Ballast has been defined as the material above the roadbed in which the cross-ties are imbedded, and its importance for the proper maintenance of track is pretty generally conceded and understood, but as to what constitutes the best material and methods of ballasting there is considerable diversity of opinion. The practice in different parts of the country varies very widely as to the material used and the amount of ballast which yields the best results, and there is but little data published on this subject outside of the experiments of several railroads. A committee of the American Railway Engineering & Maintenance of Way Association has had the subject of ballast under consideration for some time, and an attempt is being made to tabulate the experiences of different roads from which some standard practice may be determined. The object of ballast as stated in the committee's report is to secure a solid and uniform bearing for the cross-ties, to distribute the applied load over a large surface of the roadbed, to hold the cross-ties firmly in position, to give elasticity to the track, and to allow water to pass off freely, thus avoiding churning in wet weather and heaving by frost.

While the subject is treated from the standpoint of steam railways many of the same considerations apply to electric railways and especially to long interurban roads using heavy cars.

The consideration of ballast is divided by the committee into five general subdivisions, viz:

1. Material—(a) Stone, size, quality; (b) gravel, cementing, loose, sandy; (c) burnt clay, quality, method of burning, etc.; (d) slag, cinder and burnt shale; (e) shatts, character; (f) earth; (g) dust prevention.

2. Standard cross-sections (variations, modified by material and other conditions).

3. Cost—(a) Material alone; (b) loading; (c) transportation; (d) unloading; (e) placing under track, surfacing and dressing.

4. Methods—(a) Handling material; (b) keeping track of sct and accounts.

5. What constitutes ballasted track.

Ballasting is one of the most important factors in the safe and economical maintenance of railroads and that there is less known about it and less attention given it than is the case with almost any other branch of maintenance of way and structures. Books galore have been written about rails, cross-ties and other track material, about bridges and other railroad structures, and many able engineers have told us how to locate and build our railroads, how to make the cuts, construct the embankments, take care of the drainage, etc., but when it comes to ballasting, they dispose of the whole matter by saying, "The track should have plenty of good ballast to hold it in place and provide for drainage."

In regard to subdivision 1, the following materials have been enumerated by the chairman for the consideration of the committee:

- (a) Stone—size, quality. There exists a wide diversity in practice with regard to the size of broken rock ballast, although the tendency appears to be now in the direction of the smaller sizes.

The question to be decided is, What sizes are best, taking into consideration the various locations and conditions under which the ballast may be used?

The quality of stone should be such as to resist disintegration under tamping or from the effects of the weather. What are the other requirements as to quality?

- (b) Gravel—cementing, loose, sandy. Gravel is perhaps the material more largely used for ballast than any other, occurring, as it does, in large deposits widely distributed, as gravel pits deposited by water in the past, as well as in river and creek bottoms of the present. It is usually readily accessible, cheaply loaded, and with it track can be economically maintained. In considering the economic maintenance of track, the character of the gravel will have to be taken into account. Whether it is cheaper to maintain track on cementing gravel, or on loose or sandy gravel? What is the cost of renewing ties in the different kinds of gravel, as also in the other materials used for ballast? What is the life of ties in the different kinds of ballast? What is the effect of the sand on wear of rail? We might even carry the inquiry outside of the department interested in the maintenance of way, and ask what effect has the sand on the tires of rolling

stock. This may seem, at first sight, a little far-fetched, yet the records of the Louisville & Nashville Railroad for the Mobile & Montgomery division now show an average of 16,000 miles run to 1-16-in. wear of engine tires, whereas formerly 9,000 miles was the average, and the superintendent of machinery attributes the difference to be due to slag ballast having been substituted for sandy gravel ballast. If the tires of an engine are so greatly affected by the use of sandy ballast, what is the effect on other parts of the rolling stock?

- (c) Burnt clay—quality, method of burning, etc. Having had no personal experience with this material, it will be passed with the hope that members who have had such experience will enlighten us. It would seem that where a good natural ballast is readily accessible, an artificial article would not be advisable, and that the distance from nearest coalfield would enter largely into its cost.

- (d) Slag—cinder and burnt shale. The use of slag as ballast is growing in favor. In the South the "hot-pot" slag from the iron furnaces is of particularly good quality for this purpose. The slag is poured from hot pots, run on trucks to the dumping point; it spreads itself in thin layers, which renders it hard and brittle, easily broken to suitable size for ballast. The slag formerly made at these furnaces was of a porous, spongy character, hard to break to the proper size, and with a tendency to cement together again; hence it made poor ballast.

Cinder. Cinder is a waste product on all railroads that run coal-burning engines. It is used by most of them as ballast, if not on their main lines, then in yards and for side tracks. Where the roadbed is soft, excellent results have been obtained from its use.

It is claimed by some that cinder ballast is destructive to both the ties and rail. The experience of the members present in this particular, as well as all others, would be instructive.

- (e) Chatts—character. Chatts are the tailings from lead mills and are about the size of very coarse sand. The lead ore is separated from the quartz rock after being crushed.

Chatts are regarded by some of those who have used them as the ideal ballast, easy to tamp, making the renewal of ties cheap; heavy in weight, hence holding the tie in place; and comparatively free from dust.

- (f) Earth. Earth as ballast has been largely used in this country in the past, and few large railroads can be found at the present time that have not some part of their lines ballasted with earth or "dirt," as it is often called, when it is not designated as "no ballast." If it has happily disappeared from the main lines, it is yet to be found on the branches where light business will not justify more expensive ballast. An interesting question is, How should track ballasted with earth be maintained? In some parts of this country it is customary to crown the earth above the tie in center of track; in other parts of the country it is customary to make top of the clay ballast level with top of tie.

Other materials that have been used for ballast might be mentioned, such as rock screenings for top surface of yards between the tracks, where they present a clean and neat appearance, and render the movements of trainmen easy and safe.

Chert. Chert is also used to ballast branch lines in the South, and is infinitely better than ordinary dirt, though not the equal of rock, slag or the best character of gravel. It is excellent at road crossings.

- (g) Dust prevention. Until recently no serious attempt was made to prevent dust rising from the ballast of track, except by permitting grass to grow over the track; for example, Bermuda grass in the South. Within the past few years oil has been used for this purpose, apparently with success. It is claimed to not only lay the dust, but also to prevent growth of weeds. The eastern roads were the first to adopt it.

In connection with the subject of materials and oiling the roadbed the following extracts of a report read at the convention of the Eastern Maintenance of Way Association, together with a minority report, are of interest. The report signed by Geo. A. De More, states that gravel sprinkled with oil was introduced for the purpose of laying the dust, which it does very effectively, but just what effect oil will have on gravel ballast has not as yet been demonstrated. We are of the opinion that continual oiling, which is necessary to lay dust, will cause gravel to become deadened and lose the qualities gravel should have to maintain good track.



Trap rock, broken to pass through a  $2\frac{1}{2}$ -in. ring, is quite extensively used, and has demonstrated itself as the ballast in every respect, being perfectly dustless, not affected by water and frost, and is maintained as economically as gravel. Therefore this committee would recommend rock ballast 12 in. deep under the ties, on new roadbed, or 6 in. deep on old roadbed (where the track can be raised), as the most economically maintained track and with best results.

The minority report, signed by C. B. Leutell of the committee, takes quite an opposite view. It states: "I can hardly agree with the views of Mr. De More, as he has made up a report altogether from his point of view. With my experience with stone and gravel ballast, I have made up my mind that good gravel is better than stone ballast for the following reasons: (1) Stone ballast makes a very hard riding track. (2) Stone ballast is very expensive to maintain. (3) It is very difficult to keep a good surface on stone ballasted track. The voids between the stones get filled up with cinders, and unless picked or worked over very often will become dusty (perhaps not as much as gravel). I would therefore say that when good gravel can be obtained it should take the preference of broken stone, but as good gravel can be obtained in only a very small part of the country, I should say that stone would make the next best roadbed.

"In regard to oiling track, I will say that it is very efficient for the purpose for which it is used. It lays the dust quite effectively; it prevents in a large measure the growth of weeds, and it also preserves the ties. I am not prepared at the present time to state what effect the oil has on the ballast, as it has been used only about three years. Therefore it is my opinion, as one of the committee, that where good gravel (not sand) can be obtained it should have the preference over stone, and when gravel cannot be had, stone ballast is the next best."

Subdivisions 2, 3 and 4 of this subject have not yet been reported upon by the committee at the last meeting, but the following report was made on subdivision 5, which does not attempt to describe an ideal ballast but simply what the materials must be and do to fulfill the primary requirements:

To be ballast, it must be substantial, so as to distribute the applied load; it must be enduring, to resist as far as possible destruction from tamping; it must be pliable, to diminish the shock and consequent wear of track and trains and permit of easy manipulation in lining and surfacing; and it must, above all things, provide thorough drainage.

Earth or dirt will fulfill none of the above requirements, and we do not think it should be designated ballast; we consider earth or dirt ballast to be a misnomer, and that track put up with it be called earth or dirt track. There is another material used somewhat extensively in the South for ballast, with which your committee is not familiar; that is, chert; we know it is a variety of stone, but do not know enough about it at the present time to be able to say that it makes good ballast. We will, therefore, leave it out of our category for the present, but will gladly add it to the list if any member will show that it can fulfill the requirements. So far, then, as our present knowledge goes, the only materials which will fulfill the requirements are broken stone, gravel, sand, burnt clay, slag, cinder, burnt shale and chatts. The requirements as to quality, size, etc., and the comparative merits of the different materials will be considered later in the report.

The functions of ballast are: To make a solid, yet pliable and uniform, bearing for the cross-ties; to distribute the applied load over a large surface of the roadbed; to hold the cross-ties firmly in position, and to provide drainage.

Now, however limited may be our knowledge of ballasting, there are some things we do know. We know that an inch or two of ballast under the ties and none between them will not hold the ties firmly in position or make a safe and secure track. It would seem, therefore, if we know what will not constitute ballasted track, we ought to come somewhere near defining what will.

In the report of this committee, read at the first annual convention, our chairman said, "Full ballasted track does not mean the same on all lines. It is largely dependent upon climatic conditions, character of material composing the roadbed, weight of rolling stock, the daily number of trains and their character—whether passenger or freight. \* \* \* \* \*

Your committee fully realizes all this and might even add the

purse as one of the governing conditions, and yet it would seem that some minimum might be established, below which track shall not be considered as ballasted. Our opinion is that nothing less than eight inches of ballast under the ties, with the track filled in, will fulfill the requirements even under the best conditions as to roadbed, climate, drainage, etc., and that below this minimum track should be designated as partially ballasted or veneered; partially ballasted, when there is a sufficient depth under the ties but the track is not filled in; and veneered when the track is filled in, giving the appearance of ballast, but with very little under the ties.

To summarize, then, your committee would report as follows on "What Constitutes Ballasted Track."

The term "ballast" shall only apply to broken stone, gravel, sand, burnt clay, slag, cinder, burnt shale and chatts, and the expression "ballasted track" only to filled-in track, with not less than eight inches of ballast under the ties.

The report quotes the following figures of the Interstate Commerce Commission:

"In 1899, \$522,967,896.00 was paid out in wages to the officers and employees of the railroads in the United States. Of this amount, \$79,264,280.00, or a little more than 15 per cent, was paid to trackmen alone. Assuming (and the assumption is not far wrong) that 40 per cent of this amount was paid for lining and surfacing, you have the immense sum of nearly \$32,000,000.00 paid out for labor in keeping up the line and surface. The total expenditures on account of Maintenance-of-Way and Structures in 1899 amounted to \$169,825,054.00, or about \$902.00 per mile of road. Of this, \$32,000,000.00, or \$168.00 per mile of road (or 19 per cent of the total Maintenance-of-Way and Structure expenditures), was on account of line and surface. When we consider how much of this great outlay was probably due to inadequate ballast, we feel that the subject is well worth careful and exhaustive study."

In a report on ballast made by the Interstate Railroad Congress held in Paris in 1900 by Mr. A. Feldpauche, principal assistant engineer of the Pennsylvania R. R., the subject is treated under the following heads: Properties of good ballast, choice to be made between ballasts of different qualities, regard being paid to the character and the heaviness of the traffic, the cost, etc.; effect of the ballast on the condition of the road.

The author holds that good ballast, to deserve that name, should be substantial enough to distribute the stress of passing loads upon the largest area, and it should be enduring. These conditions are best met by the use of hard, conglomerate rock broken to a suitable size, the pieces to be as near the same diameter as possible, varying from  $\frac{3}{4}$  in. to  $2\frac{1}{2}$  in.; the most suitable size is still a matter of debate. The  $\frac{3}{4}$ -in. ballast packs well around the ties, holding the latter in place with less attention from trackmen, has greater elasticity, is easily handled with a shovel, but does not drain as well and is apt to be more dusty. The larger sizes drain better but are difficult and therefore expensive to handle and will not tamp easily.

Broken stone as ballast is better than cinders, gravel or other material because the interlocking of the fragments helps materially to distribute the load into the spaces between the ties. The hard fragments do not break up quickly under tamping and their sharp corners lock with the ties and prevent lateral displacement. The voids between the pieces give excellent drainage and finally a roadbed of broken stone is less dusty than one of cinders or gravel.

Owing to the higher cost of broken stone, gravel is used more extensively for ballast in the United States than any other material. The quality necessarily varies in different localities, and when loam predominates the gravel ballast is prone to retain water, increasing the cost of maintaining the track. Gravel in its best condition does not drain as freely as stone. Moreover, it is much more dusty than stone.

Cinders are stated to be equal to, and in some respects, better than the average gravel for ballasting. They are not so dusty, they do not promote the growth of weeds, but they are less durable and to some degree shorten the life of ties by chemical action. They are generally preferred where they can be had in sufficient quantities, but they are much inferior to broken stone and hardly serviceable for heavy traffic. The cost of putting them in the track is about the same as gravel, but the cost of maintenance is less.

Furnace slag is largely used and the outer vitreous portions make

a fairly good dustless ballast, better than gravel, but the softer portion is perishable and of little value. Here also the chemical changes tend to shorten the life of the tie.

Oyster shells have been used to some extent and one 95-mile road near the Atlantic coast is ballasted entirely with oyster shells. They make a dustless road, but are too light to hold the ties well in place. Moreover they are productive of vegetable growth.

The author describes a process of burning clay for making a ballast that has been used with success for many years. The most desirable quality of clay is a dense black clay known as gumbo, which burns more readily than ordinary brick clay. For preparing this a pile of old ties or other wood about 3 ft. high, 3 ft. wide and from one-half mile to a mile long is made along the right of way. When a layer of clay has been deposited on the top and back of the woodpile the fire is started, and as soon as it breaks through the clay a thin coating of coal is added, which is covered with another layer of clay about 4 in. thick. In this way layers of clay and of coal are put on as fast as the fire works through. When thoroughly burned the material is shoveled into the track. About 4 cu. yd. of clay are used to 1 ton of coal. This ballast has most of the good qualities of broken stone. It is less durable, however, but when the right quality of clay is obtainable at low cost it makes a satisfactory substitute.

### LAKE MANAWA, AN IOWA RESORT.

The accompanying illustration is reproduced from a very handsomely illustrated pamphlet descriptive of Lake Manawa, a summer resort reached by the lines of the Omaha & Council Bluffs Railway & Bridge Co.

camping purposes and the only restrictions are that the camps shall be kept clean and orderly and that those desiring to bathe shall patronize the bath houses for that purpose. The Council Bluffs Yacht Club and Rowing Association have erected handsome club houses at the lake and races are a much appreciated attraction.

The pamphlet describing Lake Manawa also makes special mention of Fairmount Park which is on the line of the Railway Co. This park is on a bluff some 500 ft. high, overlooking the Missouri River; from the summit of the hill one has a view of three cities and the wide and fertile river valley.

The general superintendent of the Omaha & Council Bluffs Railway & Bridge Co., Mr. W. B. Tarkington, or the manager of Lake Manawa and Manhattan Beach Park, Mr. E. H. Odell, solicit inquiries from parties desiring further information regarding the park.

### ANNIVERSARY PARADE.

The Augusta Railway & Electric Co., of Augusta, Ga., has a pleasing custom of arranging a public parade of its rolling stock on each anniversary of the opening of its street railway which occurred June 16, 1890. The procession on the 16th of last month, with various special cars, sweepers, etc., of the company, is thus described in a local paper:

"The procession was headed with an old mule car and wound up with a magnificent double trucker, certainly a great demonstration of advancement, but just as great was the display of another feature made on four flat cars about midway of the procession. This display was no less than the great difference in the style and weight



MANHATTAN BEACH, LAKE MANAWA.

Lake Manawa is eight miles from Omaha and four from Council Bluffs, on the Iowa side of the Missouri River. It has a shore line of nine miles, and an area of nearly 700 acres. Cottage Grove and Manhattan Beach, which are two of the most attractive portions of the lake shore, have been improved with dancing pavilions, summer theatres and club houses with the usual complement of golf links, tennis courts, picnic shelters, etc. The people of Omaha and Council Bluffs take advantage of the excellent transportation facilities afforded by the railway company to visit these resorts daily, during summer weather, the ride itself being an agreeable excursion. Camping parties from a distance also avail themselves of the lake; no charge is made for space for

used for the tracks now and in 1890. The latter is a light iron track that answered every purpose in the days of past years, and what could be used in the times of the first introduction of the light motor cars, but as the demand for rapid transit has increased the style of rail has had to follow."

Application for the dissolution of the Oakwood Street Railway Co., of Cincinnati, has been filed by the executrices of the late Atlas L. Stout. The petition states that from 1878 to 1899 the company paid no dividends; and that some of its assets in the form of real estate are a charge upon the company rather than a source of income.



# MECHANICAL DEPARTMENT

## AN ELECTRIC STREET SWEEPER.

An electric sweeper for street cleaning has recently been put in service in Cleveland, O., which operates on the tracks of the Cleveland Electric Railway Co. and sweeps the streets from center to curb. The machine, which is herewith illustrated, is the invention of General Manager Ira A. McCormack. All the plans were drawn up by him, and each successive improvement was added as the necessity arose in the course of the work. The suggestion first came from the desire of the city to have the streets cleaned in as cheap a manner as possible. The crying need for street cleaning and the woeful lack of funds for accomplishing it set Mr. McCormack to thinking, and he determined that the streets upon which there are street car tracks could be cleaned very cheaply and quickly by utilizing the street railway car power to that end.

A revolving brush at the front end of the car sweeps half of

every requirement. An arrangement has been entered into with the street car company by which all the streets in the city where there are car tracks will be kept clean by this sweeper. It will be kept running every night and will be able to cover every street in the city at least twice a week.

The first regular trip of the sweeper was made June 17th.

## SOME CHARACTERISTICS OF WASTE PACKING.

Following the presentation of the paper on this subject by Mr. T. H. Symington before the Western Railway Club, which was published in the "Review" for June, some further information was brought out in the discussion. Mr. F. A. Delano stated that the results as to the absorbing capacity of cotton waste as compared with wool waste coincide substantially with the tests made by Mr. Wickhorst, of the C. & Q. R. R. The third test seems to confirm the first test in that the capillary action of the waste coincides pretty nearly with its absorbing quality. The wool waste stands first in the matter of elasticity, and that seems to be the only advantage that wool waste has over cotton. Ordinary wool waste is better and cleaner as a rule, and freer from shoddy material of all sorts than ordinary cotton waste; so that if we get these results with commercial cotton waste we might expect to have better results if we are a little more careful in selecting our cotton waste. This is the advantage of getting white cotton waste; the presence of foreign material is more readily detected.

Mr. Bush, of the C., M. & St. P. Ry.: "Our experience is a good deal as Mr. Delano describes. We find that the absorbent and capillary capacity of cotton waste is as Mr. Symington states, and we use nothing but white cotton waste. The St. Paul road has been using it for a great many years with a good deal of success. The one disadvantage seems to

be that it is lacking in elasticity. I do not know that that lack of elasticity is sufficiently great as compared with wool to make it a feature; but I think that any waste, after it has been packed in a box for some time, has very little elasticity, and the idea we have been working on for some time in packing boxes has been to lay a great deal of stress on the keeping of the waste in contact with the journal, rather than the putting in of oil, and today we are using very little oil in repacking our journal boxes. We instruct our inspectors to take the packing iron and to pack the waste up against the journal, and I think we are getting beneficial results from this practice.

"Mr. Symington suggests some mechanical means of holding the waste up against the journal. I have no doubt that something of that sort would be very desirable if it could be made thoroughly practical. I think that the whole question of the use of waste really brings up the conditions that exists in every-day service, that in some respects are rather crude. At the same time we are doing an immense amount of business with our journal boxes as they are and are serving the purpose pretty well; but I can say, after having had the experience for a year and a half with cotton waste, that it is thoroughly satisfactory."

Mr. Herr, of the Westinghouse Air Brake Co., mentioned that



SWEEPER - CLEVELAND ELECTRIC RY.

the devil strip, which is the Ohio version of the space between the double tracks, and part of the space between the rails on which the car runs. A brush at the rear of the car 16 ft. long sweeps the rest of the tracks and ten or twelve feet of the pavement outside the tracks between the rails and the curbstones. This piles the dirt into a long furrow close enough to the curbstones so that the men with brooms and shovels can pile it in heaps for the wagons.

The brushes are driven by a 35-h. p. motor separate from those which drive the car. The car body was specially built by the J. G. Brill Co. and contains mechanism for raising the brushes and swinging the rear one out of the way behind the car when not sweeping.

A large street watering tank, holding 5,000 gallons, is mounted on a flat car which precedes the sweeper. This sprinkles the street from the center to the curb so that scarcely any dust is raised by the sweeper. The brushes of the latter are so flexibly arranged that every inequality of the pavement is followed and the sweeping is much more thorough than can be done by hand.

At the conclusion of the initial trip, at which a number of the city officials were present, they expressed themselves as entirely satisfied with the workings of the sweeper, and stated that it met



the same question was before the club seven or eight years ago and one gentleman spoke about the remarkable results he had obtained on his road by a recent change which he had made from wool waste to cotton. When he sat down a member arose; said he was very sorry he had not been able to get the floor a little sooner, because he was just going to tell about the remarkable results he had obtained in changing from cotton waste to wool, and the discussion brought out the fact that the question of holding the waste, or getting the waste up against the journal, in other words, the revamping of the equipment which this change in both cases had brought about, had worked betterment in the matter of lubrication, and perhaps that is something that all should bear in mind; that it is not only necessary to have the right kind of packing, but it is perhaps more necessary to have it properly applied.

In contrast to Mr. Herr's remarks Mr. J. F. Deems, of the C., B. & Q. R. R., stated that at a master mechanics' meeting of one of the principal western roads the consensus of opinion was that if it was wanted to make a very fast run the driving boxes should not all be packed, or it would cause trouble. Mr. Slater also corroborated Mr. Deems' remarks by telling of a special run on which every driving box on the engine was repacked. Before the engine had traveled nine miles it had two hot boxes. It had to be taken out of regular passenger service for this run, though such a thing as a hot journal had not been known on the engine for months before.

Mr. Brown: "The subject suggests that wool waste and cotton waste each have their uses and places where they may be applied, but there may be places where cotton waste would not be good material. The success in using cotton waste in journal boxes with our engine work on the Chicago, Milwaukee & St. Paul road, where we have been using it for a number of years, has been good; but we have not used cotton waste in engine truck or driving box cellars for the reason that it lacks elasticity. I have seen tried a number of mixtures with cotton waste to give it elasticity by using some long-fibred material, but they do not answer the purpose; they do not take the place of wool, that has a natural elasticity.

"The story told by Mr. Herr and the remarks by Mr. Deems, all go to show that care will sometimes kill a cat, and if we stir into a journal box too hard, we will have a hot journal, whereas if we let it alone we will get along very peacefully with it.

"As to the wearing qualities of wool and cotton waste, I am inclined to believe that wool will outwear cotton in service; but wool waste is worth thirteen cents a pound, and good white cotton waste is worth but six cents a pound, and the absorbent qualities of the cotton is so much superior to wool waste, that cotton waste will have the market, I am sure."

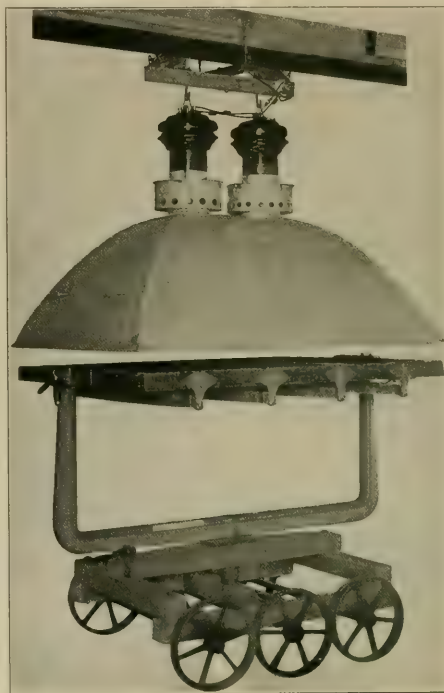
### BLUE-PRINTING BY ELECTRIC LIGHT.

A paper on this subject was recently presented by Mr. H. G. Reist at the Milwaukee meeting of the American Society of Mechanical Engineers, in which a blue-printing plant installed by the General Electric Co. is described. In large manufacturing establishments the short and dark days of winter are the occasion of great inconvenience and delay in the production of blue-prints. A plant suitable for making the required number of prints in summer is entirely inadequate for winter. In the first plan tried a small room was arranged with 9 arc lamps placed 18 inches apart; suspended from the ceiling, and by a suitable arrangement of reflectors a large portion of the light was thrown downward on printing frames arranged on trucks, being the same frames which are used ordinarily for printing by sunlight. The reflectors are hinged so that the light may be thrown to any position wanted. With a rapid printing paper this arrangement required from 6 to 8 minutes for printing.

Another arrangement for printing, and one which is being used extensively with somewhat more satisfactory results, is shown in the accompanying illustration. It will be seen that there are 2 lamps, each being a standard 5 ampere, 110 volts enclosed arc lamp, enclosed by a metal hood a little larger in size than the printing-frame. The hood is strongly constructed of sheet iron with parabolic sides which are finished on the inside with white enamel, having good reflecting power. The hood is supported on the lamps, and in order to prevent the parts from overheating, an effective ventilating device is provided at the top. There are also handles on the side so that it may conveniently be moved along the track. The lamps in turn are supported on a small trolley arrangement, made

from the parts used for sliding folding doors, and on each side there is a conducting wire from which a small trolley wheel carries the current to the lamps. The tracks on which the lighting device is supported are of sufficient length so that 5 printing-frames can be set under each of them, and the lamps readily moved to cover any one of them. The printing-frames which we are now using are the standard frames used for sun-printing, although they can be somewhat simplified if they are made specially for printing by electric light. The lamps are enclosed in white opal globes. This diffuses the light and the white interior of the reflector projects it downwards so that the area over the print to be made is very uniformly lighted, there being no perceptible difference in the tone of the print in the middle from what it is in the corners. When the first print has been exposed a sufficient length of time, the light and the hood are moved along the track to the next frame, while work is begun on the first one to replace the printing paper or tracing as the case may be.

The time required for printing naturally varies widely with different tracings and different makes of paper. In general, it may



ELECTRIC BLUE-PRINTING APPARATUS.

be stated that the time required is 3 or 4 times as long as with bright sunlight. With one grade of paper which we are using, the time by sunlight in the middle of the day during February is about 35 seconds, and by electric light  $1\frac{1}{2}$  minutes. It will readily be seen that there are great advantages in having a printing establishment which is independent of the season or of the condition of the weather. With an electric equipment blue prints may be put into the factory almost immediately after the completion of the tracing regardless of the time of day.

The cost of making prints by electric light is much smaller than one would expect, and the following figures indicate that it is cheaper to use artificial light than sunlight for this purpose.

In printing by electric light it is assumed that the cost of electricity is 12 cents per kilowatt hour, which I believe is a fair commercial rate. The lamps are turned off when not in use. They are in use only 85 minutes for each operator, as shown in the table below. Each lamp requires 550 watts and the cost is 187 cents per day:

Labor is assumed at the rate of \$1 per day.

	Sunlight.	Elec. Light.
No. of prints per day, mean per year....	41.9	56.5
Cost of printing, per print.....	2.39 cts.	2.09 cts.

The time required for changing a print in sunlight is a little longer than when the artificial light is used, because the whole frame has generally to be removed, and the frame has to be adjusted to the proper angle to get the most effective sunlight. The time allowed for changing prints is 7 minutes when printing by electric light; 8 minutes when printing by sun, while when printing during a rainy day as much as 20 minutes may be required.

### PATENTS AND RAILROAD MECHANICAL DEPARTMENTS.

The following extract from an article on this subject, by Mr. J. Snowden Bell, of Pittsburg, which appears in the American Engineer and Railroad Journal for June, should be of very general interest to our readers. The author mentions unnecessary litigation and expenditure that have arisen out of patent claims on railroad devices, and the fact that officials of the patent office can only know what has been published or what may have been observed by accident, and then continues:

Very many, if not nearly all, of the worthless patents under which unfounded claims of infringement have been made and may hereafter be made, against railroad companies, would never have been issued at all, and would not be issued in the future, if greater attention was paid by the officers of railroad mechanical departments and manufacturers of railroad appliances to the keeping of full and accurate records of all facts and dates relating to the origination and introduction into their service of new designs and appliances, and to bringing them, after they have been put into service and been found to be useful and practical, to the knowledge of those interested in the subject, through the medium of illustrated descriptions in print. The columns of the various railroad journals are always freely open to them for this purpose, and publications of the character referred to are both interesting and instructive. On general principles this course would obviously be desirable, and, for the purpose of establishing a barrier to the grant of patents for that which should not be patented, it is of direct and substantial value to railroad companies. It may be objected by those unfamiliar with the law, that the inventors of such designs as are really new and patentable, would, by publication, be debarred from protection for them, but such an objection is not a sound one.

The law allows an inventor two years after the date at which he has put his invention into public use, within which to make application for a United States patent on it, and, so long as he does not exceed this statutory limit, the publication of its successful reduction to practice acts in the direction of supporting his claims whenever he is prepared to make them. It is, however, to be noted that under the apparently unreasonable provisions of the patent laws of Europe, a prior publication in this country prevents a valid patent there, but it is only in exceptional cases that European patents are profitable, and the American inventor will, as a rule, find it to his interest not to spend his money on them.

After noting the tendency of modern manufacturers to publish drawings of their new devices, and the advantages of their doing so, Mr. Bell continues:

The other branch of the case is that of the railroad employee who may make an invention. All new and useful improvements are not necessarily patentable ones, but as regards those that are, it is as much to the interest of the railroad company as to that of the employee, that the latter should receive the protection he is entitled to. If the improvement is valuable to the company the company will ordinarily be glad to pay for it what it is believed to be worth. If it is not, the inventor is not harmed, but in either case the fraudulent patentee and would-be blackmailer has no opportunity.

The railroad man who makes a new design, or what he believes to be a new invention, should be careful to date all his sketches, drawings and written matter relating to it, and should make notes of his movements in the several stages of progression toward its actual use. He should keep his records in such shape as to be able to prove at a later day, if proof should happen to be required, what

he did, when he did it, and who took part in, or had knowledge of, his work in the matter. If the design proves, in practice, to do so well as to lead him to believe that it would be to his interest to get a patent on it, he ought to apply for a patent within two years after it has been put in public use, and, indeed, as soon thereafter as his means will permit. He should not waste his money in filing a "caveat" (which is worse than useless) and should be on his guard against incompetent "cheap John" patent solicitors and pretended patent "brokers," who will do nothing but get a fee out of him for putting his patent on their alleged agency books, and who, in nine cases out of ten, are barefaced swindlers, who have been more than once exposed. The division master mechanic, or the superintendent of motive power will, in most cases, be able to recommend some competent and trustworthy patent solicitor, and the solicitor will obtain his patent for him, if the invention proves to be patentable, in regular course.

### PAINTING CARS BY CONTRACT.

The Hoosac Valley Street Railway Co., of North Adams, Mass., finds it cheaper and much more satisfactory to have all its car painting done by an outside firm on contract, than to do this work with its own men. The company last month made an agreement with a painter from a nearby town to overhaul its winter equipment on the following basis: For cleaning, retouching and varnishing ten box cars, also painting roofs and painting trucks, the contractor to receive \$250, the work to be done in the company's shops, but all labor and materials to be supplied by the contractor. Of these closed cars, two have 20-ft. bodies, and eight have 18-ft. bodies.

For doing this same work on open cars, the contractor receives \$20 per car. For long double truck cars the price ranges from \$50 to \$60 per car.

In regard to the most durable colors, Mr. W. T. Nary, general superintendent of the road, states that his company has now decided upon yellow as standard for all cars. Formerly a lake was used but was found to have a tendency to run when subjected to severe weather conditions.

### ROLLER BEARINGS.

In our issue for June, page 366, we published a brief illustrated description of the Wright taper rolling bearing in which it was stated that tests made on street railways in England and Ireland showed that the bearings effected a saving in power of from 40 to 50 per cent. We have since been advised that the results of those tests were even more favorable than we stated, the lowest saving shown in any test having been 57 2-3 per cent.

In describing the bearing a typographical error was made in putting "free face" instead of "free race."

### A NEW TROLLEY CATCHER.

The Ham Sand Box Co., of Troy, N. Y., announces that within 30 days it will have ready for the market a new trolley catcher which will be in many respects superior to any other similar devices. It is the intention of the company to send the trolley catcher to any street railway desiring to give it a trial, with the understanding that no charge is to be made unless it is in every way up to the claims made for it.

### PATENT DECISION.

The Gold Car Heating Co., of New York, advises us that it has just won a most important patent suit in Canada over the Consolidated Car Heating Co. The Court of Appeals, at Montreal, has held that the Gold straight post steam hose coupler does not infringe the Sewall patent, which is a great victory for the Gold Car Heating Co. over the Consolidated Car Heating Co., and is strengthened by the fact that the decision of the court was unanimous, all of the five judges agreeing that the Gold steam coupler does not infringe the Sewall patent in any way.



## NEW CARS FOR BOSTON ELEVATED.

The Boston Elevated Railway Co. has recently received from the St. Louis Car Co. 45 double truck vestibule motor coaches. The car bodies are 38 ft. 4½ in. long, with 4-ft. platforms, making a total length of 46 ft. 4½ in. for each car. The cars are 8 ft. 7 in. wide. The bottom construction is a combination of wood and iron. The side sills are composed of 3 in. x 8 in. Southern pine and 6 in. channel on the inside. The center sills are 5 in. steel eye beams. The end sills are also of composite construction; the body bolsters are made of wrought steel built up with malleable iron castings. The needle beams are 5 in. steel y beams, trussed, and the entire floor is well braced with cross timbers, making one of the most rigidly constructed underframes ever put in elevated cars.

Each diagonal corner is fitted with a motorman's cab having doors on both sides; the outside doors are arranged in two sections. If desired the upper half can be swung inward and folded against the body of the car or both sections can be swung inward and folded; and when they are so opened an automatic folding gate takes the place of doors. In the motorman's cab a compartment is



MOTOR CAR FOR BOSTON ELEVATED—ST. LOUIS CAR CO.

provided under the roof for electric heaters, motor and light switches; this is lined with ¾ in. asbestos. The other side of the car has folding gates and other end of the car with rail and safety chains in addition to safety gates provided for the open section.

The outside construction, as seen from the view of the car, is straight panel tongued and grooved and the posts and braces filled in with extra heavy blocking. The cars are painted in aurora red, striped in gold.

The inside finish of the car is in African mahogany, finished in natural color. The ceiling is sky blue, neatly decorated and ornamented. All sash are glazed with ¼ in. plate glass made to raise and are fitted with necessary latches and springs. The curtains are of Pantasote with automatic fixtures. The seats are longitudinal with canvas lined spring rattan backs and seats. Under the seat next to the door is an asbestos lined fire-proof compartment for the large controller, lightning arrester, resistance, etc. The bell cord is hung through center of the car on brass hangers, and the trimmings throughout are of solid bronze, highly polished. The aisle is covered with floor mats. Lights are equally distributed through the car and electric headlights located over the hoods, and also electric marker lights are provided on each end.

## HAM SAND BOXES.

The Ham Sand Box Co., of Troy, N. Y., is continually at work to meet the requirements of new conditions as regards sand boxes and now makes eight styles. The latest design is a box made especially for sanding curves on double truck equipments and it is believed that this device is the only one that successfully meets the requirements.

Two employees of the United Traction Co. of Albany have been indicted by the grand jury, charged with inciting riot and disturbing the peace during the recent strike.

## THE A. S. R. A. NEW YORK CONVENTION.

The chairmen of the various local committees appointed at New York to arrange the details for the October convention of the American Street Railway Association report excellent progress. All the available exhibit space at Madison Square Garden has been applied for and it is probable that before the final allotments have been made it will be necessary to cut down the space asked for by each applicant. A feature of the display this year, will be the unusually large and interesting exhibits to be made by the larger electrical companies. Mr. M. G. Starrett, chief engineer of the Metropolitan Street Railway Co., 621 Broadway, New York City, is chairman of the exhibit committee.

As previously announced there will be two sessions of the convention on each of the two days set aside for business. The third day will be devoted to the inspection of exhibits. Papers will be read by title only, and will be printed and advance copies sent to the members.

A departure from the usual program at conventions will be the absence of official excursions or pleasure trips. According to Mr.

Vreeland, the only pre-arranged event of this nature will probably be an automobile ride for the ladies, although it is expected that many private excursions to nearby points of interest will be arranged among the members themselves after the business sessions.

## STRIKE AT DAYTON, O.

In our last issue we announced that on June 3d the People's Railway Co., of Dayton, O., and its employees had entered into a contract and as this agreement had been made after both parties had carefully considered the questions involved there was every reason to believe that the company would have no further trouble at least for a year.

On June 21st, however, a committee waited on General Manager Kerper and demanded the reinstatement of three men who had been discharged prior to the signing of the agreement, and that the company sign the original agreement submitted to it by the union on May 20th. At 7 o'clock in the evening, June 21st, a strike was ordered and about 30 men, who belonged to the union, quit work. Non-union men were put in their places and the company has had no difficulty keeping its service up to the schedule.

The only point at issue in the controversy was the "recognition" of the union. The company a year ago declined to make any agreements with its men save in their capacity as employees, and is fully determined to maintain this position.

The 2,000-h. p. engine which the Grand Rapids (Mich.) Railway Co. has installed in its new power house, was started June 21st.

The Schenectady (N. Y.) Railway Co. and the Amsterdam Street Railway Co. have reached an amicable adjustment of their differences whereby it is agreed that the Amsterdam company shall build the proposed road from Amsterdam to Scotia and the Schenectady company will build from Scotia to Albany.



## CANADIAN NOTES

It is the intention of the St. Thomas Street Ry. to construct a line to Pinafore Park.

The contract for building a spur line from the Niagara, St. Catharines & Toronto Ry. to Thorold quarries, has been let.

Mr. M. Rosevear who has for some years been general manager of the Toronto Suburban Ry. has resigned that position, and is succeeded by Mr. A. H. Royce.

Considerable new work will be done in Montreal during the next few months, permission having been obtained to build some six additional miles of track, and work will be vigorously pushed.

The Jacques Cartier Light & Power Co., Quebec, is about to acquire the power of the Jacques Cartier Pulp Co., at Cap Rouge, and will expend some \$300,000 or \$400,000 in improved machinery and additions.

The Shawinigan Water & Power Co. is seeking admission to Montreal and asking for permission to construct a transmission line from Shawinigan Falls to the city for the purpose of selling and delivering electrical energy.

The Toronto city council is advertising for designs for fenders with a view of obtaining the best on the market for the Toronto Railway. Robert McCallum, engineer, Public Works Department, has the matter in charge.

Considerable extensions to the trackage of the Toronto Railway Co., will be constructed during the coming summer. The council has provided track allowances on six streets, and work will be commenced at an early date.

The Sandwich town council last week granted a franchise to Mr. John A. Auld, M. P. P., to build an electric road from Windsor to Ahmertsburg, the road to be known as the South Essex Electric Co. The road will be continued through Kingsville and Leamington.

The bill of the Montreal & Southern Counties Ry. which applied for power to build a line to be operated by either steam or electricity, has passed the legislature on the condition that the clause enabling steam to be used should be expunged from the bill, thus making it an electric railway.

The Montreal Street Ry. is asking the council of the village of St. Louis de Mile End for a franchise to operate a line of electric cars in that place. This franchise was formerly held by the Montreal Park & Island Ry., but was forfeited for non-fulfillment of the clause relating to the service to be given.

Plans for the electric railway to be built from Chippewa to Fort Erie to complete the international belt line between Queenston and Buffalo on the frontier, are now being inspected by the Deputy Commissioner of Public Works. This line will be about 15 miles in length, and will be constructed on the edge of the river bank.

The annual meeting of the Ottawa Electric Co. was held July 8th. The gross revenue was \$196,363, an increase of \$19,680. The report shows an increase in expenditure over the preceding year of \$36,558, this it was shown was due to the losses at the time of the big fire. The net profits after paying all charges were \$27,519. The old board of directors was re-elected.

Mr. Ulric Rouville, a Parisian capitalist who owns extensive phosphate properties near Buckingham, Que., accompanied by N. A. Belcourt and Henri Bourassa, two members of Parliament, waited upon the Premier here a few days ago and urged that a small

subsidy be granted in aid of an electric railway from Buckingham to L'Original along the Lievre River. It was also asked that a small bounty per ton be granted upon the phosphate output, the idea being to bring about the development of the phosphate deposits in this neighborhood. The application is under consideration, and in the interval, the survey of the proposed road, which will be 105 miles long, is being pushed.

The Quebec Railway, Light & Power Co. is about to spend \$50,000 in transforming the historic property overlooking the cataract at Montmorenci Falls, into a country hotel and park, and in erecting an elevator of the inclined plane type from their railway at the foot of the cliff to the heights 300 ft. above. The whole is to be completed by the first of September next.

The acquisition of valuable timber limits along the river Ste. Annes by Messrs. Ordway & Loomis of New York, is favorably commented on in commercial circles. It is said to be the intention of these gentlemen to erect large pulp mills and also to build a special electric tramway between St. Merreol and Ste. Annes de Beaupre in order to establish an outlet for their productions.

The Montreal Street Ry. is asking for tenders for the construction of a large switchboard for motor generator sets, to control the output of its new water power plant. The board will consist of 13 panels, to be made of blue Vermont marble, and all apparatus of the latest and most approved pattern, fire proof starting rheostats to be used, all apparatus to be capable of withstanding an insulation test of 5,000 volts alternating current.

The annual meeting of the Demrara Electric Co., Ltd., of British Guiana, was held recently. The report for the past year was presented, and found satisfactory to the shareholders, showing a surplus over the bond interest. The tramways, having just been completed, showed nothing earned, but they are from last advices doing well. The officers were re-elected: President, Sir Wm. Van Horn; vice-president, Hon. George A. Drummond; secretary and treasurer, E. Alexander.

The Montreal Street Railway employees' annual trolley drive took place here last week and proved a very pleasant affair for those who patronized it. Fifty cars, illuminated with colored lights and Japanese lanterns and displaying an abundance of flags and bunting, left the Hochelaga yard shortly before 9 o'clock, and to the accompaniment of music, brass bands coming in at different sections, the occupants of the cars enjoyed a two hours' ride over the routes controlled by the Montreal Street Ry.

The Montreal Street Railway employees' club room at the Hochelaga depot has just been completed and very comfortable quarters have been made for the men. In addition to the reading rooms, bath rooms, barber shop and shoe shining department have been provided, and a very pretty garden adjoins the house on one side, making a pleasant place for the men to spend their spare time in. It is the intention of the company to provide similar club rooms at all depots, work now being in progress upon the buildings in the central districts.

London, Ont., will soon be connected with the extremely rich and well cultivated country lying between that city and Port Burwell, an area which has hitherto been only tapped by stage coaches and round-about railroad routes and has, therefore, not been as important a tributary country as its productiveness and proximity warranted. It only remains for the London, Aylmer, and North Shore Railway Co. to complete arrangements with the Townships of London, Westminster and North Dorchester, to see the work of construction begun, an onco commenced it will be hurried forward rapidly.

The case of the city of Ottawa vs. The Ottawa Electric Co. an action by the city to compel the electric railway company to build certain extensions and to prohibit the company from running freight cars on the streets of the city, was tried here recently, and will be interesting as applying to other cities. The Chancellor held that the first part of the case was a matter for reference and not for specific performance. In regard to freight traffic it was said:

"The defendant's predecessors had power to transport freight. New transport power was given the defendants and the act says that such new power is to be exercised on such terms as the city council approves. The council may by resolution permit the use of freight cars during the day time between 7 a. m. and 9 p. m., and the like approval for carriage of freight at night may be regarded as sufficient without a by-law." The action was dismissed with costs.

The purchase of the Montreal Park & Island Ry. system by the Montreal Street Railway Co., is now accomplished. It is understood that the price paid for the suburban railway was about \$1,100,000. Now that the suburban lines have come into the possession of the Montreal company, a great many changes involving the expenditure of a large amount of money, may be looked for. It is understood that the lines to Cartierville and Back River will be double tracked and put in the best possible condition; that Montreal Annex will be given an effective service, and that numerous changes will be made on the Lachine and Lachine Rapids systems.

In connection with the recent proposals to afford increased street car accommodation between the eastern and western sections of Montreal it has been suggested that a proposition which was made eight years ago to construct a suspension railway may now be revived. With this idea in view, a meeting of capitalists resident in the city and adjoining municipalities that will be affected by the enterprise, has been held. Owing to the expensive superstructures, a line of this kind would be more expensive to construct than the ordinary road; but, on the other hand, the meeting considered that the amount paid by the surface company to the city for removing snow from the tracks, \$1,600 per mile, would pay the interest on a large capitalization.

Mr. J. B. Ingersoll, superintendent of rolling stock for the Montreal Street Railway Co., has severed his connection with that company, and has accepted a position as construction engineer with the Westinghouse company. Mr. Ingersoll, who was for a number of years with the Brush company, and for some six years with the Westinghouse company in Pittsburg, carries with him the best wishes of his fellow officials on the Montreal road, and was the recipient of a handsome locket and chain and a suitable address from the men whom he has handled so well since taking hold of the Montreal road. He has brought the rolling stock of the company to a high efficiency during his stay here, and has contributed in no small measure to the general prosperity of the company.

S. L. Kohlmeier, a motorman in the employ of the Toronto Railway Co., has earned a reputation for fearlessness and courage by his action in preventing the escape of three desperadoes who were fleeing from officers. Three men, who were undergoing trial for robbing the bank at Aurora, were being conveyed to the jail in a hack, two constables accompanying them inside, while an additional officer was mounted on the box with the driver. When nearing the prison a parcel was thrown into the vehicle through the window, and before the officers knew what was going on each of the prisoners held a revolver and shooting commenced. County Constable Boyd was shot and instantly killed, and standing off the other two with their guns, the three desperadoes made a dash for an approaching trolley car. Boarding this they immediately ordered the motorman to "open her out," at the same time threatening him with their revolvers. Kohlmeier, instead of doing as ordered, shut off the power, and grasping the revolver by the muzzle endeavored to wrench it from the man who was covering him; the conductor seeing by this time what was going on pulled his trolley from the wire, and the officers and several citizens coming to the assistance of the car crew, the trio were overcome, one being so badly man-handled that he died next day, and both the others wounded. The officials of the Toronto Railway propose giving the car crew a substantial acknowledgement of their appreciation of their action.

Six hundred members of the street railway employees' union at Detroit, Mich., recently demanded of the United Railway Co. an increase of wages of two cents per hour, and a shorter day. The company refused to comply, and on June 4th the men decided to withdraw their demands. A small minority was in favor of a strike, but the conservative element prevailed.

## CARS FOR CHICAGO CITY RY.

The Chicago City Railway Co. has awarded the St. Louis Car Co. a contract for 120 double truck cars. These cars are similar to the five sample cars supplied to the Chicago City Ry. by this company in February last, and which were illustrated and described in the "Review" for February, 1901, page 131. The only difference is that the new cars will have larger panes of glass than the five first furnished.

## LEGAL DECISIONS ON LABOR TROUBLES.

The Employers' Association, of Dayton, O., has published in pamphlet form, under the title "Important to Employer and Employee," a history of the controversy between the Dayton Manufacturing Co. and the labor unions to which its employees belonged. The company was finally obliged to file a bill in equity asking for an injunction against its former employees. The case was tried in May last and a decision rendered June 1st upholding the company on all points, and ruling that picketing and boycotting are illegal, and that members of labor organizations are individually liable for damages caused by the acts of such organizations. In order that manufacturers and others may avail themselves of the citations made by counsel and the court the arguments and the decision have been printed in this form by the Employers' Association of Dayton and a copy will be sent upon request to those interested.

## THE CHICAGO ELEVATED ROADS.

The Lake Street Elevated R. R., which is the only one of the Chicago elevated roads that has no power house, has heretofore taken current from the Cicero & Proviso and the Western Ave. power stations of the Chicago Union Traction Co., but recently the Lake Street company made a contract with the Chicago Edison Co. for current and will terminate the old contracts. The company had decided upon building a power plant of its own, but the new arrangement will enable it to avoid this investment for the present.

The Metropolitan Elevated about the middle of June broke ground for its extension of the Douglas Park branch.

The proposed plan of the Northwestern Elevated to lease the Chicago and Evanston branch of the Chicago, Milwaukee & St. Paul is again attracting attention and it is believed that a satisfactory ordinance can be secured from the city council. On June 24th the St. Paul discontinued its "feeder" service formerly operated between Sheridan Park and the terminus of the Northwestern Elevated at Wilson Ave., and unless the Northwestern can lease the surface road north the transportation facilities to the northern suburbs of the city will be much reduced.

The South Side Elevated is considering building an extension to Englewood and the Stock Yards district. It is probable, however, that work will not be commenced on this line before January, 1903.

The holders of the trust certificates of the Northwestern Elevated at a recent meeting ratified the action of the board of directors in arranging to purchase the Union Elevated. The action will be formally ratified by the voting trustees on August 1st.

The plan for financing the transaction was also approved. Under this arrangement the \$5,000,000 5 per cent bonds of the Northwestern now outstanding are called, and a new issue of \$15,000,000 4 per cent bonds is authorized. These will refund the old bonds, pay for the Union Loop stock acquired, take up \$750,000 of certificates of indebtedness, and leave a balance of \$1,300,000 in the treasury.

The proposition that the Northwestern guarantee the first mortgage bonded indebtedness of the Lake Street Elevated was approved. The Lake Street road agrees to limit its indebtedness under the mortgage to \$6,000,000.

The Louisville (Ky.) Railway Co. on July 1st increased the wages of its motormen and conductors from 17½ cents to 18½ cents per hour. The increase affects 350 men.

The mechanical equipment for the street railways being built in Athens and Piraens, Greece, will be supplied by the General Electric Co. Nearly all the contracts for these roads have been or will be awarded to American manufacturers.

**BALTIMORE TYPE OF CONVERTIBLE CAR.**

For many years a type of convertible car like that shown in the illustration has been popular in Baltimore and some other southern cities. The leading features of the construction are a curved lower panel with, in some cases, a narrow panel above it and very large windows. In some instances the windows do not come all the way to the window rail, but have a narrow panel above them. The windows and the upper panels are made removable. When taken out window guards take their place. As shown in the engraving, the window rail when the panels and sash is removed is a trifle below the level of the seat. The cars are built with a central aisle and cross seats. The curtains come down so as to completely close the sides. The entrances are from the ends. It will be seen that only the diagonally opposite sides of the vestibules are opened, giving but two steps to the car. This design contemplates practically the use of but one entrance of the car under all ordinary circumstances, and that from the rear. The Baltimore company adopts one rule which, if thoroughly enforced, will undoubtedly go far toward preventing accidents. This rule is painted on each side of the curved panel and reads, "Boarding car in motion forbidden. Employees cannot waive this rule." Only one method can make this rule practicable, and that is to close the platform and step in such a way as to make it impossible for a person to get upon the car until the gate opened. The car illustrated is one of a number recently shipped

The new power station, the contract for which was let to a local contractor, will not be ready for another year; but the finished section of the line is at present operated from the electric-lighting station by a 700-h. p. engine and Siemens' multipolar 500-volt generator. Two of these units are at present in place and a third will be installed by the end of the year. These units will, it is estimated, run all lines necessary until the new station is ready, when they will be used for lighting purposes. The boiler house is to be 240 by 53 feet and has room for sixteen boilers 30 by 8 ft., working at a pressure of 160 lb. per sq. in. Vicar's mechanical stokers will be used, and there will be storage room for 300 tons of coal. The engine house is to be 206 by 40 ft., and will contain twelve 700-h. p. units. The rails are of the girder type, 7 in. deep and weigh 107 lb. per yd. They are rolled in 60 ft. lengths. The joints are designed to give great rigidity. The fish plates weigh 77½ lb. per pair, are 2 ft. 7 in. long and carry eight bolts, 1 in. in diameter. The sole plate weighs 52 lb., is 2 ft. 6 in. long and 8 in. wide. It is ¾ in. thick and is secured to the bottom flange of the rail by four bolts ¾ in. in diam. All nuts are of the nutlock type. The bonding is double and of the crown-bond type, and is placed between the fish plates and the rails, being protected by the former.

There is a concrete foundation laid for the rails, 6 inches thick, of portland cement concrete, 6 to 1, and the greater portion of the line now complete is paved with granite.



BALTIMORE TYPE OF CAR—J. G. BRILL CO.

by the J. G. Brill Company and is of interest on account of the fact that the size is much larger than those usually employed.

The length over end panels is 30 ft. 5 in. The platforms are 4 ft. long, making the total length over the dashers 38 ft. 5 in. There are two truss rods under the body carried by castings on needle beams. The trolley board extends the whole length of the roof. The end of the car is fitted with two drop sash and the inside sash is fitted with brass wire for summer use. On each post is a push button for signaling the conductor. The gongs are used with the left foot. The car is mounted on Eureka maximum traction trucks; the seats are of spring cane; the inside finish, including sash and doors, is of cherry, and the ceiling of decorated 3-ply birch veneer. The cross seats center aisle car has one advantage over open cars with cross seats without an aisle, which is that there is standing room available without making it necessary for passengers to occupy the space between the seats.

**NOTTINGHAM (ENG.) ELECTRIC RAILWAY.**

The purchase of the Nottingham horse tramways and their conversion to the electric system by the corporation of Nottingham is the subject of a report by the American consul, S. C. McFarland. The old horse car system was purchased by the city in October, 1897, for the sum of \$396,620. The system consisted of 10 miles of single track, and the city obtained parliamentary powers to reconstruct this on the overhead electric system and to make extensions equal to a total of 40 miles of single track. Work on the new road was begun in April, 1900. Two miles of double track which were put into operation January, 1901, is all that is completed yet, but an additional section of 4½ miles of double track will be ready for use in June.

The trolley wire is of hard-drawn copper .409 in. in diameter. The feeders are supplied by the Callenders Cable & Construction Co. of London, and are insulated with vulcanized bitumen. These cables are run in vitrified stoneware conduits. There are three pairs of feeders to the present section of about 2 miles. The feeders and sectional pillars have been designed by the Callenders company, and the former are so arranged that in case the insulation of the line feeder breaks down, the switches can be reversed, so that the return feeder takes the place of the line feeder.

Double-deck cars will be used, except on one section. The contract for 57 cars was placed with Messrs. Dick, Kerr & Co., of London. The cars are arranged so as to have the staircase reversed. The seating capacity is 56 and each car is mounted on a 21E Brill truck, with a 6-ft. wheel base. The wheels are made by Messrs. Miller & Co., of Edinburgh. Each car is equipped with two motors capable of giving 25 h. p. each, at a speed of 8 miles per hour. The motors and controllers are made by the British Electrical Manufacturing Co., Ltd., of Preston. The controller is of the usual type and a reversing switch is provided at each end of the car, interlocked with the series parallel switch, so that the reversal cannot be effected except when the current is off. The trolley standard and pole are of the swiveling-arm type of Messrs. Blackwell & Co.'s. latest inclosed-spring pattern, and each car is lighted by ten lamps. There is also a head-light at each end of the car, each fitted with two lamps and so arranged that whichever circuit is closed, one lamp in each head-light and three lamps in the car shall be on. Illuminated destination boxes are provided at each end of the cars. Both hand and Spencer's patent slipper brakes are used. The interior of each car is paneled with oak, with beveled mirrors. The cars cost about \$2,920 each.



## PERSONAL.

MR. JAMES A. COLLINS has resigned as treasurer of the Cincinnati Traction Co.

MR. NICHOLAS ESCALANTE PEON, treasurer of the Compañia de Tranvia de Merida, Yucatan, is now in this country on business.

MR. GEORGE F. LEMON has resigned as superintendent of motive power of the South Covington & Cincinnati Street Ry. and gone with Wicks Brothers, Chicago.

MR. JOHN ST. JOHN, who has been connected with the Hoosac Valley Street Railway Co., of North Adams, Mass., for two years, as motorman, has been appointed assistant to W. T. Nary, general manager of the road.

MR. L. S. STEWART, formerly train master on the Chesapeake & Ohio R. R., was on July 6th appointed general freight and passenger agent of the Detroit, Rochester, Romeo & Lake Orion Ry., succeeding Mr. Lewis Barnes, resigned.

MR. C. G. GOODRICH, of St. Paul, Minn., vice-president of the Twin City Rapid Transit Co., is spending a fortnight at the Pan-American Exposition, at Buffalo, and will later make an extensive tour of Europe in company with Mrs. Goodrich.

MR. M. H. BRONSDON, who was for many years chief engineer of the Union Railroad Co. and the Rhode Island Suburban Street Ry. and is now with the Lane & Bodely Co., was in Chicago recently on his way east after a month's trip to the Pacific Coast.

Mr. R. R. JARVIE, formerly head clerk to the superintendent of the Metropolitan West Side Elevated Railway Co., of Chicago, has been appointed superintendent of transportation for that company. Mr. Jarvie has been connected with the Metropolitan for six years.

MR. JOHN DUFFY has been appointed superintendent of the Syracuse (N. Y.) Rapid Transit Railway Co., an office which the company has created to take the place of that of chief engineer and master of transportation, which was abolished with Mr. Clark's resignation.

MR. TIMOTHY KINNEY has resigned as superintendent of the Pittsburgh division of the United Traction Co. and will accept a position with the Carnegie Steel Co., at the Carrie furnaces, Rankin. Mr. George W. Bethridge will succeed him as superintendent of the Pittsburgh lines.

MR. H. W. BEARDSLEY, who is widely known as the architect of several of the Chicago World's Fair buildings, is now manager of the Niagara Engineering & Construction Co., 745 Ellicott Sq., Buffalo, which is engaged in engineering, architectural and landscape gardening work.

MR. C. S. THRASHER, of Cleveland, has been appointed auditor of the Southern Ohio Traction Co., of Hamilton, to succeed Mr. Warren Bicknell, who will become manager of the Miami & Erie Canal Transportation Co. Mr. Thrasher assumes the duties of his new position July 15th.

MR. W. E. ROSSNEY, of Bloomington, Ill., has been elected a director of the Bloomington & Normal Street Railway Co., in the place of Mr. Willis E. Gray, who recently resigned on account of his removal to New York. Mr. W. S. Biddle, of Wilkesbarre, Pa., was also elected a director.

MR. HOWARD ABEL, who has been in London, where he assisted in developing the project for Mr. Yerkes' underground railway, has returned to Chicago. It is announced that Mr. Abel will be appointed to a prominent position under the consolidation of the Chicago elevated railways.

MR. CHARLES H. COX resigned as manager of the Dayton & Xenia Traction Co., of Dayton, O., to become superintendent of construction for the Middleboro, Wareham & Buzzards Bay Street Railway Co., at Middleboro, Mass., and on the completion of that road will become manager.

MR. MURRAY CARLETON was elected president of the St. Louis Transit Co. and the United Railways Co., of St. Louis, last month following the resignation of Mr. Edwards Whitaker from those offices. The United Railways Co., of St. Louis, owns about 400 miles of street railway in that city which it leases to the St.



MURRAY CARLETON.

Louis Transit Co. The directors of both companies are practically the same. Mr. Carleton, the new president of the companies, is also president of the Carleton Dry Goods Co. and a director of the Boatmen's Bank. He became a director of the street railway company after the consolidation of its constituent companies, not having previously been connected with the street railway business. Mr. Carleton began life as a poor boy. He was born at Cumberland, Md., and in 1873, when little more than a boy, he reached St. Louis, where he started to work for Henry Bell & Co., a wholesale dry goods house, at \$25 a month. In 1878 this firm went out of business and Mr. Carleton went with the house of which he is now president. This was known as the Wear & Boogher Dry Goods Co. and has since been succeeded by the Carleton Dry Goods Co. Mr. Carleton is essentially a self-made man and is widely known in St. Louis through his extensive business connections.

MR. HARRY J. CLARK resigned as chief engineer of the Syracuse (N. Y.) Rapid Transit Railway Co., July 10th, to accept a position with another electric railway company. Mr. Clark is a graduate of Cornell University and has been connected with the Syracuse street railways for nearly six years.

MR. GEORGE F. McCULLOCH, president and general manager of the Union Traction Co. of Indiana, extended to Col. Sid Conger, nstate commander of the Sons of Veterans, and his staff, the use of the president's private car, "Martha," July 1st, to go from Indianapolis to Muncie to attend the 15th annual state convention of the order.

MR. WILLIAM S. ALDRICH, Mem. Am. Inst. E. E., Mem. Am. Soc. M. E., professor of electrical engineering, University of Illinois, and Mr. Cecil B. Smith, Mem. Can. Soc. C. E., assistant engineer, city engineer's department, Toronto, Can., and formerly assistant professor of civil engineering, McGill University, have opened an office as consulting engineers in the Mail and Express Building, Toronto, Can.

MR. JAMES A. STEWART, for the past six years superintendent of the Herkimer, Mohawk (N. Y.), Ilion & Frankfort Electric Railway Co., has been presented with a check for \$2,500 by Mr. J. Ledlie Hees, of Fonda, president of the road prior to its recent acquisition by a syndicate of Utica. Mr. Hees' gift is an acknowledgement of Mr. Stewart's wise management, the latter's policy having put the road on a firm financial basis.

MR. FRANK BROWN, ex-governor of Maryland and the new president of the Berkley (Va.) Street Railway Co., together with Mr. Daniel B. Banks, a director of the road, made a tour of the Berkley system, July 1st. Mr. Brown proposes an extension of the line to Norfolk and has ordered new cars and mechanical equipment. It is his purpose to make the street railways of Berkley the equal of any in the South.

MR. JOHN H. ROBERTSON, for many years superintendent of the Third Avenue R. R., has become associated with the New York Estimating, Engineering & Contracting Co., of No. 17 Cortlandt St.,

New York City, a new concern organized to do a general consulting, engineering and contracting business. Mr. Robertson holds the office of president and treasurer. The company will furnish plans and estimates for all kinds of engineering work, design special machinery, act as manufacturer's agent and build and superintend engineering enterprises. It will make a specialty of street railway work.

MR. LOUIS E. BEILSTEIN was on July 1st appointed general manager of the Toledo Traction Co. Mr. Beilstein is a comparatively young man, but has had a wide experience in the street railway business. He began his services with the East Cleveland Railway Co., and has since been employed on the Cleveland Electric Co., the Cleveland, Painesville & Eastern, the Detroit Railway Co., and the Northern Ohio Traction Co. He resigned his position with the latter company to take his present position.

MR. CHARLES T. YERKES has been singularly honored in London, having been invited to preside at the annual festival banquet of the Royal St. Anne's society, July 11th. The society is the oldest charitable organization in the world and its banquets are given under the patronage of the king and queen. Mr. Yerkes is the first American who ever occupied the chair at one of these feasts. His predecessors have been the dukes of Connaught, Wellington, Cambridge and Newcastle and the lord mayors of London. The dinner was given in Salter's hall, the most famous banqueting chamber in England.

MR. W. A. RAMSAY has resigned as president and general manager of the Colorado Springs Rapid Transit Railway and the Colorado Springs & Suburban Railway Cos., and has also resigned as private secretary to Mr. W. S. Stratton, who controls these roads. Mr. Ramsay's successor in the presidency and management of the street railways has not as yet been named. He will be succeeded as Mr. Stratton's secretary by Mr. W. G. Rice, recently manager of the Stratton interests in the Cripple Creek district. Mr. Ramsay intends going to England on business of his own and will remain there until fall.

MR. W. B. TARKINGTON, recently appointed general superintendent of the Omaha & Council Bluffs Railway & Bridge Co. began his railroad career in the mechanical department of the Chicago & Northwestern Railway Co. He served a machinist's apprenticeship, and was promoted to division master mechanic on the Iowa division, being at that time the youngest official in the mechanical department of the road. In 1888, the Omaha & Council Bluffs Railway & Bridge Co. was formed to build an electric line between Omaha and Council Bluffs and a high steel bridge over the Missouri River; this was the first electric railway built by the Thompson-Houston company. Shortly after, Mr. Tarkington began his service with this company as chief engineer. In a short time he was promoted to master mechanic, having entire charge of power plants and shops; while serving in this capacity, a modern power station was erected and the rolling stock was entirely rebuilt and equipped with the most improved machinery. Through all the changes and development of the property to its present proportions, Mr. Tarkington has acquired a wide and practical experience in street railway service, improving every opportunity. Indefatigable energy and loyalty to the interests of his employers are his characteristics; he has one motto—"Work."



W. B. TARKINGTON.

MR. NELSON PERIN, it is announced, will shortly retire from the presidency of the United Railways & Electric Co., of Baltimore, and will make an extensive tour of Europe for recreation from business cares. Mr. Perin is a native of Cincinnati, but has resided in Baltimore for 15 years. He was the principal organizer of the

old City & Suburban Ry., and was subsequently active in developing other street railway projects in Baltimore which resulted in the consolidation of local interests and the organization of the present company. Mr. George R. Webb is slated to succeed him as president of the United Railways company.

MR. WORRALL WILSON was elected president of the Detroit & Chicago Traction Co., at a directors' meeting held in Brooklyn, June 27th. The company, commonly known as the Boland syndicate, has secured rights of way through Ann Arbor, Jackson, Albion, Marshall, Battle Creek and 15 less important cities, the rights covering a distance of 285 miles. Mr. Wilson, as president of the road, will be associated with Messrs. W. A. Boland, P. H. Flynn, D. F. Lewis, Frederick C. Cochen and ex-Senator John McCarty in the consummation of one of the greatest interurban electric railway projects of the times.

MR. F. B. HUBBELL has assumed the office of general manager of the Washington (D. C.), Arlington & Falls Church Ry., in place of Mr. R. H. Phillips, resigned. Mr. Hubbell has had 30 years' experience in the steam railroad field, having been with the Kansas City, Pittsburg & Gulf, the Maryland Central, and the Northern Central railroads. He was also at one time associated with the Pennsylvania Steel Co., and is a gentleman of considerable financial interests. In addition to the office of general manager he will retain his present office of vice-president of the Washington, Arlington & Falls Church company.

MR. GEORGE HOEGER, superintendent of the Roxborough, Chestnut Hill & Norristown Railway Co. and the Schuylkill Valley Traction Co., began his business life in Germany as messenger on one of the German steam roads. He came to America in 1879 and took up his residence in Chicago, where he soon accepted employment with the North Chicago and afterward with the Chicago City Ry. as horse car driver. He went to Milwaukee in 1886 and engaged with the old Cream City Ry. and shortly after was made car dispatcher. In 1888 he went with the old West Side lines of Milwaukee and aided in the work of converting these to electric traction. Mr. Hoeger remembers that the accepted rail in those days was the old Johnson section laid on chairs. After the consolidation of the street railway companies in Milwaukee, Mr. Hoeger continued with the combined system until 1894, in which year he went to Philadelphia, when most of the lines in that city were still running with horse cars. He aided in rebuilding the Roxborough, Chestnut Hill & Norristown Ry. and when the road was completed was made assistant superintendent. In 1899 he was made superintendent and also took charge of the Holmesburg, Tacony & Frankford Electric Ry., the two properties having been purchased by the United Power & Transportation Co. In 1900 he took charge of the Schuylkill Valley Traction Co. and operated the three roads until March 1, 1901, when the Holmesburg road was transferred to another operating division. Mr. Hoeger is also superintendent of the Trappe & Limerick Electric Ry., a new line building to Pottstown.

THE MOHAWK VALLEY TRACTION CO., Fort Plain, N. Y., has elected the following officers: Emiel Rebell, president; George Smith, vice-president; Frank J. Ehle, treasurer, and William J. Rosser, secretary.

THE LIMA (O.), LEWISTOWN & BELLEFONTAINE TRACTION CO., which purposes building an extensive interurban system, has elected the following officers: W. W. Fisher, of Bellefontaine, president; John Foos, of Lima, treasurer, and James Holler, of Lima, secretary. Mr. Wilbur A. Ginn, of Columbus, was appointed engineer and will commence surveys at once.

## OBITUARY.

MR. GARRETT VAN GINKLE, who was until quite recently the largest stockholder and president of the Dallas (Tex.) Consolidated Electric Street Ry., and owner of the North Dallas Circuit Ry., was accidentally struck and killed by a car on the Consolidated road on June 14th. The interment was at Des Moines, Ia.

MR. ALBERT L. JOHNSON, whose 20 years' career in the field of electric traction embraced operations in Cleveland, Detroit and Brooklyn and the establishment of interurban systems in Pennsylvania and New Jersey, died at his residence at Fort Hamilton, near Brooklyn, N. Y., July 2d. Mr. Johnson's death was due to an affection of the heart. Mr. Johnson was born at Louisville in 1862, but removed with his parents to Indianapolis at an early age where he lived until he attained his majority. At the age of 22 he drove a mule car on one of the street railways in Cleveland. A few years later, in company with his brother, Tom L. Johnson, the present mayor of Cleveland, he acquired an interest in a Brooklyn street railway and afterward became interested in similar properties in Cleveland and Detroit. Allentown was made the base of the Johnsons' operations in Pennsylvania and an extensive system of electric lines through the Lehigh territory was developed. It was Albert Johnson's ambition to extend these lines and to afford an ideal electric railway service between New York and Philadelphia. Another cherished scheme of his was the building of a tunnel from Staten Island to Brooklyn to connect with the tunnel from Manhattan to Brooklyn. Mrs. Johnson and four children survive.

### NEW PUBLICATIONS.

THE IOWA ENGINEER, a quarterly publication devoted to the interests of the engineering departments of the Iowa State College, Ames, Ia., is a new publication which promises to fill an important place in the engineering field. The initial number of this new magazine appeared in attractive form June 1st.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO has recently issued Circular No. 1049 on Alternating Current Switchboards which illustrates and describes the various standard panels which are now extensively used. Circular Index No. 3 of the company's circulars, now in force, was issued in June.

PROCEEDINGS OF THE PURDUE Civil Engineering Society for 1900-1901 has been published. This is a civil engineering pamphlet issued annually by the Civil Engineering Society of Purdue University. Price 50 cents. The present volume, No. 5, contains articles, on "Some Modern Creosoting Plants," by W. Buchler, "Concrete," by C. C. Boyer, "Leveling," by A. E. Keunner, and a number of other articles of civil engineering interest.

LE MOIS SCIENTIFIQUE ET INDUSTRIEL, which is an international review of the scientific press, has commenced its second year of publication with a considerably enlarged edition. These monthly reviews, which cover a very wide range of technical and scientific subjects, are condensed abstracts of the most important of that class of literature, and reference is always given to the original publication. It comprises a useful index of all current scientific literature.

CENTRAL STATION EXPERIENCES is a new publication consisting of a series of narratives of the trials and tribulations of a steam engineer in learning to run an electric station. The articles have appeared serially in Power, and this volume is a reprint of them by the Power Publishing Co., New York. The stories are told in a colloquial style and cover a great many incidents in regard to the operation of an electric plant which might often prove of service to a central station attendant.

THE FALCON ENGINE & CAR WORKS is the title of a large illustrated catalogue published by the Brush Electrical Engineering Co., Ltd., of London. The volume contains over 50 sheets of illustrations, code words, etc., for numerous types of locomotive trams and various kinds of street railway rolling stock, omnibuses, freight cars, etc., made by this company. The sheets are lettered and numbered according to subjects, are printed on heavy wood cut paper and bound in green cloth. The rolling stock described is too numerous to mention in detail.

THE GENERAL ELECTRIC CO. has recently issued the following bulletins: No. 4248, Small Alternating Current Motors. No. 4249, Woven Wire and Copper Wire Brushes. No. 4250, Small

Continuous Current Stationary Motors Type C. A. No. 4251, Belt Driven Railway Generators. No. 4252, Small Plant Switchboards. No. 4253, Slow and Moderate Speed Belt Driven Generators. No. 4254, The Series Alternating System. Also the "Flyers" Nos. 2068 to 2071, inclusive, on: Snap Switches for 500-Volt Circuits; Rock Insulators, Form B; Portable Lamp Holder; Manhole Fuse Boxes; and catalog and price lists No. 7544 and 7545 on Repair Parts of E-60-A Railway Motor for 250 and 500 Volts, and Parts of C B-14 A and H Motors.

RAILROADS OF CUBA. The report of William H. Carlson, special commissioner of railroads to Major General Leonard Wood, U. S. V., military governor of Cuba, has recently been published. It comprises a volume of 350 pages and contains a large amount of statistical and other information in regard to the Cuban railway, and in addition to the public railways, includes reports from over 100 plantation railways and the electric street railways on the island. The railroads represent nearly \$50,000,000 of property, but are generally in need of considerable modernizing. The completion of a central line through the length of the island is also specially recommended. Legislation in regards to Cuban railroads has been practically a dead letter for some time past and a better railroad service, with quick transportation and lower rates is an urgent necessity in developing the resources of the island.

THE "ENGINEERING" AND ELECTRIC TRACTION POCKET BOOK. By Philip Dawson, Assoc. M. Inst. C. E., M. I. Mech. E., M. I. E. E., author of "Electric Railways and Tramways," etc. Published by "Engineering," London, and John Wiley & Sons, New York. Second edition, 16mo., 1,350 pages, with 1,300 figures and 947 tables. Price, \$4.00.—The compiler was the first who attempted to combine in a convenient form with any great degree of completeness the civil, mechanical and electrical data relating to electric traction and the success of the first edition of the Pocket Book, published in 1899, has led to the preparation of a second revised and enlarged edition which has just been issued from the press. A German translation will soon be published in Berlin. The subject-matter is divided into 12 sections: Track, including construction and return circuit and bonding; Lines and Feeders; Steam Engines; Steam Boilers; Electric Generators; Switchboards; Gas Engines; Storage Batteries; Surface and Conduit Systems; Rolling Stock and Motors; Testing and Testing Instruments; Efficiency, Maintenance and Depreciation. Appendix I deals with power transmission and Appendix II contains conversion tables for weights and measures. The matter is presented in a manner that makes it easily intelligible to all who have a practical connection with electric traction, and the book cannot fail to be extremely valuable to those who have need to consult authorities on the various subjects of which it treats.

### TROLLEY ACCIDENT NEAR PROVIDENCE.

Two trolley cars of the Rhode Island Suburban Railway Co. met in a head-on collision on the line between Providence and River Point on June 16th. One was an open and the other a large vestibuled car and the two partly telescoped. Five persons were seriously hurt and a number of others were badly bruised.

### ALLIS-CHALMERS CO.

The Allis-Chalmers Co. has acquired the entire business of the Edward P. Allis Co., Milwaukee, Wis., Fraser & Chalmers, Chicago, Ill., the Gates Iron Works, Chicago, Ill., and the Dixon Manufacturing Co., Scranton, Pa., exclusive of the locomotive business of the latter company. The general offices of the new company are located on the 10th floor of the Home Insurance Bldg., Chicago. The Allis-Chalmers Co. will continue to build, under the same management, the same lines of machinery as heretofore made by the several companies, and hopes to meet a continuance of the generous patronage accorded the several companies in the past.

A heavy rain storm at Syracuse, N. Y., on the night of June 6th caused seven washouts on the lines of the Syracuse Rapid Transit Railway Co.



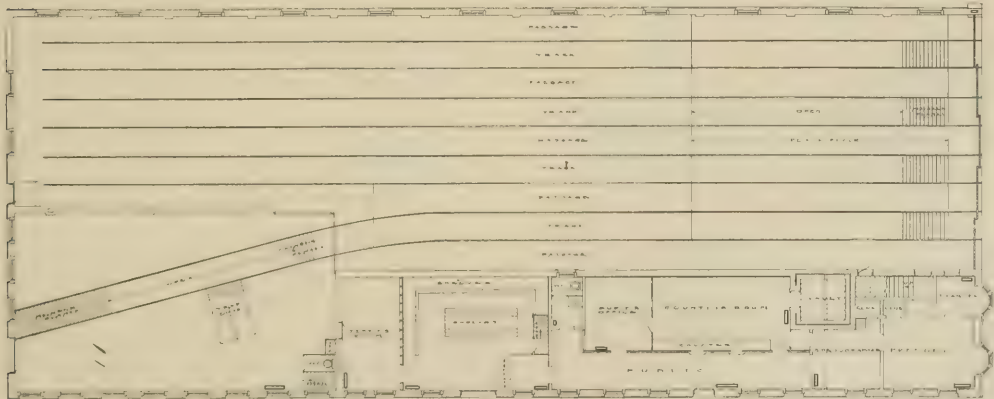
## NEW CAR HOUSE FOR FOND DU LAC ROAD.

The Fond du Lac Street Railway & Light Co. has just completed a new office building and car house, shown in the accompanying illustrations, for which we are indebted to Mr. T. F. Grover, president of the company. The company's machine shop are also located in the building. The structure was built at a cost of about \$20,000 and is of cream-colored pressed brick, and its appointments have been made as complete as possible for a small street railway system. The building is 170 ft. deep and 70 ft. wide and contains four tracks, and provision is made so that



CAR HOUSE AND OFFICE BUILDING, FOND DU LAC.

the building can be extended to the north and four more tracks added at any time. From the floor plan herewith illustrated, it will be seen that the company has dispensed with all transfer tables and has its repair shop in the southwest corner of the building. Cars may be run over the pit in this repair shop, which has a movable rail opposite the trap door shown, and allows dropping the car wheels, motors, etc., into the pit. They are then drawn up through the trap door. There is also a pit under each track as it enters the barn allowing the cars to be inspected as they come in and go out. These pits are all of concrete and are provided with



PLAN OF GROUND FLOOR.

water connections for cleaning cars and steam coils for heating in the winter.

The general offices are on the main floor, the second story front being for a motormen's and conductor's waiting room. The remainder of the second floor is used as a storeroom.

The car barn doors are all hung with Coburn track and hangers and may be moved from one end of the barn to the other with ease. The company now operates thirteen motor cars and five trail cars. The plans for the new car house were prepared by H. J. Esser, architect, of Milwaukee.

Five hundred trainmen of Metropolitan company, Kansas City, have a kod for permission to wear lighter uniform blouses

## OHIO NOTES.

The Stark Electric Railway Co., of Canton, has amended its charter, changing its location to Alliance, and its westerly terminus from Waynesburg to Canton.

The Columbus, New Albany & Johnstown Electric Railway Co. has begun active operations on its line from Columbus to Johnstown, in Licking County. The road is ably financed and all the details for its completion have been arranged. The officers claim they will have cars running as far as Gahanna by early fall.

The Columbus Railway Co. has opened up an important extension of its lines to the steel plants and glass works in the southern part of the city. The extension brings into closer relation with the city proper a growing and important section, and the event was celebrated with speeches, in which the officials of the road, the mayor and a number of councilmen took part. The local railway company is also building a number of other extensions which will prove of great benefit to various sections of the city. It has just received 12 new cars for summer traffic and has given orders for 20 more to be delivered as soon as possible.

General Manager Stewart, of the Columbus Railway Co., has reported to the county auditor the property of the road to be listed for taxation. He places the trackage within the city at \$6,500 per mile, and that outside of the city at \$2,000 per mile. This, together with other property reported by the company amounting to \$321,375, would give a total of \$805,315. The board of equalization, however, last year raised the trackage valuation to \$10,000 per mile. This appraisement was, however, enjoined and the suit is still pending. This would have put the value for taxation purposes at \$1,333,286. It is more than probable the trackage appraisement will stand at \$6,500 per mile.

The entrance of the first interurban cars into Columbus, those of the Columbus, Grove City & Southwestern Ry., on June 29th,

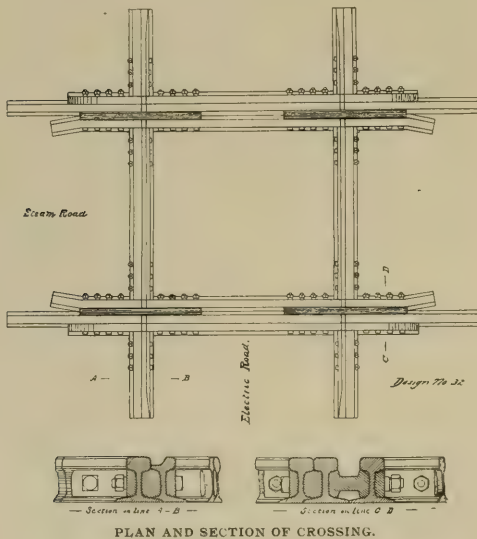
was celebrated with considerable eclat. They made their first appearance amid the plaudits of thousands of people along the line, the firing of cannons and the waving of flags. There were three cars in the train and each was filled with prominent city officials and officers of the road. The formal exercises commemorating the event were in charge of the members of the Hill Top Association, a West side improvement association that has done much to facilitate the efforts of the interurban railway promoters. Addresses were delivered by W. B. Poits, of the Hill Top Association; ex-mayor Swartz, Mayor Hinkle, J. Y. Bassell, secretary of the board of trade; Congressman Tompkins, Mr. Crum, formerly director of the law department, and Mr. Monnett, the first man in the city to grant a concession to the Columbus, London &

Springfield Electric Railway Co. The guests of the road were the county and city officials, A. G. Grant, president of the Columbus, Grove City & Southwestern, the officials of the Columbus, London & Springfield Ry., Capt. W. H. Fisher, of the Columbus Rifles, and Capt. Joseph O'Shaughnessey, of the Hibernian Rifles, the officials of the Dayton, Springfield & Urbana road, Gen. H. A. Axline, of the Urbana, Mechanicsburg & Columbus Ry., vice-president W. F. Burdell, of the Scioto Valley Traction Co., Hon. D. J. Ryan and L. P. Stephens, of the Columbus, New Albany & Johnstown Ry., President J. M. Loren, of the Columbus, Delaware & Northern, President T. A. Simons of the Columbus, Delaware & Marion Ry., and the officials of the Columbus, Buckeye Lake & Newark Traction Co.

The new road had a very auspicious opening and many of the speakers referred to the splendid opportunities and possibilities that these interurban roads have opened up to Columbus. The establishing of these roads and their future development have opened up avenues of trade that will inure greatly to the benefit of the future Columbus. The cars are large and roomy and the new road already has all the business it can possibly handle.

### STEAM AND ELECTRIC CROSSINGS.

The Indianapolis Switch & Frog Co., of Springfield, O., which makes T rail special track work for steam and electric railways has among its designs for steam and electric crossings, the design No. 32, which is herewith illustrated. It is built with easier rails,



and solid rolled filler. The corner irons are extra heavy and there are 14 bolts in each corner. On the electric track the two rails are placed together and the flangeway is planed out of the head of the guard rail. The company is glad to receive plans and submit quotations for special designs or adopted standards of any railway.

### JACKSON-GRASS LAKE LINE OPEN.

The first car over W. A. Boland's new electric line between Jackson, Mich., and Grass Lake was run June 29th, carrying President Boland and other officers of the company, the city officials of Jackson and a number of invited guests. The car left the Jackson depot at 1:30 p. m., and made the run in 40 minutes. Afterward the party was entertained by Mr. Boland at Grey Towers, his summer residence at Grass Lake.

### HALF FARES.

The Central Traction Co., of Indianapolis, has amended its articles of association, changing its name to the Indianapolis & Eastern Traction Co.

The Wilkesbarre (Pa.) Traction Co. has decided to allow its motormen and conductors to wear shirt waists of uniform style and color.

The legislature of New York has under consideration a bill providing that electric railway companies shall be invested with the same rights of condemnation granted steam railroads.

The Cleveland City Railway Co. on July 1st voluntarily increased the wages of its 800 employees. The men will receive 18, 20 and 21 cents per hour instead of 18 and 20 cents, the former scale.

The Stillwater (N. Y.) Mechanicsville Street Railway Co. has arranged to enter Albany and Troy over the lines of the United Traction Co. The traffic agreement will go into effect before August 1st.

The Schuylkill Valley Traction Co. has placed 350 poles on its line between Norristown, Pa., and Collegeville. A new ten minute schedule will soon be put in effect over this branch of the company's system.

The Worcester (Mass.) & Milford Street Railway Co. has obtained a franchise through Hopedale, a grant which has been pending for six years. The company's line will now be extended through Upton and Hopedale.

The Great Falls (Mont.) Street Railway Co. has furnished its motormen and conductors with new uniforms of dark gray cloth. Service stripes will be worn on the sleeves, each stripe signifying three years of service.

The United Traction Co., of Albany, N. Y., has completed its new car house at Albia. The structure is of brick and will accommodate 90 cars. Shower baths and other conveniences for the men have been provided.

The 30 linemen employed by the Cincinnati Traction Co. went out on strike July 1st for an advance in wages. Their places were filled by promotion and the company experienced no inconvenience from the strike.

Cars of uniform size and color will be put on all the Mellon lines at Pittsburg; and all cars operated by this syndicate are being equipped with a new system of safety brakes, which the Westinghouse company is furnishing.

Sunday, June 16th, the receipts of the Brooklyn Rapid Transit Co. from fares alone exceeded those of any other day this season. The cars running to Coney Island, Manhattan and Brighton Beaches were crowded during the entire day.

The Pennsylvania secretary of state has secured an appropriation of \$1,500 for extra clerk hire said to be necessitated by the work of recording the franchises recently granted street railway companies under the Focht-Emery acts.

The Richmond (Ind.) Traction Co. has purchased the Union Traction Co.'s abandoned power station apparatus at Marion and will remove it to Richmond, where it will be used for the operation of the projected interurban line.

Preliminary work on the Hudson River tunnel which is being constructed from the Jersey shore to New York is already completed. The English contractors, Pearson, Sons & Co., are represented by Simon Stern, of New York City.

The Richmond (Va.) & Petersburg Electric Ry., 22 miles in length, connecting the cities named in the title, is nearing completion. The transportation of agricultural products will constitute an important feature of the company's business.

Buffalo parties, whose names have not yet been published, are reported to be negotiating for the purchase of the Buffalo, Hamburg & Aurora Electric Ry. Attorney John S. Rockwell, representing the company, is quoted as authority for the report.

It is announced that 20 miles of the new Delaware General Electric Ry. between Dover, Del., Smyrna and Frederica, will be in operation by July 24th, and that material for the construction of 40 miles more will soon be delivered and work resumed.

In lieu of passes, the Cincinnati Traction Co. will issue a series of colored tickets to those persons entitled to ride free over its lines. Complimentary tickets will be red; employees' tickets will be white, and those issued to women for any reason will be blue.

It is believed that the interurban electric lines entering Indianapolis will, within a short time, handle a large portion of the mail that goes into the city, and that the street railway mail service may reach its highest development on the interurban lines of Indiana.

A New Jersey court has sentenced a young colored man to three years in state's prison for flinging missiles at a car on the Bayonne line. The misdemeanor was committed on May 24th and nearly resulted in the death of a woman passenger who was hit by a stone.

The Manchester (N. H.) Street Railway Co. gives elaborate public entertainments at the lake pavilion during the summer. An excellent company has been engaged to sing the standard comic operas, and the public has thus far testified appreciation by most liberal patronage.

The committee on railroads in the Connecticut legislature has reported a bill providing the railroad commissioners shall have supervision of street railways as to public safety, and that appeals from the town, borough and city authorities shall be made to the railroad commissioners.

The Troy (N. Y.) New England Railroad Co. on June 24th inaugurated its summer schedule, based on connections made by its cars with those of the United Traction Co. At the Averill Park pavilion there are music and dancing every week day afternoon and evening, and sacred concerts on Sunday afternoons.

The Columbus (O.) Railway Co. on July 1st announced that the wages of all the employes in its transportation department would be increased  $\frac{3}{4}$  of a cent an hour. Men in the service for the first three months will receive  $16\frac{1}{2}$  cents an hour; for nine months, 17 cents, and for a year and over, 18 cents.

The Lexington & Boston Street Railway Co. presents a beautifully illustrated folder entitled "The Route of the Minute Men." Historic scenes along the line from Lexington to Concord, Bedford and Lowell are reproduced in half-tone and together with an interesting narrative constitute a novel and attractive book.

The Brooklyn Rapid Transit Co. has contracted with the post master general at Washington to transport letter carriers in uniform over its lines for \$9,000 per year. Last year \$10,543 was paid by the postal authorities for the transportation of carriers over the Brooklyn lines. The new arrangement was effective July 1st.

The Auburn Belt Line Street Railway Co. has withdrawn its application for a franchise through Leicester, Mass., in favor of the old Rochdale & Charlton Depot Co. The latter and a recently organized local company are petitioning for a franchise in Leicester, proposing to build an interurban line from Rochdale to Leicester by way of Greenville.

The Sharon & New Castle Electric Railway Co., at a recent meeting in Youngstown, O., elected the following directors: H. W. Whipple and George W. Penhale, of New York, and M. A. Norris, Harry C. Hamilton, S. D. L. Jackson and Randall Montgomery, of Youngstown. The directors elected the following officers: H. W. Whipple, president; M. A. Norris, secretary, and O. W. Bright, of New York, treasurer.

The Steubenville (O.), Mingo & Ohio Valley Traction Co. will increase the wages of its motormen and conductors to 20 cents per hour so soon as the extension to Brilliant shall be in operation, which will be about July 20th. Superintendent Lipphardt is also considering cutting the runs of motormen and conductors from seven to five round trips daily, an arrangement which will not affect the length of the working day.

A through parlor car service over the Nostrand and Flatbush avenue surface lines of the Brooklyn Rapid Transit Co. for the convenience of patrons bound for Brighton Beach was inaugurated June 23d, and has proved a most popular innovation. The cars are luxuriously appointed and are furnished with comfortable wicker easy-chairs. Parlor car passengers are charged a fare of 25 cents from Fulton ferry to the beach.

In the case of J. F. Watson vs. the Fairmount (W. Va.) & Clarksburg Electric Railway Co., the supreme court decided that under the charter and franchise granted the company there is no restraint, and that the company may construct its line through any street in Fairmount which shows a width of 20 ft. The decision reversed the order of the circuit court, and proceedings were dismissed with costs to Mr. Watson.

The Vicksburg Railroad, Light, Power & Manufacturing Co., of Vicksburg, Miss., held its annual meeting on July 3d and re-elected the old board of directors. A vote of thanks to J. Z. George, general manager, and M. J. Mulvihill, secretary, for their efficient management of the affairs of the company was adopted. The month of June, 1901, showed an increase of 40 per cent over June, 1900, the results of operation being very satisfactory to the company.

The electric funeral car in St. Louis is still causing dissension in the St. Louis Livery Stable Keepers' & Undertakers' Association. Resolutions against the funeral car were adopted and one member of the association who expressed himself favorably to the innovation was threatened with expulsion. He has obtained a temporary injunction restraining the executive committee from expelling him, and has filed a suit for \$10,000 damages for interference with his business.

The newly chartered rapid transit companies proposing to build elevated and underground railways in Pittsburg have opened a suite of offices in the Lewis block in that city and are holding daily meetings at which the engineering problems involved in the traction projects are discussed. Thomas S. Bigelow, president, and R. R. Quay, treasurer, make their headquarters in the same building. Their engineering forces are for the present under the direction of Gaylord Thompson.

The New Jersey & Staten Island Junction Railroad Co. is securing rights of way for a two-mile tunnel which is projected to extend from Stapleton, Staten Island, under the Narrows, to 65th street, Brooklyn. The tunnel is estimated to cost \$3,000,000, and the further plans of the promoters include the construction of a street railway extension from the Brooklyn terminus to connect with the Long Island R. R. Mr. Stephen M. Hoye, of Brooklyn, is president of the company.

The following comparative statement for the months of May, 1900 and 1901, has been issued to the stockholders of the Consolidated Traction Co., of Pittsburg, Pa.: Gross earnings from operation, \$264,382; last year, \$249,711. Operating expenses, \$120,106; last year, \$123,349. Net earnings from operation, \$144,275; last year, \$126,362. Total net earnings and other income, \$173,010;



last year, \$155,756. Total income deducting taxes, rents, etc., \$109,644; last year, \$94,013. Interest on bonds and dividends on preferred stock, \$86,393; last year, \$86,719. Surplus, \$23,251; last year, \$7,294.

A verdict for the defendant was returned last month in a suit brought against the North Chicago Street Railroad Co. by Oliver W. Nixon. Mr. Nixon sought to receive \$10,000 damages for injuries he received Oct. 5, 1898, while riding on a North Clark street cable car. He declared that the breaking of a hanging strap was the cause of the injuries for which he sued.

The Milford (Mass.), Woonsocket & Attleboro Railway Co. will utilize the North Attleboro branch of the New York, New Haven & Hartford road to gain an entrance into Attleboro from Plainville. The branch is to be abandoned by the New Haven corporation so soon as its new line from North Attleboro to Valley Falls, R. I., is completed. The Milford, Woonsocket & Attleboro company will equip the line for electric traction, and a direct service from Attleboro to Woonsocket will be inaugurated.

Alderman Goldzier, of Chicago, has evolved a scheme for lowering the tunnels for the city at the expense of the street railways. He thinks the Sanitary district ought to do the work as it has the money to do it expeditiously. To provide means for reimbursing the district, the alderman proposes to pledge the city to provide in any franchise extension ordinance that may be passed that the North and West Side traction companies shall use the tunnels and pay for them. The alderman does not propose to ascertain whether the companies desire to use tunnels. His plan is to force them to pay for them as a part payment for the franchises. Mr. Goldzier's tunnel-lowering plan would cost \$2,000,000.

#### MORE RAILWAYS IN LONDON.

The London, England, county council on June 25th decided to expend £2,000,000 on building and equipping new electric railways in various parts of the city, and on widening the streets through which the lines will pass. A bill is under discussion of the parliamentary committee authorizing the introduction of electricity as the motive power of the Metropolitan District railway by arrangement with the new company of which Mr. Yerkes is the head. It has been announced that £600,000 of the £1,000,000 capital of the company has been subscribed, and that Mr. Yerkes and his associates are ready to subscribe the remaining £400,000.

#### FT. WAYNE & SOUTHWESTERN SOLD.

The McKinley syndicate on June 9th purchased the franchises and property of the Ft. Wayne (Ind.) & Southwestern Traction Co. and expects to include in the system some 200 miles of interurban electric railway. Townsend & Reed had the contract for building between Ft. Wayne and Huntington, will complete this work; it is intended to have cars operating on this section by September 1st.

The officers of the company are: President, W. B. McKinley; vice-president and general manager, S. L. Nelson; secretary and treasurer, George E. Macomber.

#### CHANGES AT SALT LAKE.

Mr. A. W. McCune is reported to have purchased 2,354 shares of stock, formerly held by the Francis Armstrong estate, in the Salt Lake City Railroad Co., for a price which is believed to have approximated \$106,000. The purchase will give him considerably over two-thirds of all the shares. Mr. McCune resigned as president of the Salt Lake City Railway Co., at a directors' meeting June 26th, and will be succeeded in that position by Mr. Charles L. Rood. The resignation of William F. Armstrong as a director of the company was also received and accepted. At the same meeting the directors passed a resolution increasing the wages of all motormen and conductors having been in the service of the company three years and over from 19 to 20 cents an hour.

#### CARS FOR SHARON-YOUNGSTOWN LINE.

The Sharon-Youngstown and the Sharon-Wheatland Street Rys., the extensive interurban system nearing completion in Pennsylvania and Ohio, will shortly be in full operation, its quota of rolling stock comprising 60 cars. Fifty-four large and modern cars have been received at Sharon and Youngstown and a number of these will be put into service at once. Electric lights are placed over each seat for the convenience, in the evening, of passengers desiring to read; and each car is equipped with electric push buttons.

#### THE EVERETT-MOORE SYNDICATE ROADS.

For some time past there has been a great deal of activity in sections of Ohio and Michigan in the consolidation of existing street railway systems and the projecting and building of new lines which will practically cover the territory in the neighborhood of Detroit, Toledo and Cleveland and which will include lines reaching as far, it is stated, as Pittsburg. About two years ago the Everett-Moore Syndicate commenced acquiring the street railways in this territory. Recently the purchase of all the street railways in the city of Toledo was consummated by the syndicate, the purchase price being \$12,000,000. The same interests have just secured practical control of the Toledo & Monroe Ry., and negotiations are said to be on foot which will bring the Cleveland City Ry. under the same control. Among the other recent operations of the syndicate have been the consolidation of the Detroit & Toledo Shore Line and the Detroit & Toledo Short Line, the purchase of the Miami & Erie Transportation Co. and the Detroit & Pontiac road. It is stated that negotiations are also under way for the purchase by the syndicate of the Detroit, Rochester, Romeo & Lake Orion road, the Detroit, Romeo & Utica road and the Detroit, Ypsilanti & Ann Arbor Ry. It is also stated that the Mahoning Valley line is now practically in the hands of the syndicate and that all these roads will be merged into one system, known as the Cleveland, Pittsburg & Detroit Traction Co., which will extend from Pittsburg to Port Huron.

#### PAVING TAXES IN SYRACUSE.

A recent decision of the New York Appellate Court requires the Binghamton (N. Y.) Street Railroad Co. to pay for only one-fifth of the pavement between its tracks on the newly completed Front street extension. In 1892 the company entered into a contract with the city to pay for one-fifth of the pavement between its tracks, but when the city commenced to collect assessments from the Front street property owners to cover the expense of paving, action was brought to require the city to collect under the state railroad law, which requires that street railway companies pay for all the pavement between their tracks and for two feet on each side. It was alleged that the contract of 1892 between the city and the Binghamton Street Railroad Co. was illegal. The decision of the Appellate Court reaffirms the judgment of the lower court and holds that the contract of 1892 is perfectly legal. The complaint was dismissed with costs to the taxpayers.

#### OIL CUPS OF TROPENAS STEEL.

The Sargent Co., Chicago, has issued a new folder illustrating the oil cups which it manufactures. These cups are made of the tropenas steel and can be supplied in large or small quantities. Their appearance after distortion as shown in the photograph which the folder contains, testifies to the quality and toughness of the metal.

#### DO YOU EXPECT TO TAKE A VACATION?

If so, it will be to your interest to secure one of the beautiful books just issued by the Passenger Department of the C., H. & D. Ry. on "Tours to Northern Summer Resorts and the Pan-American Exposition." These books will be furnished on application to any C., H. & D. representative or by addressing D. G. Edwards, P. T. M., Cincinnati, Ohio.

## ECHOES FROM THE TRADE

THE W. T. VAN DORN CO., of Chicago, has received an order for 100 sets of couplers for the cars of the Manhattan elevated railway.

CROMPTON & CO., LTD., formerly at Mansion House Buildings, London, E. C., removed their head offices on June 10th to Salisbury House, London Wall, E. C.

THE G. C. KUHLMAN CAR CO., of Cleveland, O., was awarded the contract for 30 double truck cars for the Aurora, Elgin & Chicago interurban lines; the cars will be mounted on Peckham M. C. B. trucks.

THE ALLIS-CHALMERS CO., Milwaukee, shipped two car loads of street railway machinery to Sidney, Australia, June 20th. The shipments made by this company during May amounted to more than \$700,000.

THE BURT MANUFACTURING CO., of Akron, O., has recently installed several "Cross" oil filters in the New York City public school buildings. The field for these filters is unlimited, and they show a saving wherever oil is used for lubrication.

THE IRONSIDES CO., Columbus, O., states that the United States government, after a thorough test which demonstrated protection from corrosion incident to salt water exposure, now lays up all wire rope hawsers for the navy in Ironsides wire rope filler.

THE FILER & STOWELL CO., of Milwaukee, Wis., has recently secured orders through its Chicago agent, Mr. Frank Engelhardt, for a 3,000-h. p. heavy duty engine for the Inland Steel Co., Chicago, and a 700-h. p. cross compound condensing heavy duty engine for the Grand Rapids Railway Co., Grand Rapids, Mich.

THE EUGENE MUNSELL CO. and the MICA INSULATOR CO., of Chicago and New York, who are the largest dealers in mica and manufacturers of "Micanite," "M. I. C." compound and "Empire" cloth and paper, report that business both in Chicago and New York has been exceptionally good during the past six months.

"GRAPHITE" for July, published in the interest of the Joseph Dixon Crucible Co., Jersey City, N. J., contains a number of readable technical articles and much good comic matter. "Graphite" accomplishes its purpose of establishing a better understanding in regard to the different forms of graphite and their uses.

BERRY BROTHERS, Ltd., of Detroit, are the manufacturers in the United States of a line of railway car varnishes and it is scarcely too much to say that they have no competitors in this field. The company has offices in New York, Boston, Philadelphia, Baltimore, Cincinnati, Chicago, St. Louis and San Francisco, the main office and factory being at Detroit.

W. S. DAVIS & SON, of Concord, N. H., who are making tower wagons for street railways, have produced a type of wagon which is specially convenient for the erection and repairs of overhead work. These wagons are neat in appearance and are provided with desirable adjustments for facilitating the work of the linemen. The company will be pleased to furnish illustrations and prices of these wagons on application.

THE MAYER & ENGLUND CO., of Philadelphia, reports that despite the warm weather orders have been pouring in at such a rate as to tax the capacity of its factory to the utmost. The demand for the Mayer & Englund rail bond is particularly large, this bond seeming to meet with the especial approval of companies which

have had trouble with bond thieves stealing the bonds where exposed types have been used.

THE JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J., mailed under date of June 25th postals calling attention to the durability records of Dixon's silica-graphite paint which has been used for 38 years in all climates with entire satisfaction. A feature of the protective paint market is the price of linseed oil. The steady advance in the cost of pure oil and pigments has caused the market to be flooded with adulterated paints.

THE BRILL CONVERTIBLE CAR is the title of a pamphlet published by the J. G. Brill Co., of Philadelphia and London, which is now in its third edition. The catalogue is devoted to this type of Brill cars which have been published and illustrated from time to time in the columns of the "Review." This company was the only American exhibitor at the Paris Exposition of 1900 to which the Grand Prix was twice awarded, once for its system of motor trucks and a second time for its convertible car.

THE AMERICAN ELECTRICAL WORKS, of Providence, R. I., never permits a national holiday to pass without sending some unique reminder of the day to its friends and customers, and in the past has received many compliments on originality and good taste displayed in designing its souvenirs. For July 4, 1901, the company sent out a particularly attractive folder illustrating Independence Hall and giving a brief history of the building and the principal events of which it was the scene.

THE CENTRAL ELECTRIC CO., of Chicago, is western agent for the Falcon Electric Manufacturing Co.'s are lamps, panel boards, plugs, receptacles and fan motor. This company wishes to call particular attention to this fan motor as a high class article of neatness, durability and reasonable price. This fan motor is provided with universal joint, which makes it adjustable for either wall or desk use, and is fully described in the Central's 1901 fan catalogue, which it will send to anyone upon request.

THE GOULD STORAGE BATTERY CO., having recently completed a large addition to its works, is now catching up to the orders, and will soon be able to make prompt deliveries. The electric vehicle type of battery of this company's make gives 100 ampere hours for 20 pounds of completed cell, which is a result never before realized in batteries of the substantial electro-chemical formation, which is, of course, remarkable, since even "paisted" types scarcely do as well, yet labor under the disadvantages prone to "paisted" processes.

THE PETTIBONE BROS. MANUFACTURING CO., Cincinnati, O., makers of caps and uniforms, has issued its special circular No. 244 containing a brief and interesting history of the development of its extensive business since the firm was founded in the early sixties. The circular contains a number of testimonials from military and fraternal organizations, and a guide to the catalogs which have been issued. "Special Correspondence" is the title of a periodical published by the Pettibone company for the benefit of the fraternal press.

THE WESTERN ELECTRICAL SUPPLY CO., of St. Louis, reports that its electric railway department is being crowded with orders, and that the demand for overhead material of the Ohio Brass Co. make, for which it is exclusive territorial agent, has been exceedingly large. The company is also exclusive agent for the Lawton "Peerless" fender, and reports that after a series of tests this fender has demonstrated itself to be one of the safest, strongest and most practical fenders on the market. It has placed these fenders with a number of railway companies and in every instance they

have given the highest satisfaction. The Western Electric Supply Co. issues one of the most complete electric railway catalogs in the business, which will be mailed on application.

THE NEW HAVEN CAR REGISTER CO. is now placing on the market a new type of trolley catcher, which is very simple in design. This trolley catcher has been used for some time on the street railways of New Haven and has proved extremely satisfactory. The reputation of the New Haven Car Register Co. for excellence of construction in its registers is a guarantee that other devices made and recommended by it will be thoroughly reliable.

THE COMPRESSED AIR CO., of No. 621 Broadway, New York, has recently purchased the Rome Locomotive & Machine Works, of Rome, N. Y., where it is investing a large sum in new machinery and apparatus to bring that plant to a thorough up to date condition. These works are at present engaged in building air locomotives, air cars and noiseless air brakes for street cars. The company has just completed an improved type of air locomotive to be tried on the Brooklyn Rapid Transit elevated railroad. The compressing station for this test is already nearly completed.

PORTER & BERG, successors to McGill, Porter & Berg, Chicago, report having closed a number of nice contracts for I-T-E circuit breakers within the past few months. I-T-E stands for the very best and these circuit breakers have an enviable reputation. A number of other large orders for pole brackets and overhead material have also been received by this firm. They represent the Ohio Brass Co., manufacturer of goods of this character. The many other well known specialties handled by Porter & Berg in the railway department are finding a ready sale among street railway companies.

THE PANTASOTE CO., 29 Broadway, New York City, has been distributing to the trade a very unique and acceptable souvenir in the shape of a small image which is a reproduction of his Satanic Majesty, the "Lincoln Devil," who has occupied a position over the entrance to Lincoln Cathedral, Lincolnshire, England, for many hundred of years. His occupation is to frighten away all evil spirits or ill luck, and when good fortune once enters the door, it is there for good, as he never allows it to escape. The company is to be congratulated on being able to present its friends with so desirable a talisman.

THE BRUSH ELECTRICAL ENGINEERING CO., which has its London offices at No. 49 Queen Victoria St., has recently been successful in obtaining several large contracts for switchboard work; among these we may mention the whole of the sub-station high and low tension switchboards required for the extensive three-phase installation of the city of Dublin, the complete high-tension switchboard for the new station of the Leicester Corporation, and the traction board for the Middleton Corporation. The Brush company builds every description of electric light and power apparatus and contracts for installation work on any scale.

THE PECKHAM MANUFACTURING CO. has recent orders for its heavy double trucks from the following interurban electric railway companies: Little Miami Traction Co.; Cleveland, Elyria & Western; Cincinnati, Lawrenceburg & Aurora; Omaha & Council Bluffs Railway & Bridge Co.; Columbus, Delaware & Marion Electric Ry.; Aurora, Elgin & Chicago Ry.; Mahoning Valley Ry.; Toledo & Monroe Ry.; Toledo & Western Ry.; Saginaw Valley Traction Co.; Columbus, Buckeye Lake & Newark Ry.; Youngstown & Sharon Ry.; Jackson & Suburban Traction Co. The trucks which the Peckham company has designed for heavy interurban service have given excellent satisfaction wherever used.

THE NEW PLANT of the B. F. Sturtevant Co. at Hyde Park, Mass., sketch plans for which are now well under way, will probably provide about eight acres of floor space, fully double that existing in the old plant at Jamaica Plain. Nearly one-third of this area will be devoted to the manufacture of engines, motors and generating sets. The recent growth of this department has been

almost phenomenal and it is in this field—particularly in the application of Sturtevant motors to Sturtevant fans—that the most rapid growth is expected in the immediate future. The entire plant will be equipped with Sturtevant generating sets and motors for direct driving of line shafts and of large individual machines.

GEORGE W. LORD, manufacturing chemist, 2238 to 2250 N. 9th St., Philadelphia, announces that his European business has increased in the past few years to such an extent that it has been decided to establish a number of additional branches at several points in Europe. These branches will be in charge of American managers and salesmen, and will be equipped with the latest improved American office appliances. As heretofore, all goods sold will be manufactured in Philadelphia, but a stock of chemicals, prepared specially for the waters used in the steam boilers of the various districts, will be carried by each branch. The manager of the sales department will sail on July 20th to visit the old agencies and to make the preliminary arrangements for locating the new offices.

A. M. MORSE, contracting engineer, Marquette Bldg., Chicago, Ill., reports activity in sales of corliss engines, notwithstanding the fact that shop deliveries are disappointing, because of the large volume of business. The demand for corliss engines of medium size continues and is not confined to street railway work. Among some of the engines he now has under construction is an 800-h. p. compound condensing engine for the Rialto Elevator Co., South Chicago; a 250-h. p. compound condensing engine for the Stover Manufacturing Co., Freeport, Ill., and two 500-h. p. condensing engines for the New England Elevator Co., at Portland, Maine. The new 600-h. p. corliss engine direct connected to a 400-kw. generator running at 100 r. p. m. is now installed in the plant of the Alton (Ill.) Electric Railway Co., making the seventh engine Mr. Morse has furnished the Alton company.

THE BAKER HOT WATER HEATERS, which have been used for many years on the steam roads of this country, are coming to be employed extensively for heating electric cars, and they possess a number of advantages for this service. In the Baker system, hot water pipes run around the car and at the feet of every passenger, insuring a perfect distribution of air, heated to an agreeable temperature at all times. The system is in use on the Twin City Rapid Transit lines, the Milwaukee Electric Ry., the interurban lines running out of Detroit, and on numerous other roads. Since the death of Mr. W. C. Baker, announced in a recent issue of the "Review," the business has been carried on under the management of his daughter, who has already succeeded in securing many new customers. The headquarters of the concern are at 143 Liberty St., where the business is run under the old name of W. C. Baker.

THE NEW PROCESS RAW HIDE CO., of Syracuse, N. Y., recently received the following letter from the Goss Printing Co., which speaks for itself: "The experience we had with your rawhide pinions last year at the Paris Exposition we presume will be of great interest to you as their performance was a very remarkable one. These pinions were used on an electric motor which operated one of our four deck straightline Goss newspaper perfecting presses, on which we printed the daily Paris edition of the New York Times. We were going along smoothly one afternoon, running off the paper in fine shape with a big crowd looking on, and much interested in the work of the press, when, all at once, the whole press seemed to take a jump upwards, and we thought the whole machine was broken and disabled. The power was shut off at once and upon examination we found the teeth of one of the cast iron gear wheels had broken out; these teeth were imbedded in the rawhide pinions. The pinions themselves were not injured except for the iron teeth pounded into them. These we picked out and ran the same pinions and finished not only that day's edition, but they were used until the end of the Exposition and were not worn out then. We afterward found the cause of the sudden change in speed to be in their changing motors at the power station. We are pleased to write this very strong endorsement of your New Process Pinions for we feel that you deserve it."





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#### CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

#### DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to *The Review*, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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In view of the fact that the annual convention of the American Street Railway Association will be held on October 9th, 10th and 11th, a few days only before our publication date, the regular September issue of the "Street Railway Review" will be made the Convention Souvenir number; the date of publication will be delayed somewhat, however. This arrangement will enable the "Review" to be delivered to our readers several days before delegates start for the convention.

As has already been announced, one of the features of the New York convention will be the "Daily Street Railway Review," which will be issued each morning from October 9th to 12th inclusive, the three days of the convention and on Saturday. The "Daily" will have reports of the association meetings, the register of those in attendance, descriptions of the exhibits and full accounts of the convention. These four issues, in addition to the wide circulation they will have at New York, will be mailed daily to all our subscribers and reach every street railway company in the world, and thus give the first reports to those who stay at home, as well as to those in attendance.

Last year after the Kansas City convention we received a great many letters from all parts of the country testifying to the high appreciation of the writers for the enterprise of the "Review" which enabled them to secure prompt and complete reports and thus keep in close touch with the work of the associations. Such unqualified praise could not but be gratifying to us because it showed that our efforts have been recognized.

The "Daily Review" ceased to be an experiment after its first issue at Chicago in 1899, last year it was an even greater success though published over 400 miles from our home office, and this year we venture to promise the best Daily of all.

The delights of a trolley ride in extremely hot weather are greatly appreciated by all classes of people, and many of the street railway companies made a practice of distributing complimentary

tickets through various charitable associations in their respective cities, the intention being that children particularly shall have the benefit of the trolley rides. The difficulty in preventing unscrupulous persons from taking advantage of the company has undoubtedly restrained other roads who would like to extend similar privileges. The action of the St. Louis Transit Co., which last month offered to carry children under ten years of age to the city parks free of charge upon presentation of a physician's certificate that an outing would be beneficial, may prove suggestive to other companies.

This offer was taken advantage of by a large number of children directly upon its announcement, and the number was still further augmented by the action of the physicians of the city in generally agreeing to issue the certificates without charge. It is probable that the certificates will be dispensed with eventually, as arrangements are under consideration whereby the St. Louis Provident Association will send the children to the parks, the railway company supplying the transportation. The company only wishes the assurance that the children carried are worthy poor. This assurance coming from the Provident association will be quite as satisfactory as the doctors' certificate plan.

The act of the Ohio Legislature authorizing steam railroads to use electricity as a motive power has resulted in a suit, recently decided by a lower court, which presents some interesting points. A company sought to secure a right of way over about 6½ miles of streets in Cincinnati by condemnation proceedings. The main point at issue was the legal status of the interurban road, the company claiming that steam railroads having been authorized to use electricity, the difference between steam railroads and electric street railways had been practically destroyed, and therefore an appropriation of the streets under the railroad law was permissible. The ordinance which the company sought specified the use of girder rails such as are ordinarily used by street railways and provided for a maximum fare of 5 cents within the city limits, and that not more than two cars were to be used in any train. It was also provided that no stop of over five minutes should be made in front of any property. Many of the streets desired for this railroad are occupied with the tracks of the present street railway system of the city.

It was claimed by the city that this plan was a scheme whereby the various interurban traction companies which have been organized, and in some cases are in operation, could gain entrance into the city without making themselves liable as street railways to various city ordinances. In other words, it was argued that the railroad company was seeking to evade the responsibilities of a street railway in regard to license fees and taxes and ignored altogether the rights of abutting property owners.

The city's contention was upheld by the court, which found that a railroad company, under the laws of Ohio, has a clear right to obtain title by appropriation of a street for crossings and for entrance to a city in reaching its terminal point, but this right of appropriation, under the law, does not exist in a street railroad. Both public and private interests demand that no burden shall be placed upon the streets which will exclude other and proper uses of them; the title to the streets is left to the city authorities, who have the control of all streets for street purposes. The court, therefore, finding that all the tracks of the company were to be laid upon the public streets, denied the application. The suburban railways were found to be street railways in law and therefore they will not be able to gain admission to the city under the railroad law. Such lines are now left to enter the city as street railways, obtaining consents of property owners and the municipal authorities, or to make some arrangement to enter over the tracks of existing city lines.

That steam railroads feel the effect of the competition of the electric interurban railways in many localities is becoming very evident by the numerous plans adopted in different places to overcome this opposition. Mention was recently made in the "Review" of several cases where the steam roads have either bought out their electric rivals or established a parallel system to their own to forestall competition, as well as instances of reducing fares and increasing the number of trains, all of which methods, however, are costly for the steam road and have had but little appreciable

effect on the development of interurban lines. A new remedy has just been suggested by the general manager of the Pere Marquette Railroad, Mr. S. T. Crapo, which consists of establishing second and third class cars with relatively low fares on regular trains. There would be three classes of tickets and the only difference to passengers would be in the accommodation furnished. The author of this plan believes that by making better time than the electric cars can possibly make, coupled with a low rate of fare, the competition of the electric roads could be met and overcome, but experience has proved this to be a fallacy because where fares have been reduced on first-class coaches to meet those of trolley lines the latter have retained their proportion of the traffic and would certainly not be injured by the advent of third-class coaches against which a certain amount of prejudice frequently exists.

To a certain extent the traffic of interurban roads is not drawn from the steam roads for the reason that the trolleys create a new business in the direction of pleasure rides, particularly during the warm season, but aside from this the difference in the service of a steam and a trolley road will divert a certain class of passengers to the latter without regard to the speed or the rate of fare. One principal reason for this is the difference in the terminal facilities of the two systems. The steam road passenger must make his way to the depot where he boards the train, which is seldom in the center of either the business or residence district of a city, and he must leave the train at the depot at the next city which is likely to be situated at some distance from his eventual destination. The trolley passenger on the other hand boards a car in almost any part of the city in which he finds himself, and either directly or by transfer reaches any desired point in the next city, and he can also board and leave the car at any point which suits his convenience without being obliged to terminate his ride at a special depot. The loss of time and the effort of walking to and from a depot at either end will often more than offset the advantage of the greater speed of the steam road. Another advantage of the trolley which cannot be generally met by the steam road is the frequency of the service. Its lower cost of operation makes it possible to operate trains of one or two trolley cars at short intervals, much more frequently than it would be possible to operate steam cars with any economy. A passenger can therefore often save time by taking the slower running trolley rather than by waiting a longer time for a faster steam train. It seems evident therefore that no inducements that can be offered by steam roads will be sufficient to divert from the trolleys that class of traffic to which they are particularly adapted.

The question of speed regulation for electric cars as well as for all other styles of vehicles is one which properly comes under the jurisdiction of the local authorities of the communities in which such vehicles are operated, but such regulations are practically never strictly enforced except in some special locations, where crowded streets or other causes make the use of high speeds specially dangerous. Twelve miles an hour may be taken as the average limit placed upon vehicles within city limits, with the exception of some congested districts, where eight or ten miles is prescribed. The only consideration which should limit the speed is the question of safety, but in Watervliet, N. Y., a speed ordinance was introduced in June which was so arbitrary that the court has refused to sustain it. For a long time past the United Traction Co., which operates the railway lines in Watervliet and several neighboring cities, has been selling reduced rate street car tickets, but a few weeks ago the sale of these tickets was stopped by the company, which resulted in a slight increase in the rate of fare. While the discussion of the method to be pursued to force the company to reduce its fares and issue transfer tickets was taking place among the citizens, the common council of the city passed an ordinance fixing the maximum speed at which any cars might be run in the city at six miles an hour, although twelve miles per hour had always been permitted previously. In a short time following the passage of the ordinance a large number of the company's motormen and conductors were arrested while operating the cars, charged with violation of the speed ordinance. Cars were left standing on the tracks and passengers were obliged to complete their journeys on foot. In one instance seventeen passengers on one car were obliged to walk to Troy, as the police, acting under orders from the mayor, had removed the controller handle, so that the car could not be operated.

The company then obtained a temporary injunction restraining

the city from enforcing the ordinance until its validity was passed upon, and in a subsequent action taken by the city to vacate the injunction, the motion was denied and the ordinance declared void. In its opinion the court states that the ordinance was one materially impairing the property rights of the railway company, and that it was subversive of the interests and convenience of passengers, not all of whom were residents of the city of Watervliet. While the claim was made that this reduction in the limit of speed was made on account of complaints made by the public in regard to the dangerous rate of speed prevailing, there was no proof that any accident ever occurred because of the higher rate of speed.

While laws regulating the speed of vehicles have been enacted by a great majority of municipalities, they are very difficult of enforcement in any case, and to avoid falling into disuse they must be reasonable and in the interest of the traveling public. In many cities no ordinances as to speed have been passed, in the absence of which the cars can be run at any speed consistent with safety, which they should be permitted to do in any case. Among these cities may be mentioned Philadelphia, Pa., Toledo, O., Wheeling, W. Va., Little Rock, Ark., Manchester, N. H., Holyoke, Mass., and Erie, Pa. In the great majority of cities there are certain crowded business centers where low speeds are required, but even in such cases it is rare that a speed of less than eight miles an hour is prescribed.

In general the question of speed may safely be left to the railway company, as the interests of the public and the company are identical. The public invariably desires to be carried as fast as is consistent with safety, and the company is equally as desirous as the public to avoid accidents, as they mean a large financial loss whenever the company's negligence can be proved. The proper speed for a car is one that will permit the motorman to keep it well in hand and which will not endanger the public using the streets with responsible care, and this is almost impossible to lay down by ordinance.

Even where speed ordinances are in effect which may be considered fair their strict enforcement is impossible, from the fact that it is an extremely difficult matter to judge the speed of a vehicle. Unless provided with special measuring apparatus no one can judge the speed with any accuracy over short distances, although the average speed over some distance can be pretty accurately gaged. It is, however, the maximum limit which is always laid down in ordinances of this class, and it is safe to say there is scarcely a bicycle rider, automobile driver or trolley car motorman in the large cities who does not violate the speed ordinances of the city every day, yet no attention is paid to such violations, except where recklessness is shown. The only rational limit to the speed of vehicles is that at which the safety of pedestrians and other vehicles is not menaced while using ordinary care, and this varies in different localities and at different times, according to the amount of travel on the streets. The question of safe speed must be largely left with the driver of the vehicle, as in some cases even six miles an hour might be dangerous, and for this reason it is useless to hamper the service of a railway company by restrictions for safety which after all depends almost entirely upon the judgment of the driver.

While most of the interurban roads handle freight, this business has heretofore been more in the nature of a small side line with them than one of their chief sources of income, and we believe that the importance of the subject has not been fully appreciated. On the lines where it has been made a specialty this branch of the business has grown rapidly, and two examples of this growth were described in the "Review" for March. These were the Rochester & Sodus Bay Railway Co. and the United Traction Co., of Albany, and we note in a recent issue of *Bradstreet's* a very flattering mention of the Cleveland & Eastern Electric Ry. which has gone extensively into the freight-carrying business. The article forecasts a very profitable future for the trolley as a freight carrying and distributing agent. It is considered that the immense expansion of the trolley system of the United States, if utilized to effect exchanges of freight between the districts connected, will constitute an addition to the transportation facilities of the country which will bring about great economic changes of benefit to all classes of society. These roads are in a position to render many hundreds of millions of dollars of services that will add very considerably to their net incomes.



## The Street Railway System of Baltimore.

**New Repair Shops and Car Barn — Trucks and Cars — Paving in the Street Railway Tracks — The Park System — The Postal Service.**

Baltimore is one of the oldest cities in the United States and was one of the first to substitute horse tramways for the old omnibus lines, the first horse car company being chartered in March, 1859. The city was also among the first to adopt cable traction, and had an electric railway in successful operation in the early eighties.

The United Railways & Electric Co., which has exclusive control of the street railway and electric lighting systems of Baltimore, was formed in March, 1890, by a consolidation of the Baltimore Consolidated Railway Co. and the Baltimore City Passenger Railway Co., both of which had resulted from various prior consolidations of companies operating in Baltimore City, Baltimore County, Anne Arundel County and Howard County.

Practically all the available streets of the city are occupied by

and the shops have been laid out with this future policy in mind. A spur track from the Baltimore & Ohio R. R. runs alongside the plant with branches into the several buildings, so that all materials arriving can be switched without unloading from the original freight cars, directly into any one of the shops or the storeroom. As the gage of all the United Railway lines is 5 ft. 2½ in., this spur track has been laid with double gage so that it may be used by either the steam or electric cars. The plant is 368 ft. wide by practically 1,000 ft. long, each of the two groups of buildings being divided by fire walls into essentially four distinct buildings all under one roof. The floor space of the entire plant covers more than eight acres. The buildings are fireproof throughout, with brick walls, and roof trusses and bracing of I-beams and channel girders. Each division



EXTERIOR VIEW CARROLL PARK SHOPS AND BARN.

tracks of the United system and there are 16 suburban lines extending to all the well populated districts within 10 miles, and controlling nearly every avenue of approach. The topography of Baltimore is such that it would be extremely difficult to put new lines anywhere. The universal fare within city limits is 5 cents with one free transfer if desired, and the service and equipment are both excellent. The system comprises 360 miles of track.

In keeping with a vigorous and progressive policy the officials of the United company have during the past year devoted a large proportion of available funds to making important changes and additions, all of which have greatly increased the value of the property as a whole and will tend to largely decrease the cost of operation.

Some of this work particularly a mammoth new car house, and repair shop, having accommodation for 800 cars is especially worthy of note as it embodies what are believed to be the latest, and for these particular conditions at least, the best ideas in street railway engineering practice.

### LARGE REPAIR SHOPS AND CAR BARN.

The new shops are located on Columbia Ave. two or three miles out from the heart of the city, and here will be concentrated all the repair work necessary to the maintenance of nearly 1,500 cars, there being room for about 800 cars in the buildings at one time. The shops have but just recently been completed and are not yet in full running order.

From the illustrations herewith it will be seen that the plant comprises two distinct groups of buildings, each having its own entrances, but so arranged that any one of the tracks of one group of buildings may be connected with any one of the tracks in the other by means of a 40-ft. transfer table, this arrangement not only giving greater flexibility in the shifting of cars than if the tracks were in one length, but also giving greater protection against the spread of fire.

The plans for the shops have been prepared by the company's own engineer, and by careful attention to minute details the company has secured a plant at exceedingly low cost and at the same time, one designed to exactly meet the requirements of the system. It is the determined policy of the management of the company to make its own supplies, build its own cars, etc., in-so-far as possible,

of the two groups has a slate roof of the monitor type, with glass ventilators regulated by chain and crank from the floor.

Under the cars and motor erecting shops and the machine shop is a sub-cellar which is utilized for repair pits and for shafting, it being the ultimate purpose to place all the shafting for the shop tools underneath the floor. Cross tracks are laid in this sub-cellar, so that small hand cars can be rolled from one side of the building



MACHINE SHOP.

to the other, carrying supplies, tools or armatures from pit to pit or from shop to shop without raising them to the shop floor.

All the tracks in the barn are laid with 6-in. rails on 12x12-in. stringers and embedded in a concrete floor. All of the floors are of concrete except in the machine and mill shops where wood is used instead. Each track has its own trolley wire hung from a hard pine trolley trough with G. E. barn hangers, and an idea of the size of the plant can be had from the fact that it took 100,000 ft. of lumber to make these troughs. A feature to which particular atten-



tion is called is the entrance curves, all of which it will be noticed are inside the buildings. There is no loss of floor space by this arrangement as the corners not occupied by tracks are utilized for closets and wash-rooms for the men. A platform or practically a second story is built in these triangular corners the upper story

No. 3 unit is located in the machine shop, and heats the machine shop and motor erecting shop.  
No. 4 unit is located in the mill and cabinet shop, and heats the mill and cabinet shop, and the car erecting shop.  
The coils for the indirect chambers consist of vertical radiators,



HALF END ELEVATIONS.

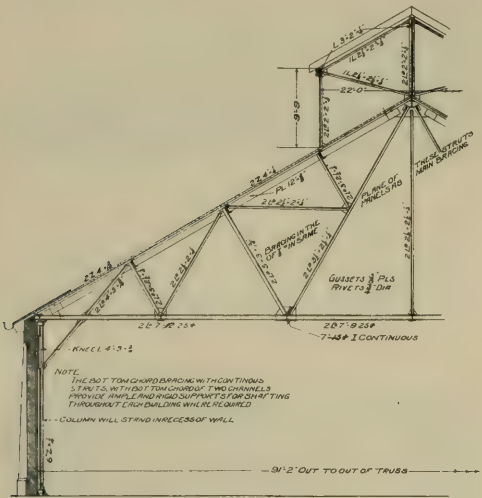
being devoted to rows of lockers in which the shop men can keep their working clothes, etc. Another feature is a number of shower baths and sprays that are fully appreciated by the employes especially in the summer months.

The heating and ventilating of this extensive plant as can be well

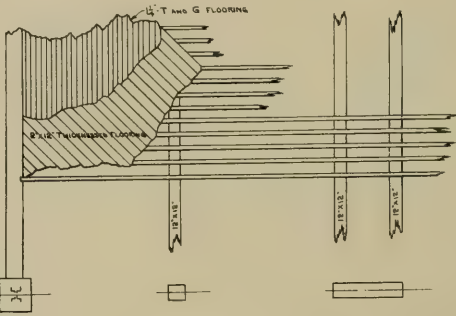
made of 1-in. wrought iron pipe, screwed into cast iron bases, which bases are divided with diaphragm and cast iron return bends at the top. These coils are divided into sections, and arranged so that any one section can be used for either exhaust or high or low pressure steam.

The blowers consist of four three-fourths housing steel plate fans, 13 ft. in diameter, with top and bottom discharge, and were made by the American Blower Co. of Detroit, Mich., and were especially designed by that company for this work. The heating surface is divided in each unit, so that each shop can be heated separately.

The blowers are attached directly to 14x18-in. engines, with a speed of 125 r. p. m.; the capacity of the blowers at this speed is 467,300 cu. ft. per minute. The four units contain 18,000 sq. ft. of radiating surface, which is divided in proper proportion, and set



ROOF FRAMING.



DETAIL OF FLOORING.

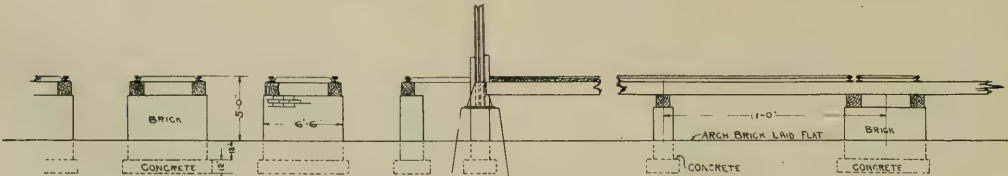
imagined, was a matter requiring careful study. The buildings contain something like 12,822,700 cu. ft. and it was thought desirable to secure one complete change of air every 25 minutes.

The heating is done by the blower system, and the plant is divided into four units, Nos. 1, 2, 3 and 4.

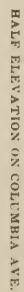
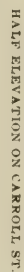
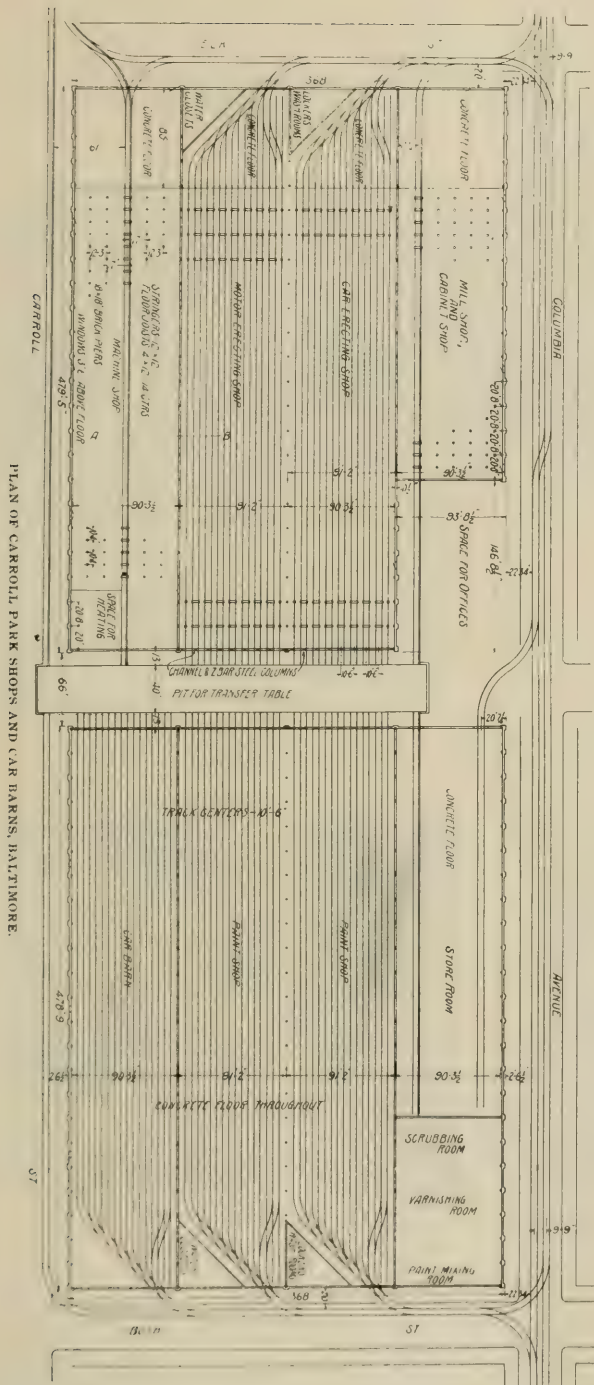
No. 1 unit is located in the car barn, and is at present arranged to heat only the paint shop, with provisions for adding the car barn at any time in the future.

No. 2 unit is located in the store room, and heats the paint shop and store room, together with the varnishing room.

upon foundations, built of brick and cement, with I-beams for supporting the coils. The entire heating system is enclosed in galvanized sheet iron chambers, and the heat ducts are arranged for the air to be taken from the top, and by means of galvanized sheet iron ducts suspended from the roof girders, distributed to the various portions of the buildings. The ducts are carried along between the roof trusses and are supported with T-iron ring bands, extending entirely around the ducts. Steam is supplied from water-tube boilers of 750 h. p. capacity, located in the north end of the machine shop. The engines are supplied with steam at 80 lb. or if



CROSS SECTION ON A B.



desired a low pressure can be used for supplying the coils for heating purposes, and at the same time utilize the exhaust from the four engines. The high-pressure drips are returned from the coils to Holly receivers, of which there are four, one for each unit, and discharge directly back into the boiler by the Holly gravity system, for returning condensation to the boilers. Where the pipes pass under the transfer table between the two groups of building they are carried in a brick tunnel.

These boilers are only intended to supply the heating system,

it enters the sewer traps. The entire floor area of the plant from one end to the other is laid in a plane inclined 4 per cent one way and 2 per cent the other way, this arrangement having been required by the original grade of the property which could not be conveniently altered.

Although the buildings themselves are virtually fireproof, elaborate precautions are taken to prevent the spread of fire among the cars or combustible stores. Hose stands connected direct to the city mains are placed every few feet and the barn and shop en-



MOTOR ERECTING SHOP.

together with the system for heating water for the lavatories. All the rest of the machinery in the various shops will be run from shafting operated by electric motors. The condensation from the exhaust when used for heating purposes is returned to automatic pumps and receivers, and is pumped back to the boilers. The exhaust connection from each engine is fitted with a positive oil eliminator, which prevents the oil from getting into the boilers.

The system is considered one of the largest of its kind ever installed in one plant, and required over 60 tons of galvanized sheet iron for making all the galvanized ducts and casings.

ployes, of which there will be over 500, are each assigned to a particular fire station in the plant to which they proceed at the first signal of fire. The men are thoroughly drilled in the use of hose, fire signals, etc.

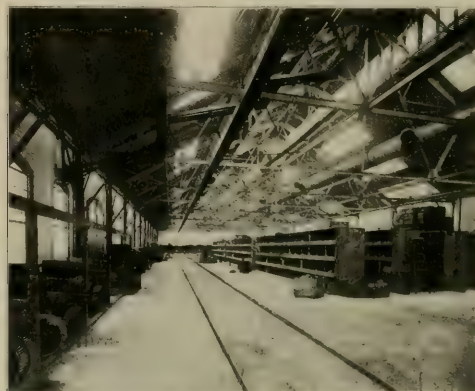
Special precautions against conflagrations have been taken in the paint and varnish departments. All large supplies of oil and paint are stored in a separate brick building outside the main plant, but for mixing purposes and for keeping the small paint and varnish supplies which are in constant use, there is provided a fireproof partition in one corner of the main paint room. This small partition



MILL AND CABINET SHOP, SHOWING HEATING PIPES.

The pits are also connected with the hot air circulating pipes so that cars entering the shops with ice on the motors and trucks can be readily thawed out and dried.

All drainage from the roof, from the toilet rooms and from the car barn floors is provided for by a system of specially constructed sewers by which any unusual amount of water such as would be present in a hard rain storm is automatically turned into overflow pipes. The water from the floors is passed through strainers before



STORE ROOM, CARROLL PARK SHOPS.

or room is 35x35 ft., two of the walls being the two brick walls of the main building, the other two being of wire screen with a door for entrance and exit. The room has a terra cotta roofing, and a large chimney passes up through this roofing and through the main roof, the theory being that if the contents of the mixing room should take fire, the flames and heat would pass directly up this chimney and would have no tendency to spread out into the main room. There is also connection with the sewer system so that in



the event of a fire the burning material could be flushed down through a water trap and so extinguished.

These buildings were designed and erected under the supervision of Messrs. D. B. Banks, mechanical engineer, and S. W. Huff, formerly electrical engineer of the United Railways. The architects were Baldwin & Pennington, of Baltimore, and the heating system was installed by Crook, Horner & Co., of Baltimore. Mr. G. F. Perin holds the office of superintendent of shops.

#### TRANSFER TABLE.

The 80-ton transfer table used for transferring cars from any track in one of the main group of buildings to any track in the other, was supplied by Geo. P. Nichols & Bro., of Chicago. This table is also utilized for shifting steam freight cars loaded with coal or supplies, from the spur track outside the plant to the boiler room or any part of the shops. It is 40 ft. long and runs on four 70-lb. T-rails laid in a pit 18 in. deep, or  $13\frac{1}{4}$  in. to the tops of the



NICHOLS TRANSFER TABLE.

rails. There are three rails on the table to give two gages, 4 ft.  $8\frac{1}{2}$  in. and 5 ft.  $2\frac{1}{2}$  in.

The table is formed of 15-in. channel girders with four double cross girders, each of the double girders carrying two 33 in. Griffin car wheels, upon which the table runs. Six of the eight wheels are independent, each turning in its own bearings, there being no

is a third clutch for operating the winding drum. The levers are interlocked so that it is impossible to start the winding drum while the table is in motion. The cable for hauling loads on or off passes from the drum through double sheaves and thence through a movable

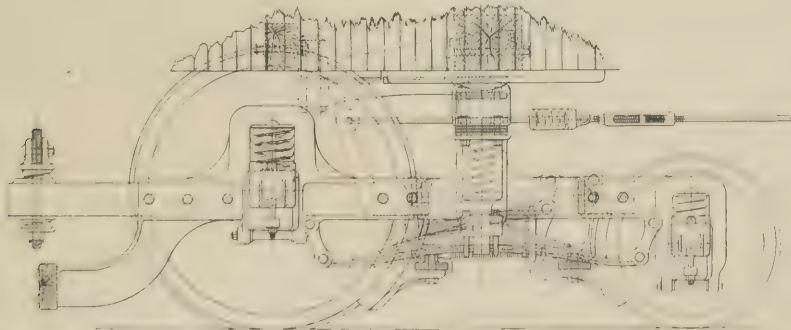


WASH BASINS AND SHOWER BATHS.

snatch block which may be fastened to eye bolts at either end of the table, so that cars may be drawn from either direction. When unloading it is necessary to fasten the snatch block at some distant point. This hauling machinery will, of course, be brought into action only when handling dead loads, as all the regular electric cars will run on to the table with their own power. The same motor that drives the table also operates the hauling machinery. A powerful band brake is provided for stopping both the driving drum and the table itself.

The trolley wire for supplying current to the transfer table is carried along the edge of the pit wall. Standard glass insulators are fixed in the brick wall, top first, being held by mortar. Pins are screwed into the insulators and on their ends carry porcelain spools on which the trolley wire rests. Attached to the table is a bronze arm with a hook at the end over which the wire runs; the arm is placed so that the hook clears the insulators, and in consequence the wire is lifted from the insulator spools as the car runs back and forth. A  $3\frac{3}{4} \times 3\frac{1}{2}$  in. angle is fastened to the wall above the wire to protect it. The return circuit through the track rails. This form of trolley support is quite usual in crane practice but so far as we know is new as applied to transfer tables.

Our illustration shows the table before the cab for protection of



LORD BALTIMORE MAXIMUM TRACTION TRUCK.

connecting axles. The remaining two wheels are the drivers and are connected by an axle, to which is geared the 25-h. p. Westinghouse railway motor by which the table is operated. Mounted upon the table is a system of clutches and a winding drum to be used in pulling cars on and off the table. The speed of the table is controlled through two clutch gears operated by one lever and giving low speed for heavy work and high speed for lighter work; these

the operator was completed. The cab will be built about the vertical angles, and the motor will be protected by boxing.

#### CARS AND TRUCKS.

The United Company owns about 1,500 cars of various makes, the larger number being Brownell and Brill, part of which are single truck and part double truck. It is of in-

terest to note that after considering the relative merits for a combined city and suburban service, of double truck cars with four motors to a car, and maximum traction trucks with two motors, the company has decided in favor of the latter type. The system now has some 230 maximum traction trucks, all of the Lord Baltimore type, each truck equipped with a Westinghouse No. 56 motor having a rating of 60 h. p. The trucks are running under 40 ft. cars on interurban lines, having grades as high as 6 per cent, and are meeting the conditions found in Baltimore to the satisfaction of the management.

The maximum traction trucks used are of special pattern. They are designed to carry the greater part of the weight on the driving wheels, without the liability of derailling the idler wheels. The metal bolster centre plates are pivoted directly above or near the center of the driving axle and the body bolster center plate is recessed at its front end to receive the main car body bolster, to which it is secured by bolts through the base and ends. The truck frames have housings for graduated helical springs, which rest on top of the journal boxes, and which cushion the entire load. The side frames are strongly braced diagonally between the wheels, the motor being carried outside of the driving axle. The end cross bars, upon which the motor is supported are drawn in at angles,



W. A. HOUSE,  
General Manager United Railways & Electric Co., Baltimore.

so that in taking curves they do not project outside of the rails; they are bolted direct to the side frames.

Each truck has two half-elliptic springs, 38 in. long, upon which the car rides. These springs are suspended below the side frames by links, and the weight of the car body and load is transmitted to them by steel posts depending from and fastened to the bolsters. The bolster is equi-distant between the wheels and the weight of the car body and passenger load is equally divided between the driving and idler wheels. Taking 12,600 lb. as the weight of car body and neglecting all other weights, this would bring 3,150 lb. upon each pair of wheels. But these trucks weigh 5,000 lb. each without motor, or 8,150 with motor and with the Lord Baltimore type of suspension, this additional weight is so distributed as to bring when the car is empty, 10,250 lb. on each pair of driving wheels, and 4,200 lb. on each pair of idlers, or to 71 per cent of the total weight on drivers and 29 per cent on idlers. The weight of passengers, equivalent to about 18,000 lb., is equally distributed, giving when the car is fully loaded 14,750 lb. on each pair of drivers and 8,700 lb. on each pair of idler wheels. These weights were determined by actual tests carried out on a car of the United Railways company. The trucks are run with the four pony wheels toward the center of the car. The brake mechanism is designed to bring about 70 per cent of the braking power upon the driving wheels. The brake shoes on each truck are hung between the wheels.

#### PAVING.

The predominating paving in the streets of Baltimore is an ordinary cobble-stone pavement, very cheap but rather rough and noisy. Most of this was laid years ago, and has not recently been disturbed. On cobble-stone paved streets where street railway

tracks are located, the space in and between the tracks is paved with the same material, the cobble-stones being brought closely up to either side of each rail.

In response to a popular demand for better streets, however, the city has in recent years undertaken a general overhauling of the main thoroughfares and has substituted improved pavings on many of the principal residence and business streets. In this work the materials used have been reduced to two standard substances, namely, granite and asphalt, it having been the opinion of those in authority when this task of improving the streets was begun, that for durability under the heaviest traffic, the granite block, when made small and uniform, and laid diagonally on a solid concrete foundation, with pitched joints, has no equal in the world as a city pavement; but where the highest possible durability when combined with noiselessness, cleanliness, and comfort to man and beast is desired, asphalt, either spread on a concrete foundation, or in compressed blocks laid on sand, stands at the head of the list.

A number of the business streets have accordingly been paved with Belgian blocks, this form of paving being particularly desirable where tracks are in the street.

Where sheet asphalt is used it is laid on a 6-in. concrete base, mixed in the proportion of cement 1, sand 3, broken stone 5. On this is placed 1½ in. of binder and 2 in. of wearing surface. In streets so paved it is customary to lay toothing stones of Belgian blocks or lag against the street railway rails, although the city in one or two instances has specified that in sheet-asphalt paved streets vitrified brick be laid in the tracks and for 24 in. outside of the outer rails.

The following specifications for laying vitrified brick in the street railway tracks in Baltimore will be of interest:

"The contractor will be required to remove the cobble-stone from the portion of the street covered by his contract. The railway company will surface the tracks and run its cars on one track while the work of the contractor is being done along the other track.

"After the railway tracks are brought to a proper elevation and surface by the railway company, the contractor shall do the necessary grading, prepare the sub-grade, surface and lay a bed of concrete 6 in. thick. The top of the concrete shall be of such elevation and contour that when a layer of clean sand 1 in. thick for a cushion is placed on top it will bring the upper surface of the paving bricks ½ in. above the tread of the rail inside the tracks, and ½ in. above the upper surface of the rail between the inner rails of the tracks and outside the outer rails, and have a crown or rise between the rails in each case of 1 in.

"The concrete between the ties must be 6 in. thick and thoroughly rammed under and around the rails and around the ties.

"The sub-grade surface must be thoroughly compacted in the street railway work before the concrete is put down.

"The contractor will be required at his own expense to lay a line of good quality of hard burned building brick along both sides of the web of the rail of such thickness that the outer edge of the brick will be on line with the outer edge of the head of the rail. The vitrified blocks or brick will be set at right angles to the direction of the street. They must be closely and well fitted between the rails and laid to a true and uniform surface.

"The break in the joints shall be not less than 3 in. and none but whole brick will be used, except at the end of the course. The work must be done by skilled mechanics with the aid of proper tools.

"The brick will be brought to a firm bearing and true surface by ramming. The surface will then be swept off and inspected. Any brick which are chipped or broken or any soft brick which are in the pavement after it is rammed must be removed and replaced by perfect brick. The surface will then be covered with fine clean dry screened sand and well swept into the joints, and a layer ½ in. thick shall be left on the pavement."

Mr. O. W. Connet, acting city engineer of Baltimore, states that brick paving of this kind costs \$2.13 per square yard in place.

About ten miles of street in Baltimore are paved with what are known as compressed asphalt blocks, a pavement that has met with considerable favor in Washington, Philadelphia, London and various other American and English cities. This material is composed of suitable stone, crushed, rolled and screened, and partly pulverized, and then heated to a high temperature, mixed with a certain proportion of Trinidad asphalt, and finally subjected in this heated state to an immense pressure, and molded into a solid, homogeneous



block: the blocks are 4x8x12 in. and under ordinary conditions do not require a concrete foundation, a bed of gravel to the depth of about 4 in. and sharp paving sand to the depth of 3 in. when placed on a firm natural soil, affording a thoroughly reliable base. It is claimed for this pavement that it affords a smooth and even surface and has all the desirable qualities of sheet asphalt, but does not polish or become slippery with moisture or wear.

The block asphalt company further claims that it is perfectly feasible to place the asphalt blocks in direct contact with street railway rails without intervening toothing stones or stretchers, as the blocks are not subject to the vibration and consequent crumbling that is a characteristic of sheet asphalt when laid close to the rails. In streets having heavy vehicular traffic, particularly where the streets are narrow and the traffic is necessarily concentrated within a limited area, the company recommends that one or two rows of granite or lag blocks laid end to end be placed along each rail to prevent the formation of wagon ruts. Asphalt block paving is said to be but slightly more expensive than sheet asphalt.

There are a number of features in connection with the management of Gwynn Oak that are somewhat out of the ordinary and are deserving of note.

The company has provided an inexpensive covered stage as shown in one of the half-tone engravings, but instead of giving a lengthy vaudeville or operatic performance, the amusement program is limited to about 30 minutes for the matinee and the same period in the evening, the performance usually taking the form of two or three good vaudeville acts. The show is entirely free, although a few seats are provided for those who wish to pay for the privilege of sitting down. It is believed that a short, snappy performance of this kind serves the purpose of drawing all the crowd that would ordinarily attend a longer show, and at the same time it gives patrons more time to walk around the grounds and visit the other attractions provided. These various attractions include a large dancing pavilion, restaurant where regular meals are served under the direction of experienced caterers, riding gallery, rifle and pistol ranges, photograph gallery, tennis courts, swings,



GWYNN OAK PARK.

- 1—Tennis Court—Ladies Pavilion—Dancing Pavilion.  
3—Lake and Bath House.

- 2—Restaurant and Dining Pavilion.  
4—Vaudeville Stage.

The United Railways company pays a proportion of the cost of paving on the streets in which its tracks are laid, the amount varying according to the requirements of the franchises owned by the underlying companies.

#### THE PARK SYSTEM.

The franchise tax or compensation paid to the city of Baltimore by the railway company is devoted to the maintenance of the public parks. In addition to this the railway company is directly interested in parks or pleasure resorts of which it owns five. Two of the properties, Gwynn Oak and Lakeside, are operated by the company, and three are leased.

Gwynn Oak, the largest and most attractive of the company's parks, is about seven miles northwest of the city on Gwynn's Falls, and may be reached in about 45 minutes from the heart of Baltimore by either of two electric railway routes, the fare by either route being 10 cents. Entrance to the park is free to all and the resort is perhaps the most popular one in the vicinity.

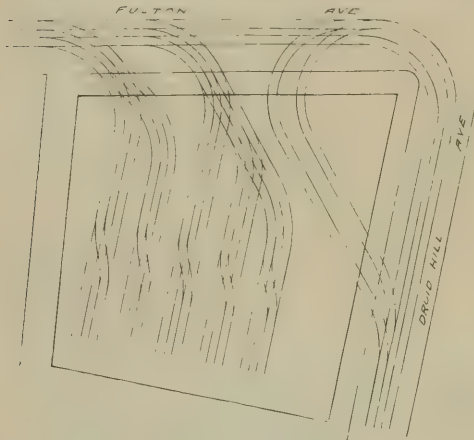
etc., the amusements being scattered in various parts of the grove, thus avoiding the cheap "Coney Island" appearance that often mars the attractiveness of pleasure resorts of this nature. The various privileges are leased to outside parties.

The company has found the dancing pavilion one of the most popular and remunerative features of the place, and it may be remarked here that dancing as a park amusement is in great favor in Philadelphia, Washington, Baltimore and other more southern cities, although in many northern places there seems to be a decided prejudice among the respectable classes against dancing in public.

At Gwynn Oak the dancing pavilion is patronized by the best people of the city. In the afternoons no charge is made for using the dancing floor, but in the evening all gentlemen entering the pavilion pay 25 cents each, the ladies being admitted free of charge. On favorable nights the company has taken in this way as high as \$50 during the evening, and the receipts for the season always more than pay the cost of musicians and attendants.



A small lake at one end of the grounds adds greatly to beauty of the place and the company provides boats and bathing facilities at popular prices. In winter the lake is well lighted with arc lamps and when the skating is good the cars carry almost as many passengers to Gwynn Oak as in summer. The company each year manages to cut enough ice on the lakes to supply the restaurant all through



TERMINAL AT FULTON & DRUID HILL AVES.

the warm weather and has built a small ice house for storage purposes.

The tennis courts which are free are always in demand on pleasant afternoons during the tennis season. Another feature that seems to be appreciated is the ladies' pavilion, which is fitted up with cloak room, reclining chairs, couches, etc., and is always in charge of a competent matron.

On special occasions during the season extra attractions, as balloon ascensions, rope walkers, divers, etc., are engaged, these performances always being free to patrons of the park.

Gwynn Oak Park has been running now for over seven years and it may therefore be taken for granted that the company is satisfied with the results. Col. Robert Hough is superintendent of parks.

#### SPECIAL WORK.

An important part of the general improving of the United Railways system that has been going on for the past few months has



POSTAL CAR, BALTIMORE.

been the laying of numerous new curves and cross-overs, which will greatly facilitate the dispatching and operating of cars, as it will enable the superintendents at times of large fires or other delays to switch cars from one line to another and avoid tying up entire divisions. This increased flexibility is also of advantage in running mail, funeral and other special cars, as they are not now necessarily confined to the regular routes. Practically all of the

special work required in this work has been furnished by the Pennsylvania Steel Co., of Steelton, Pa.

Among the track installations of special interest is the new terminal layout at Fulton and Druid Hill Avenues, where the company is building a new transfer and terminal station. It is at this point that passengers leave the city cars for those running out over the interurban lines and it is the intention to have all the various routes converge under one roof so that passengers may find any particular car with a minimum of inconvenience and confusion. The arrangement of the tracks for which the Pennsylvania Steel Co. furnished all the materials is shown in one of the drawings.

#### CARRYING U. S. MAILS.

Baltimore is one of the few cities of the United States enjoying a complete system of street railway mail collection. Not only do the postal cars collect and deliver pouches in various sections of the city, but at frequent intervals during the day the cars, each carrying from one to three clerks, start out over different routes and make collections from the regular street deposit boxes at corners, hotels and other prominent places. As the car approaches a collection box a clerk jumps off with a mail pouch, empties the box of its mail and jumps back onto the car, oftentimes in less than 30 seconds. When the scheme was first suggested it was feared that the postal cars might delay the regular passenger traffic, but no trouble whatever has been had from this source. On the contrary, as the mail cars do not stop for passengers, they can make better time than do the passenger cars and instead of blocking the line, the regular cars have to hurry to get out of their way.

When a clerk has returned to the car with a pouch of mail he dumps the contents on a long sorting table, and the mail is immediately taken in hand by two expert clerks who sort, cancel and distribute the matter. The postal cars are fitted with filing cases, pouch racks, cancelling irons and all the necessary paraphernalia for collecting, stamping, sorting and delivering mail matter in transit. It will thus be evident that the mail arrives at the main postoffice sorted and ready to proceed on its journey instead of in bulk as it would be if brought in by the regular carriers. In a busy office this means the saving of many hours in the dispatching of mail, enabling matter to catch outgoing trains that otherwise would be missed.

The postal cars do not necessarily follow the regular passenger car routes, but by means of a complete system of connecting switches and crossovers are run from one line to another, enabling postal routes to be made up to better advantage. A development of this mail service is to have carriers collect the mail in sections adjacent to the car lines and bring their collections to designated points in time to catch the mail cars, thus again affecting a saving of considerable time. Of course the mail cars also carry postal matter from station to station in the city, from station to the depots and vice versa, and to and from suburban towns.

At present the Baltimore street railway mail department employs six postal cars and about 15 clerks. The cars serve 11 carrier stations, each having from 3 to 15 carriers, and 24 sub-stations, which dispatch to the main office daily about 120 pouches and 50 sacks. The railway clerks make up about 35,000 letter packages and 200 paper sacks a month. The appropriation for this street railway mail service in Baltimore is \$34,000 per annum, and the government pays the street railway company 12 cents per car-mile run for operating the postal cars over its lines. The present extent and efficiency of the service is largely due to the efforts of Mr. S. David Warfield, postmaster of Baltimore.

#### OFFICERS.

The officers of the United Railways & Electric Co., of Baltimore, are: President, George R. Webb; vice-president, Col. W. S. Franklin; general manager, William A. House.

The New York & Portchester Railway Co. will shortly commence the construction of its proposed line which will run from East 132d St. through the Borough of Bronx to Morris Park, Mount Vernon, Pelham, New Rochelle, Mamaroneck, Larchmont, Rye and Harrison to Portchester. The company expects to run trains from Portchester to the city hall, Manhattan, in 54 minutes at one-third of the present rate of fare. Four tracks will be laid, two to be used for express trains exclusively. The third rail system will be installed.

## Late Street Railway Legislation.

### California.

#### NEW CONDITIONS FOR GRANTING FRANCHISES.

Among the new provisions which Chapter CIII of the Statutes of California passed in 1901 contains with regard to the sale of street railroad franchises in municipalities and the conditions for the granting of such franchises, the following may be noted:

An applicant for a franchise shall file with the governing or legislative body of the municipality an application, and thereupon said governing body shall, in its discretion, and when the application is accompanied with a petition praying that the same be granted, signed by the owners of three-fourths of the frontage of the real property fronting along and upon the route of the franchise applied for, must advertise the fact of said application, together with a statement that it is proposed to grant the same, etc.

The publication must state, among other things, that sealed bids will be received up to a certain hour and day, and that the successful bidder and his assigns must, during the life of said franchise, pay to the municipality two per cent of the gross annual receipts of the person, partnership or corporation to whom the franchise is awarded, arising from its use, operation or possession. No percentage shall be paid for the first five years succeeding the date of the franchise, but thereafter such percentage shall be payable annually; and in the event said payment is not made, said franchise shall be forfeited; provided further, that if the franchise be a renewal of a right already in existence, the payment of said percentage of gross receipts shall begin at once.

In case the franchise granted shall be an extension of an existing system of street railroad, then the gross receipts shall be estimated to be one-half of the proportion of the total gross receipts of said system which the mileage of such extension bears to the total mileage of the whole system, and said estimate shall be conclusive as to the amount of the gross receipts of said extension.

Said advertisement shall also contain a statement that the said franchise will be granted to the person, firm or corporation who shall make the highest cash bid therefor; provided only, that at the time of the opening of said bids any responsible firm or corporation present or represented, may bid for said franchise or privilege a sum not less than ten per cent above the highest sealed bid therefor, and said bid, so made, may be raised ten per cent by any other responsible bidder present, and said franchise or privilege shall finally be struck off, sold and granted by said governing body to the highest bidder therefor, in gold coin of the United States, and said successful bidder shall be required to deposit with said governing body, or such person as it may direct, the full amount of his or its bid, within twenty-four hours thereafter; and in case he or it shall fail so to do, then the said franchise or privilege shall be granted to the next highest bidder therefor.

Work to construct street railroads, or to exercise any privilege whatever, a franchise for which shall have been granted in accordance with the terms of this act, shall be commenced in good faith within not more than four months from the granting of any such franchise, and if not so commenced within said time said franchise so granted shall be declared forfeited, and shall be completed within not more than three years thereafter, and if not so completed within said time said franchise so granted shall be forfeited; provided, that for good cause shown the governing or legislative body may by resolution extend the time for the completion thereof, not exceeding three months.

The bond which the grantee of every franchise or privilege granted under this act is required to file with the governing or legislative body shall be filed with such governing body within five days after such franchise is awarded, and in case said bond shall not be so filed, the award of such franchise shall be set aside, and the same may be granted to the next lowest bidder, or again offered for sale, in the discretion of said governing body.

No clause or condition of any kind shall be inserted in any franchise or grant offered or sold under the terms of this act, which shall directly or indirectly restrict free and open competition in bidding therefor, and no clause or provision shall be inserted in any franchise offered for sale, which shall in any way favor one person,

firm or corporation, as against another, in bidding for the purchase thereof.

Any member of any common council or other governing or legislative body of any city and county, city or town of this state, who, by his vote, violates or attempts to violate the provision of this act, or any of them, shall be guilty of a misdemeanor, and may be punished therefor, as provided by law, and may be deprived of his office by the decree of a court of competent jurisdiction, after trial and conviction.

This new act omits the provision contained in the act of 1897 prohibiting the extension or renewal of any existing franchise until within one year prior to the date of the expiration thereof, unless such existing franchise should be first surrendered by the holders thereof.

#### AUTHORITY TO LAY TRACK—COMPRESSED AIR—NO GRANT NEAR GENERAL ELECTION.

Section 497 of the Civil Code of California is amended, as shown on page 370 of the Statutes of 1901, so that it begins: Authority to lay railroad tracks through the streets and public highways of any incorporated city, city and county, or town, "or from any point in, or at the exterior boundary of such city, city and county, or town, to, in, or through any public park owned by such city, city and county, or town, outside of such city, city and county, or town," may be obtained, etc., the words in quotation marks being new. It also adds compressed air to the list of permissible motive powers. Then, the section is concluded with this new sentence: It is unlawful to grant any franchise mentioned in this section, or to extend the time for the construction or operation of any street railroad, within ninety days next preceding the date of holding a general election, or within seventy days next immediately following, including the day of holding such general election; and any franchise or extension so granted is void.

#### MAIL-CARRIERS TO RIDE FREE.

Section 498 of the Civil Code of California, embodying restrictions and limitations to the grant of right of way, is amended, as shown on page 371 of the Statutes of 1901, by adding to it the sentence: Every right or franchise for a street railway granted under the provisions of this title is subject to the condition that the person or corporation to whom the same is granted must and will permit mail-carriers in the employ of the United States government, at all times, while engaged in the actual discharge of duty, to ride on the cars of such railroad free of charge.

#### AS TO FARE AND SPEED.

Section 501 of the Civil Code of California, relative to rates of fare, speed, etc., is amended, as shown on page 371 of the Statutes of 1901, so that the first sentence reads: The rates of fare on the cars must not exceed ten cents for one fare for any distance under three miles. "and in municipal corporations of the first class must not exceed five cents for each passenger per trip of any distance in one direction, either going or coming, along any part of the whole length of the road or its connections," the words in quotation marks being new. And, as amended, it omits the provision heretofore contained, namely: "The rate of speed must not be greater than eight miles per hour."

#### PENALTY FOR OVERCHARGING—CAUSES OF ACTION ASSIGNABLE.

Section 504 of the Civil Code of California, prescribing the penalty for overcharging, is amended, as shown on page 371 of the Statutes of 1901, to read:

Every violation of the provisions of section five hundred and one, subjects the owner or owners of the street railroad violating the same to a forfeiture, to the person unlawfully charged or paying more than is herein allowed to be charged, of the sum of two hundred and fifty dollars for each and every instance in which such

unlawful charge is made or collected, to be recovered by suit in any court of competent jurisdiction. Such cause of action is assignable to one having a like cause of action in his own right against the same defendant, and an action may be maintained by the assignee in his own name, and several such causes of action can be vested in such assignee and united in the same action.

#### RIGHTS OF IMPROVEMENT RESERVED TO MUNICIPALITY

Section 507 of the Civil Code of California is amended, as shown on page 372 of the Statutes of 1901, principally by substituting the word "municipality" for "corporation," so that it reads: In every grant to construct street railroads, the right to grade, sewer, pave, macadamize, or otherwise improve, alter, or repair the streets or highways, is reserved to the "municipality," etc.

#### REQUIREMENT AS TO BRAKES AND FENDERS.

A new section is added to the Civil Code of California, to be numbered 369a, by an enactment on page 454 of the Statutes of 1901. It reads as follows:

Any person, company, or corporation, operating cars on the streets of cities or towns, or on the country roads within the state, for the conveyance of passengers, propelled by means of wire ropes attached to stationary engines, or by electricity or compressed air, who runs, operates, or uses any car or dummy, unless each car and dummy, while in use, is fitted with a brake capable of bringing such car to a stop within a reasonable distance, and a suitable fender, or appliance placed in front or attached to the trucks of such dummy or car, for the purpose of removing and clearing obstructions from the track, and preventing any obstacles, obstructions, or person on the track from getting under such dummy or car, and removing the same out of danger, and out of the way of such dummy or car, is guilty of a misdemeanor. Where the board of supervisors of any county, or the city council or other governing body of any city, by ordinance, order, or resolution, prescribes the fender or brake to be used as aforesaid, then a compliance with such ordinance, order, or resolution must be deemed a full compliance with the provisions of this section.

#### NEW INTERURBANS IN NEW YORK.

The Buffalo, Niagara & Rochester Electric Ry., commonly known as the Ridge Road trolley, having been granted a franchise several other companies have been organized to build feeders to the transit line.

Franchises are asked for by the Genesee & Orleans company, to build a line from Batavia to Oak Orchard, 27 miles; the Monroe County Belt line, to run through the villages of Brighton, Fairport, Pittsford, Penfield and Despatch, 20 miles; the Rochester & Eastern Railway Co., to construct a line from Rochester to Geneva, 65 miles; Rochester & Sullivan Traction Co., to build a line from Rochester to Dansville, 78 miles.

Mr. Charles E. Lux, of Lyons, is actively engaged in getting franchises along the proposed line to Syracuse, and has secured rights in the villages of Clyde, Lyons, Newark, Palmyra, Fairport and Pittsford.

The Rochester & Eastern company will have traffic arrangements with the Rochester Ry. and with the Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Co.

Electric lines are building in several directions from Utica, and franchises have been granted or asked for lines extending to Schenectady and Albany. From Caldwell at the foot of Lake George to Hudson there is an unbroken chain of trolley lines, and from Peekskill to New York City. There are now several breaks in the trolley systems between Peekskill and Hudson, which in all probability will be completed soon.

Elias H. McKnight, of Middletown, O., has entered suit against Peter Schwab, of Hamilton, for an accounting of money alleged to be in the defendant's hands as a part of the price paid by the Dayton & Troy Electric Railway Co., for the stock of the Troy, Tippecanoe & Dayton Interurban Co.

#### CONSOLIDATION AT BELLEVILLE, ILL.

The St. Louis & Belleville Traction Co., of Belleville, Ill., has consummated the purchase of the property of the Mississippi Valley Transit Co., East St. Louis, and the reorganization of the latter has been effected with a new board of directors comprising: George J. Kobusch, of St. Louis, Charles M. Clark, of Philadelphia, J. M. Borders and Edward Abena, of Belleville, and E. C. Springer and E. W. Mudge, of Edwardsville. The board has elected the following officers: George J. Kobusch, president; Charles M. Clark, vice president, and J. M. Bramlette, secretary and treasurer. The company will continue under its old name. It is announced that its line to Edwardsville will be completed by September 1st and work will then be pushed with all possible rapidity on other projected extensions. The completed system will be operated as one of the allied lines of the St. Louis & Belleville Traction Co.

An injunction to restrain the St. Louis & Belleville Electric Railway Co., a subsidiary of the St. Louis & Belleville Traction Co., from discontinuing the passenger service on its lines for the purpose of conveying coal and freight over them exclusively, has been asked by Melvin L. Gray, of St. Louis, who claims to have granted the company a right of way over his lands near Winstanley Park in 1868, with the understanding that the line should be constructed for passenger traffic only.

#### ANOTHER ILLINOIS INTERURBAN RAILWAY.

The Springfield (Ill.) & St. Louis Electric Railway Co., which was recently incorporated to build a line from Springfield to East St. Louis, has effected its permanent organization with the following officers: H. H. Littell, of Buffalo, N. Y., president; J. W. Gaulbert, of Louisville, Ky., vice-president; H. S. Reardon, of Springfield, general manager; C. K. Minary, of Springfield, secretary, and H. C. Hamilton, of Girard, treasurer. The board of directors comprises: J. W. Gaulbert, William Jarvis and St. John Boyle, of Louisville; H. S. Reardon, E. W. Payne, Bluford Wilson and D. T. Littler, of Springfield; H. H. Littell, of Buffalo; J. P. Matthews and A. H. Bell, of Carlinville; H. C. Hamilton and George L. Tipton, of Girard; John Gelder and J. P. Henderson, of Virden, and George W. Hutton and W. E. P. Anderson, of Auburn. The work of securing rights of way over the proposed route will be commenced at once.

William Jarvis, one of the directors of the new interurban company, is president of the Springfield Consolidated Railway Co., of which C. K. Minary, secretary of the former, is treasurer and general manager. A traffic agreement may be effected whereby the interurban cars will enter Springfield over the tracks of the local street railway.

#### POWER HOUSE AND CAR BARN AT WHEELING BURN.

The power house and car barns of the Wheeling (W. Va.) Traction Co., at West Wheeling, were destroyed by fire July 21st, entailing a loss of \$50,000, inclusive of the loss of 18 cars which were burned. The fire started at about 7 p. m. and is believed to have originated from a short circuit in the electric lighting wiring under the roof of one car. Some difficulty was experienced by the employees of the company and the fire department before the hose could be got in working order, by which time the car house was partially consumed, and the flames had spread to the power house across a narrow alley. Both buildings and their contents were totally destroyed. The barns were constructed of sheet iron, 70x150 ft. in dimensions; the power house was a brick structure, 70x100 ft.

#### SMALL FIRE AT MILWAUKEE.

A fire which resulted in damage to the amount of \$300 occurred at the power house of the Milwaukee Electric Railway & Light Co. on the afternoon of July 24th. The flames originated from combustion in a pile of coal in the boiler room, and the destruction of the entire plant appeared imminent. The work of the fire department was effective, and within 24 hours repairs had been made and operations in the damaged boiler room resumed.



# MECHANICAL DEPARTMENT

## NEW STYLE OPEN CARS IN MONTREAL.

A car of a novel type, two views of which are shown here, has been in daily service since last May on the lines of the Montreal Park & Island Railway Co. As will be seen it consists of a 15-bench open car, one side of which is the same as that of a closed car. It has a seating capacity for 75 persons and has carried as high as 115 passengers at a time. The car is geared to run at a speed of 45 miles an hour and is mounted on double trucks of the company's standard, which are equipped with Westinghouse 38 B motors. We are indebted to Mr. W. H. Douglas, assistant secretary and superintendent of the company, for the following details of construction of the body:

The length of the car over all is 43 ft. 6 in., while its width at the floor line is 6 ft. 10 in. and at the top of the posts 7 ft. 3½ in. Its height from floor to ceiling is 7 ft. 6 in. The vestibules at each end are octagonal in shape and are provided with three windows which slide down.

On one side the car is closed to a height of 3 ft. 3 in. from the floor, and the upper part of this side contains sashes making two half windows, the upper panels being stationary and the lower ones opening upwards.

The other side of the car is entirely open with two steps running the entire length of the car arranged so that the rises from the street to the car floor shall be all equal. Eaves troughs extend along the sides of the car to carry the water off the roof and these discharge into three half-inch iron pipes, at each end and at the center of the car, which run down below the car floor.

Grab handles are placed on each post on the open side of the car and each seat is also supplied with a grab handle. On the closed side 16 in. above the sill is a strong guard rail of white oak 2½ in. beveled to 1 in. with a 1 in. half-round iron band. The trolley stand is at one end of the car; buffer beams project 8 in. from the vestibules. Two outside sills are of Georgia pine 5x8 in. x 40 ft. and two inside sills also of Georgia pine are 3x8 in. x 24 ft. in size. The cross sills are in accordance with the other sills. The body is supported by two truss rods of 1½ in. iron, with turnbuckles. The bolsters are arranged for 27 ft. truck centers. The

5½x2½ in., with V joints and for inside of vestibules ½x2½ in. white wood with beaded joints. The flooring is of Georgia pine 1x2½ in. T. G. dressed one side and the roofing is of alternate strips of white wood and bass wood, ½x2½ in., with beaded joints covered with heavy duck. The roof is oval in shape without decks



VIEW OF CLOSED SIDE.

and is supported with ash ribs 1¼x1½ in. in section spaced 11 in. apart.

The seats are 18 in. high with a 15-in. face with side frames filled in with strips of ¾x1¼ in. maple. The backs are 15 in. high and 6 ft. long with finished frame of 1x2½ in., with 3½ in. ends, with division in the center filled in with turned spindles placed at intervals of 2½ in. These are of ash, and a swing arm is placed at each end of the seat backs, the seats are all single except the front and back ones, which are placed back to back. A foot rest is provided under each seat and a steel panel supports each seat on the step side of the car. On the closed side the seats are supported from cast iron brackets on the posts. Sand boxes are placed on each side of the car and are connected up with 2½-in. rubber pipes projecting down in front of the rear truck. They are operated from the front vestibule.

The Sterling brake is used on one end of the car only. The lighting consists of a center 5-light cluster and a 4-light cluster at each end, one light in the rear vestibule and one for the headlight. The window frames are extra heavy, especially in the vestibules. All the inside work is oiled and stained, and all the outside work is painted.

Five of these cars were supplied to the London (Ont.) Street Railway Co., where they have given great satisfaction.

## A SIMPLE METHOD OF CHANGING A COMMUTATOR.

BY JOS. E. SMITH.

Formerly when it became necessary to change a commutator on a railway armature, it was always looked upon as a job requiring as much skill and practice as though the whole armature had to be rewound. But with the advent of assembled segments, this was all changed. The old method was to carefully unsolder all the leads from the commutator, straighten them out and bend them back, out of the way, over the core. This bending back was often accompanied by the breaking off of one or more leads close to the coil. This made it necessary to take out the coils, or which was more probable, to rewind the armature throughout.

The method herein described will enable anyone, with the tools mentioned, to change a commutator in about an hour and a half. The main advantage of this system is that it is unnecessary to dis-



VIEW OF OPEN SIDE.

solder and cut out joints and cut out the former being 2 in. in square and 7½ ft. long and the latter 3x4 in. and of the same length.

The side paneling is of tongued and grooved white wood ½x2 in., dressed on both sides, with V joints on the outside and beaded joints inside. The paneling for the inside outside is white wood

turb the leads, not even taking off the front dress head. A G. E. 1000 armature will be taken as a model, though the apparatus may be slightly changed to suit any other style machine.

First, it is necessary to have a piece cast like Fig. 1, the holes A, A and B, B being fitted to the clamping nut on the end of the commutator. After having been fitted to one it will fit any other. Also, two wrenches shaped like Fig. 2. One must fit the pinion,

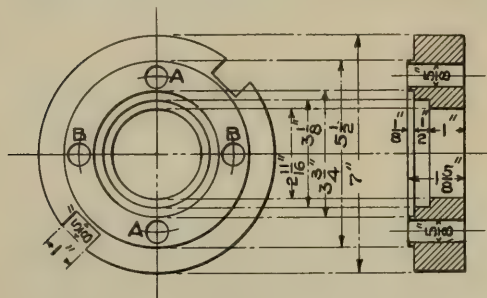


FIG. 1.

and the other the recess on the edge of the ring, Fig. 1. Each wrench has a pipe extension about 6 ft. long.

Take off the thrust collar from the commutator end, and take out the small set screw in the clamping nut. Slip on the ring, screwing it tight to the clamping nut by two bolts,  $2 \times \frac{1}{2}$  in., through holes BB; then drive tight fitting pins into holes AA. This holds the casting firmly on the nut, so that it almost forms a part of it.

Now put the armature up in the stand, put on the pinion wrench and allow the end to rest on the floor. Then put the other wrench on the ring, and with the pipe extension and two strong men on the end of it, you can start the nut, which is taken off entirely with the mica insulating rings. We now have the whole front and a part of the inside of the commutator exposed.

Set a gasoline torch or blow lamp, so that the flame will strike the segments as near as possible where the leads are soldered into them. When a few segments are hot enough to melt the solder

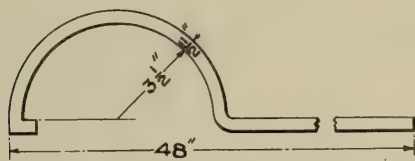


FIG. 2.

on them, take a small pair of narrow nose pliers; catch one segment and pull it toward the end of the shaft, leaving the end of the lead as it was before the segment was removed. Take the next segment in the same way, and in this manner go around the commutator until all the segments have been taken off.

Take the pliers and lift up the ends of the leads, just enough to leave room for the new segments, and put on the ring of assembled segments, being sure that the slots in the segments line up with the leads. Put on the mica rings; then the clamping ring; then the clamping nut and casting. In tightening the nut, use as much pressure as was necessary to loosen it.

Now take a hammer and chisel and set the leads into the segments; try for a ground, turn down the commutator, wind string over the leads where they were soldered, and the job is complete.

President Glenn E. Plumb, of the Illinois & Rock River Railroad Co., has let the contract for fifteen miles of rails to be used on the line between Sterling and Grand Detour, which portion of the projected system, it is announced, will be put in operation by January.

## CANADIAN NOTES.

The Montreal Street Ry. is considering the idea of giving 10 workman's tickets for 25 cents, during certain hours of the day.

The Westminster Townships Council has granted the right of way for the proposed electric railway to connect London and Port Burwell.

The Yarmouth (N. S.) Street Ry. has decided to extend its lines to Milton, and also to make some extensions in the western end of the city.

The London Street Ry. has received the last of its new rolling stock equipment, consisting of five new open cars, built by the Montreal Car Co.

Webb, Pierce & Bostwick, of Ypsilanti, Mich., promoters of the proposed electric road to connect Windsor, Chatham and Leamington, have opened an office in Detroit.

Mr. W. C. Hawkins, of Schenectady, N. Y., has been appointed general manager of the Hamilton Electric Light & Cataract Power Co. It is expected that other changes will be made in the staff.

The new electric road between Phoenix, B. C., and Greenwood, is to be built under the supervision of Mr. S. M. Rice, who has arrived at Greenwood and work will be pushed forward without delay.

The Quebec Suburban Electric Ry. Co. is applying for incorporation to build a line of electric railway along the south shore of the St. Lawrence River, from Quebec through Lewis and Lothbiniere Counties.

The differences between the Hamilton, Grimsby & Beamsville Electric Ry. and its employes have been settled, and the latter, after being out less than a day, during which time no cars were operated, have returned to work.

Arrangements have been made by the Beemer syndicate to assume control of the Hull Electric Ry., and the electric road will be operated in conjunction with the steam roads, thus giving the latter access to Ottawa and Hull.

It is rumored that the Boston syndicate which recently acquired the Sydney electric light plant, and the ferry system between Sydney and North Sydney, will at once commence the construction of an electric railway between Sydney and Glace Bay.

The St. Thomas Street Ry. are considering the question of extending to Port Stanley. The company has signified its willingness to build the line if certain concessions are granted. If constructed, this extension will necessitate the building of a new power house.

The Ottawa Electric Ry. has advanced the wages of its employees, the revised schedule going into effect July 1st. Some weeks ago the men presented a petition for an increase in pay, and while not getting all they asked for, were granted a substantial increase, and appear thoroughly satisfied.

The Metropolitan Street Ry., of Toronto, has made application to the city for permission to connect its tracks with the Canadian Pacific at North Toronto for the purpose of taking the construction material for the Schomberg branch of the Metropolitan over its own lines without transhipping.

Mr. J. Ross-Kerr, general manager of the Kingston, Jamaica, Electric Railway Co., died suddenly in Montreal. Mr. Ross-Kerr, who was in town on a visit, was stricken with heart disease and died at the residence of Mr. James Ross, vice-president of the Montreal Street Ry. The deceased was an old employee of the Montreal road, but was acting as manager of the Galt, Preston & Hespeler Electric Ry. at the time of his appointment to the Jamaica roads.

The remains will be taken to Kingston, Jamaica, for interment. He was 38 years of age, and leaves a wife and one child.

General Manager Evans of the Quebec Railway, Light & Power Co., announces the following appointments and changes in the staff: Mr. J. A. Everell is appointed superintendent of the Montmorency and Ste. Annes divisions; Mr. H. N. Bartlett is appointed assistant superintendent of the Citadel division.

The South Essex Electric Railway Co. wants a bill passed giving it power to extend its lines from the town of Leamington to the end of Point Pelee. The company also wants the time originally granted for completion of the lines under charter, extended from two years to five, and ask for two years in which to commence work.

The report that the bitter fight between the Montreal Terminal Ry. and the Montreal Street Ry., in which the latter has successfully opposed the attempts of the former to obtain entrance to the city, is to be solved by the amalgamation of the two companies, is being circulated. The officials of both companies deny the truth of these rumors.

Mr. W. R. Russell, who for some time past has been general superintendent of the electric railways of the Quebec Railway, Light & Power Co., has severed his connection with the company. Mr. Russell has been very successful in his efforts to bring the lines of this company to a high state of efficiency, and carries with him the best wishes of his fellow employees and employers.

Rumors are in circulation here of a scheme in which Detroit and Toronto parties are said to be interested, to connect the two cities by a trolley line, which would pass through or near Hamilton. The project is reported to have developed to the extent of options being secured on portions of the right of way covered by existing trolley lines, which may be utilized as part of the system.

Judge Snider has rendered his decision in the arbitration case between the city and the Hamilton Street Railway Co., over the question of the cost of laying tar macadam between the rails and two feet on either side. He decided in favor of the company, holding that it could not be classed as repair work, but was a new pavement. The company, under its charter, is bound to make repairs, and the city had claimed that this pavement was a repair.

The British Columbia Electric Ry. is expending \$100,000 in improvements this year, on its system in Victoria. Of this \$30,000 is for new rolling stock and equipments, \$30,000 for relaying track, \$17,000 for new car houses, etc., and \$25,000 for doubling the capacity of the plant at Goldstream. Among the other improvements to be carried out is included a new line of about three miles in length, to the "Gorge," the favorite summer resort of the people of Victoria.

Mr. Philip Trudel, of Ottawa, has invented a street car fender with some novel and valuable features, and has submitted it to the government engineer for approval. The fender is carried about 3-in. from the rail, a roller being at the bottom, and the fender can be dropped right to the rail by the release of a handle within easy reach of the motorman's hand. The fender also drops automatically when it hits any heavy body, and at the same moment a flow of sand is released on the wheels.

Mr. F. L. Wanklyn, general manager of the Montreal Street Ry., has written to the city council offering to haul stone from the quarries, by means of the electric railway, for 25 cents per ton. Montreal has had to pay dearly in the past for hauling stone from the neighboring quarries, and the proposition has been very favorably received. One effect of this scheme would be to re-open the large quarry owned by the city at Outremont, work in which has been discontinued for some time, owing to excessive charges for transportation.

Another employee of the Montreal Street Ry. is going to Paris. This time it is Mr. L. Trudeau, roadmaster. Several days ago Mr. D. McDonald, formerly superintendent in Montreal, now of Paris,

cabled an offer to Mr. Trudeau to be superintendent of the Bordeaux system, and after some consideration the offer was accepted. Mr. Trudeau has been in the employ of the Montreal company for 16 years, having worked his way up from conductor, and his superiors here feel that they are losing a good man, and one that will win success in his new sphere.

The new electric railway company, which is now constructing its lines at Three Rivers, Que., has been granted permission to lay tracks across the new iron bridge which the city is building across the river, without paying for the privilege. This favor will remove the last obstacle in the way of the new company, and work will be rushed forward upon five of the principal streets of the city. The company is still obliged to acquire a considerable amount of property from an old estate on the proposed route, but negotiations to this effect are now being brought to a satisfactory conclusion.

The assessment of the Toronto Street Ry. plant has been increased this year from \$91,212 to \$1,543,281, and the company has entered an appeal. Last year's assessment was on a "scrap-iron" basis, but the city has taken advantage of the legislation passed this year by the Ontario Legislature, and has assessed the plant as a unit, in one ward. The city has also availed itself of the recent decision of the Court of Appeal, holding that the rolling stock of an electric railway is real and not personal property, so that the cars of the Toronto Railway Company are now taxed for the first time.

Considerable prominence is given to a report that a syndicate headed by Hon. L. J. Forget, president, and Mr. James Ross, vice-president of the Montreal Street Railway Co., are endeavoring to combine in one company all the principal electric railways and lighting companies between Montreal and Niagara Falls, together with the steamships of the Richelieu & Ontario Navigation Co., and the Niagara Navigation Co. The fact that Mr. Forget is president of the Richelieu & Ontario company and that both are deeply interested in the electric railways and lighting companies of the district referred to, lends color to the report.

The Von Echa Co., owner of the Woodstock & Ingersoll Street Ry., recently invited the members of the councils of Brantford, Galt, Paris, St. George, Ingersoll and Woodstock to come to Woodstock and take a trip over the 10 miles of electric road just completed by that company, the company paying all expenses of the trip. Nearly all the gentlemen invited came, and a special car, containing the party, about 70 in all, including a number of prominent citizens of Woodstock, left the street railway terminus at noon for Ingersoll. On returning the company banqueted the guests at the Hotel Oxford. The Von Echa Co. is seeking for a charter to extend the lines to the above named towns.

The Hamilton Radial Railway Co. has made arrangements for the extension of its line from Burlington to Oakville, the Oakville council having granted the right of way. According to the agreement the Oakville council is to grant the company free right of way, and in return the company promised to commence building operations before August 1st, and to have cars running through to Oakville by June 1st next. The company is to pay the council \$1.00 per day for the privilege of using the large foot bridge this side of the town, and will erect a swing bridge over the river between Bronte and Oakville. The agreement also stipulates that the return fare shall not be more than 50 cents and that school children's tickets are to be sold at the rate of 6 cents a trip.

The Montreal Street Ry. is now in full possession of the Park & Island line. This was accomplished recently by the resignation of the Park Island directors, which was followed immediately by the selection of a new board, composed of all of the Montreal Street Ry. directors, L. J. Forget being afterward chosen president, and James Ross, vice-president. Although the details of the new extensions and improvements which are soon to be made to the Montreal Park & Island system have not been fully worked out, the general plan seems to have been determined upon, and from what can be learned it is certain that considerable work will be done this season. The success attending the around the mountain belt line,



where 12 cars are now constantly engaged, has been a surprise to the directors of the street railway themselves, and will lead no doubt, to more surprises to the public before many months. It is understood that the entire system will be revolutionized. In the first place the lines to Cartierville and the Sault will be double-tracked and a link built three or four miles along the river, connecting these two sections, and forming them into an immense belt line. It is likewise stated that within a month the flourishing municipality of St. Louis du Mile End will be connected with the city, and that at least a five minute service will be given that growing suburb.

The Quebec Electric Ry. Co. has purchased a 14-ft. right of way from the property owners of Beauport, and will at once commence the construction of a double track between Quebec City and Montmorency Falls. The company has recently opened a very handsome park at the falls, and transformed the ancient residence of the Duke of Kent into a fashionable restaurant, which it operates in connection with the railway system. The great increase of traffic on these lines has more than repaid the company for the outlay. The company is now building a special car to convey the Duke and Duchess of Cornwall and York through the city and to Montmorency Falls on the occasion of their coming visit to the ancient capitol. This car will be one of the most luxurious that has ever been built in America, and no expense or pains will be spared to make it as perfect as possible.

In the scheme of a Market Radial Railway Terminal Co., outlined by the Board of Trade Committee on Markets and Terminal Railways, all the conditions of the problem of focussing in Toronto the freight traffic of a great system of radial railways, appear to have been met. The solution of that problem is of extremely vital importance, not to Toronto alone, but also to a great circle of country about it, and to the electric and steam roads converging upon the city. It is said that there is a division of opinion among the directors of the Toronto Railway as to the advisability of enlarging the local system so as to provide radial roads for the surrounding districts. Mr. William MacKenzie, the president, being strongly in favor of such an extension, while Mr. James Ross, of Montreal, who with other Montreal shareholders controls a majority of the stock, is leading the opposition.

Power from Niagara Falls will soon be delivered in Toronto through the efforts of the Toronto Railway Co., and the Toronto Electric Light Co. The plan proposed is to organize a company which shall represent both the above companies, the first named company to take 10,000 h. p. and the latter, for itself and customers, 5,000 h. p. Officials of both companies are interested in the Niagara Power Co.

After many years of anxious anticipation, the residents of the Canadian side of the river at Niagara Falls have witnessed the breaking of ground for the development of another large portion of the wonderful force of the falls. It was on October 4th, 1890, that ground was broken for a similar development on the New York side. The ten years since then have brought an industrial growth that has been the envy of the residents on the Canadian side of the border, each new manufacturing industry intensifying the feeling that just as good facilities and manufacturing prospects were available on the Canadian side.

While the matter of developing Niagara power in Canada has been under discussion for many years, many things have served to delay the actual commencement. Franchises have been made and remodelled. New companies and new promoters have entered the field, the discussion finally resulting in a better feeling all round. The sincerity of the Niagara Power Co. was all along manifested by the immense rental it paid under its agreement. This company is controlled by the same capital that has established the installation at Niagara Falls, N. Y., under the name of the Niagara Falls Power Co., a fact that gives assurance that the plans will be carried to rapid and perfect completion without those financial difficulties which too often overtake enterprises of such great magnitude.

It has long been understood that the possibilities for the development of power were greater on the Canadian side than on the New York side, and that the cost of the output in Canada would be somewhat less than the cost of similar power on the New York side. The tunnel tail-race on the New York side is over 7,000 ft.

long, while on the Canadian side the prospective development will only require a tunnel having a length of about 2,200 ft. In its size this Canadian tunnel will be of somewhat larger section than the tunnel on the New York side, and it will be lined with brick as will also the wheel pit, the same as the great work on the New York shore. The wheel pit to be built in Canada will have a length of about 250 ft. and its depth will be approximately 200 ft. The tunnel will be discharged into the lower river near the Horseshoe Fall.

The operation of such extensive and reliable capital must of necessity be of vast benefit, not only in the immediate vicinity of the development, but at distant points, such as Hamilton and Toronto. Moreover the comparative nearness of the Welland canal should lead to the transmission of a large amount of the developed current to the neighborhood of that waterway for most advantageous application in industries which should develop mammoth proportions under the impulse of the transportation facilities for both raw and finished product.

### CONSOLIDATION AT LANCASTER, PA.

July 1st a consolidation of the Conestoga Traction Co., the Edison Illuminating Co. and the Lancaster Gas Light, Fuel Co., all of Lancaster, Pa., was effected, the title of the new company being the Lancaster County Railway & Light Co. The company intends to supply light to all towns on the railway line.

The work on the company's new lines is progressing rapidly, and it is expected that the Lancaster, Lampeter & Strasburg road, 11½ miles, will be in operation by October 1st. July 22d an eight-mile line through Mannheim, Petersburg and Friedville and connecting with the Lancaster-Leitz line at Neffsville was opened for traffic. A proposed road on which work will be commenced this fall will run from Lancaster to Mt. Joy, via Landsville and Florrin. The entire system is to be changed to high-tension transmission lines with rotary converter sub-stations.

### OFFICE BUILDING FOR CINCINNATI TRACTION CO.

The Cincinnati Traction Co. has arranged to lease, with the privilege of purchasing, a site for its projected 15-story office building in Cincinnati, the ground thus secured being 119.6 ft. on Walnut St., by 58 ft. on Government Square. Plans for a modern office building which the company will erect are being prepared.

### BERKSHIRE COMPANY AWARDS CONTRACT.

President R. D. Gillett of the Berkshire Street Railway Co., which proposes building a 42-mile electric railway from Cheshire, Mass., to Great Barrington, has awarded the contract for the construction of the line to Fred T. Ley & Co., of Springfield. The work of construction will be commenced in the northern part of Berkshire County, and four months will be required to build the road. The power house will be located at Pittsfield, and is estimated to cost about \$250,000, and the total cost of the road will approximate \$1,000,000. Double truck cars will be used.

### AMERICANS IN LONDON TRACTION.

Mr. C. T. Yerkes, on July 18th, filed articles of incorporation at London for the Metropolitan District Electric Traction Co., limited. The capitalization is \$5,000,000, Mr. Yerkes holding one-third of the stock. The officers are as follows: C. T. Yerkes, chairman; J. Wilcox Brown, president of the Maryland Trust Co., secretary, and W. E. Madelick, assistant secretary. The board of directors comprises: John H. Parsons, president of the Union Traction Co., of Philadelphia; Thomas Jefferson Coolidge, president of the New England Trust Co.; Frederick Ayres, of Boston; H. H. Rogers, John J. Mitchell, president of the Illinois Trust & Savings Bank; Cecil A. Grenfell, of London, and others.

The contractor for the New York Rapid Transit road expended \$1,200,000 during July.

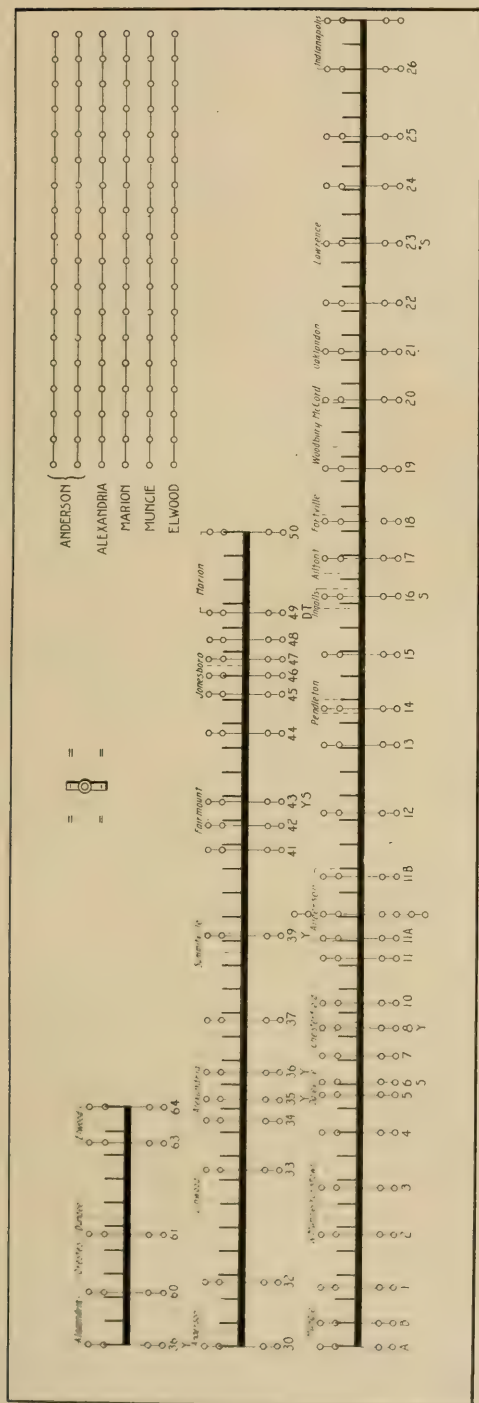


FIG. 1—TRAIN DISPATCHER'S BOARD, UNION TRACTION CO., ANDERSON, IND.

## TWO METHODS OF DISPATCHING ON INTER-URBAN ELECTRIC RAILWAYS.

We describe here two methods of operating cars on interurban lines which are quite different in principle. In the case of the Union Traction Co., of Indiana, the movements of all cars are made in accordance with special orders from the dispatcher, while on the Toledo, Fremont & Norwalk R. R., the dispatcher issues orders only for special trains or in event the regular schedule has been interrupted by accident.

The dispatcher for Union Traction Co. has his office at Anderson, and keeps track of trains by means of record boards which we shall proceed to describe. These boards were put in service early in the present year and are the result of the joint suggestions of Mr. Albert S. Richey, electrical engineer, Mr. Charles Berry, formerly superintendent, and the train dispatchers, Messrs. H. E. Fenton, A. C. Smith and H. Fifer.

There are two tables 6 ft. long each, having a board 2 ft. wide and 6 ft. long set on top slightly inclined backward and painted alike to show a diagram of the system. On the upper part of each board is a double-pole double-throw switch, by which the telephone transmitter and receiver of the board are connected either to the general telephone circuit or the dispatchers' circuit, the former connecting all the offices and power houses and the latter, being for the use of car conductors in reporting to the dispatchers. The dispatcher's telephone receiver is worn on the head, while his transmitter is hung in front of him.

Fig. 1 shows the diagram on the dispatchers' board. The actual location of the various points may be seen from the map of the company's lines. The board is painted black; the heavy lines indicating the route are white,  $\frac{3}{8}$  in. in width, each mile being indicated by a red line 3-32 in. broad and 1 in. long. The limits of towns are indicated by yellow lines (shown dotted in Fig. 1) and the name



FIG. 2.



FIG. 3.

of the town painted above it; where the town is small only a single yellow line is put in. Switches are indicated by white lines extended for  $1\frac{3}{4}$  in. on each side of the heavy lines, with  $\frac{3}{8}$  in. holes bored  $\frac{3}{4}$  in. between centers (the number of holes at a switch indicates its capacity). Each switch is given a number or a letter, as A, B, 10, 11A, etc. Sub-stations are indicated by the letter S, and Y's by the letter Y. In the upper right-hand corner of the board are lines with holes indicating the location and capacity of the various car houses of the company.

Fig. 2 is an end elevation of the dispatchers' table and Fig. 3 shows one of the pegs which are used to indicate cars. The number of the car appears twice on top of the peg, that below the horizontal line being inverted. The arrow-head on the horizontal line indicates the direction of the car.

The method of operating is as follows: When a car, say No. 3, leaves one of the barns, the conductor calls up the dispatcher's office and receives his orders which, for example, are "to pass car No. 6 at switch 12 and report at 14," the peg representing car No. 3 being placed in one of the lower holes in switch 14, the next reporting point. When car No. 6, which was last instructed to report at switch 15, reports it is instructed to meet car No. 3 at switch 12 and report, and peg No. 6 is moved to an upper hole at switch 12.

The general practice is to have only one car report at meeting points, the conductor's report that he has met car No. —, serving to notify the dispatcher of its whereabouts without requiring its conductor to come to the telephone. If the service has for any rea-

The dispatcher's train sheet is a blank, 12x30 in., on which he en-

2. Every employe of this company whose duties are in any way prescribed by these rules must always have a copy of them at hand when on duty, and must be conversant with every rule. He must render all the assistance in his power in carrying them out.



and immediately report any infringement of them to the head of his department.

3. If in doubt as to the meaning of any rule or special instructions application must be made at once to the proper authorities for any explanation. Ignorance is no excuse for neglect of duty.

4. Central standard time is the only recognized standard. A standard clock will be located at the Fremont Passenger Station, which will be used as regulator and from which the trainmen may obtain correct time.

5. Each conductor and motorman must have a reliable watch.

6. Regular meeting points are indicated on the time table by figures in full faced type.

The numbers of trains that are to meet are shown in small type adjoining the full faced type.

7. A flag or lamp swung across the track, a hat or any object waved violently by any person on the track, signifies danger, and is a signal to stop.

8. A train running after sunset or when obscured by fog or other cause, must display the headlight in front and one or more red lights in the rear.

#### Signal Rules.

9. One tap of the signal bell when the train is standing is the signal to start.

10. Two taps of the signal bell when the train is running is the signal to stop.

11. Three taps of the signal bell when the train is standing is the signal to back the train.

12. Three taps of the signal bell when the train is running is the signal to stop at once.

13. Four slow taps of the signal bell when the train is running is the signal to stop at the next house.

15. All extra trains are of inferior class to all regular trains of whatever class.

16. A train of inferior class must in all cases keep out of the way of a train of superior class.

17. Every train must be brought to a full stop before crossing the track of any railroad at grade at a distance not less than one hundred feet nor more than three hundred feet from the same except when such crossing is provided with interlocking apparatus.

At points where a railroad crossing is not provided with an interlocking apparatus the conductor will go ahead to see that the way is clear, and if it is, will motion the train forward. Employees must exercise the best of judgment in crossing tracks of a steam railroad. Take the safe side in all cases and run no risks.

18. When a train is stopped by an accident or obstruction the conductor must immediately go back ten trolley poles and remain there with danger signals to stop any train moving in the same direction until called in by motorman or approaching train arrives. A red flag by day and a red light by night denotes danger and a train should stop at once when approaching such a signal.

19. A train which is delayed and falls back on the time of another train of the same class does not thereby lose its rights.

20. Extra trains must not be run without an order from the train dispatcher.

21. A train about to enter or leave a siding must approach the switch under full control.

22. A train must not start without a signal from its conductor.

23. Conductors and motormen will be held equally responsible for the violation of any of the rules governing the safety of their train and they must take every precaution for the protection of their train even if not provided for by the rules.

24. In all cases of doubt or uncertainty take the safe course and run no risks.

25. Special orders directing movements varying from or additional to the time tables will be issued by the authority and over the signature of the train dispatcher.

26. To obtain orders the conductor of a train will call the dispatcher who will give such orders as are necessary, whereupon the conductor will write the same plainly on a blank provided for that purpose, and when the conductor has finished writing the order, he will repeat it to the train dispatcher who will O. K. same, if it is correct, when the same will be in full force and effect. If for any reason the line should fail, before the dispatcher O. K.'s the order it is of no effect and must be there treated as if it had not

been sent. After receiving an order the conductor will read the same to the motorman, and after reading hand it to him.

27. Orders used by motormen must be sent by them daily to the chief train dispatcher.

28. A train of whatever class must be governed strictly by the terms of the order addressed to it and must not assume rights not conferred by such orders.

29. Orders once in effect continue so until fulfilled, superseded or annulled.

30. A train must not leave a terminal without orders.

31. No person of whatever rank or position will be permitted to absent himself from duty, or to change off with another for a trip, or part of a trip or day without first obtaining permission from his superior.

32. Bulletin orders will be posted on the face of bulletin boards for thirty days, after which these still in force will be placed for further reference in a permanent file connected with the bulletin.

33. Conductors and motormen must have a copy of the time table, examine the bulletin board before starting out for a day's work. Such employes as start out from other than the main car house, will make it their duty to examine such bulletin board upon their first opportunity, or on their return trip past the car house.

34. In case conductors or motormen change off before the completion of their trip, they must carefully exchange all special orders they may have, and each must know that his orders are perfectly understood by the other. Changes of this kind, however, must never be made without permission from the train dispatcher.

35. Conductors and motormen must report for duty twenty minutes before the leaving time of their train.

36. On completion of a day's work, or fraction thereof, the motorman will report to the Master Mechanic the operating condition of his car on a blank prescribed for the purpose.

37. Conductors must take up tickets at the earliest moment after the train starts, and cancel each ticket or trip pass by punching it as soon as taken up. Great care must be taken with half fare tickets and passes to know that they have been presented by the proper person and to see that persons over age do not ride on half fare tickets.

38. Employees must not smoke while on duty.

39. Conductors will permit no person to remain standing if it can be avoided, and will permit no person to occupy more seats than their tickets entitle them to unless there is room for all.

40. As a train enters a town the conductor will call out the name of such town plainly, so that all passengers may hear the name of the town clearly.

41. Motormen, in all matters relating to power, are under the authority of the master mechanic, but in all matters connected with the movement of trains, they are under the authority of the train dispatcher.

42. Conductors and motormen must not move any train at night without a light in front and one in the rear. If any accident should happen to the headlight, a lantern must be used to take its place.

43. Motormen will not permit men who are learning to operate the machinery except when they are themselves present upon them.

44. Conductors and motormen will not leave their train while on duty at the same time.

45. The gong must in all cases be rung before the train is put in motion and also when running through streets of towns or cities.

46. The gong must be rung for at least a quarter of a mile before reaching a road crossing at grade and until it is passed.

47. Extra trains will be distinguished as

Special passenger.	"Special."
Extra freight.	"Extra."
Work train.	"Work train extra."

#### RUBBER TILES FOR RAILWAY CARS.

It is proposed to cover car floors by small rubber tiles, which are joined by cleverly made sutures. The chief advantage claimed for this tile is that it is absolutely impervious to moisture and therefore highly sanitary. The tile yields slightly to the tread, and if laid in railway cars it would take up much of the jarring motion of the train. Dr. J. N. Hurty, secretary of the Indiana state board of health, who has examined these tiles, has endorsed them highly.

## ACCIDENT SWINDLERS IN PHILADELPHIA.

The following account from the Philadelphia Evening Telegraph of the operations of a number of fake accident swindlers who have made a business of defrauding the street railways of Philadelphia and neighboring cities will be of interest to claim agents.

Some time in the early spring of last year one of the claim agents of the Union Traction Co. in investigating a claim for damages received in an alleged accident on one of the company's lines recognized in the claimant a man to whom the company had paid a small amount in a similar case only a few weeks previous. This aroused his suspicions; he reported the matter to Mr. Nelson Sailer, general claim agent of the Union Traction Co., and a rigid inquiry was begun, with the result that a carefully laid plan to defraud the company was laid bare and almost every member of the gang of swindlers has been arrested, and is now in prison awaiting trial, and since they have all made sworn confession their conviction and punishment seems sure.

A man named William J. Doran, with many addresses, seems to have been the leader of the swindlers, while others who have profited at the expense of the Traction company under his tutelage are Charles Ritner, alias James Madison, alias George Fisher; Charles Duffy, Bernard Doran, Clarence E. Mutchler, Mrs. Ida Doran, and Mrs. Amelia M. Ritner.

William J. Doran is known to have secured from the company on four separate occasions payments of \$60, \$25, \$5 and \$35 in settlement of claims for injuries said to have been received by being thrown from cars on the company's lines. It was his over-anxiety to still further mulct the company which eventually led to the detection of himself and his confederates. Agents Silcox and Kline, who unearthed the conspiracy, say that Doran and his associates are artists in their special line, and can simulate injuries so well as to even deceive experienced physicians.

The practice of the members of the gang was to board a trolley car, and then as it was rounding a curve let themselves fall to the street. They would then enter a claim against the company, and when the agent would call would signify a willingness to accept a small amount in settlement, knowing the company would sooner pay a small sum than go to the expense of fighting the claim in the courts.

As an illustration of how cleverly Doran can feign injuries, Agents Silcox and Kline tell how he secured \$100 from the Camden & Suburban Railway Co. for injuries said to have been received by falling from one of the company's cars last March. Doran was supposed to have been so badly hurt about the stomach that when he was taken to the Cooper Hospital in Camden, the man who took him there would not let the doctors examine his stomach for fear he would fall apart. Doran remained at the hospital about two days, got \$100 from the railway company to withdraw his claim, and immediately afterwards became cured.

Doran is a professional contortionist, and for several years travelled with Barnum's circus. He can twist his limbs into many queer shapes and keep them there while being examined by physicians, and was thus able to carry out the deception.

After he became associated with Ritner, Duffy, Mutchler, and the other Doran—the two women are implicated in the conspiracy mainly by reason of guilty knowledge of the fraud—Doran would in most instances fall from the car himself, give the conductor the name of one of his confederates, and then go to the home of that confederate, get into bed, and impersonate the man whose name he had given. On one occasion Doran fell from a car, gave the name of George Fisher, which at that time was Ritner's alias, and his address as No. 313 North Sixth St., where the Ritners were living. He then went to the house and went to bed. When Agent Kline called in reference to the claim, Doran, as Fisher, was in the bed, while Ritner was under it, and by a series of knocks instructed Doran how much to ask for, each knock meaning he was to increase his price \$5.

On December 12th last Mrs. Doran figured as her husband's active assistant. They agreed she was to board a north-bound Third St. car and fall from it at Germantown Ave., where Doran would be in waiting, so as to be a witness to the "accident." When the corner was reached Mrs. Doran jumped from the car, which was going at a good rate of speed, and was thrown into a pile of snow, in which she was completely buried. Doran thought she had fallen beneath the car and been killed, lost his nerve, and ran

home, leaving her to her fate. She was only slightly injured, however, but secured \$5 on her claim.

When Mutchler learned his fraud had been discovered he left the city and went to Canada, where he remained some time, but at length was induced to recross the line, and an account of his arrest, which was made a short distance from Buffalo and attended by sensational incidents a short time ago, was published at the time.

Scarcely had Agents Silcox and Kline broke up the Doran gang when they discovered that another man, more desperate and daring than was Doran, was victimizing the company. This man was James H. Varalla, who in January last lived in the neighborhood of Twelfth and Buttonwood Sts. He was first heard of by the Traction company about that time, when he secured from it \$50 in settlement of a claim for injuries received in falling from one of the company's cars. His story at that time was to the effect that he had fallen from a car and had fractured his right arm. He gave the name of S. W. Brubaker, of No. 1339 Hope St., as a witness of the accident, and Brubaker, when visited by Agent Kline, corroborated Varalla's statements. Since then Brubaker has been arrested, and has made a sworn confession, setting forth that Varalla had induced him to join him in defrauding the company, promising to give him half of whatever sum he might receive.

Emboldened by the success attending his first venture, it was not long before Varalla was engaged in another scheme. On February 20, 1901, Varalla and his wife were still living at Twelfth and Buttonwood Sts. That morning a constable levied on them for rent. An hour or so later Varalla left the house and went to Hunting Park, where he remained all day. In the evening, according to facts learned by the Traction's agents and confirmed in a confession they say he has made, Varalla left the Park, went up Old York road, and proceeded to put his scheme into operation. He dug a hole under one of the T-rails and planted in it a plank, so arranged that when a car would strike it the car would be lifted up and thrown off. He then ran north on York road about 200 yards, where he boarded a south-bound car. He stood on the rear platform and when the car struck the plank and was lifted from the track, he threw himself clear across the road. Four passengers in the car were seriously injured in the wreck. Varalla hurried to the Samaritan Hospital, where he gave the name of Frank Berrell, and claimed that his right arm was hurt. It was bound in splints. Varalla went from the hospital to the house of a woman on Crawford St., Germantown. He told her he had hurt his arm in falling from a trolley car and was going to get some money from the Traction company, promising her a portion of it if she would allow him to remain at the house and would tell any Traction agent who might call that his name was Frank Berrell, and that he had been boarding with her for some time.

Varalla then wrote to the Traction company, claiming his right arm had been crushed to a pulp, and demanding \$2,000 damages. He made himself a false arm of straw and sawdust, which he intended using to deceive the Company's agent. Kline was sent to investigate the claim, and when Varalla saw him coming up the road he put on a pair of gold-rimmed glasses belonging to the woman, in an effort to disguise himself. Despite this, he was recognized by Kline, who had met him in January, and charged him with having caused the wreck. This he denied, but as soon as Kline left the house he slipped out the back way and escaped.

For a time he kept away from the city, working for the American Valve Co., at the Trenton Cut-off. The agents at length learned of his whereabouts, and when he ventured to return to the city a few days ago, he was promptly arrested. Varalla was given a hearing before Magistrate O'Brien and held for court in default of \$1,000 bail for placing an obstruction on the tracks; \$800 bail for conspiring to defraud the company, and \$600 bail for attempting to extort money.

Brubaker, who aided him in the first instance, was also held in \$800 bail on a charge of conspiracy. The Germantown woman has made a complete confession to the officers of the Traction company, and has given them the false arm Varalla made.

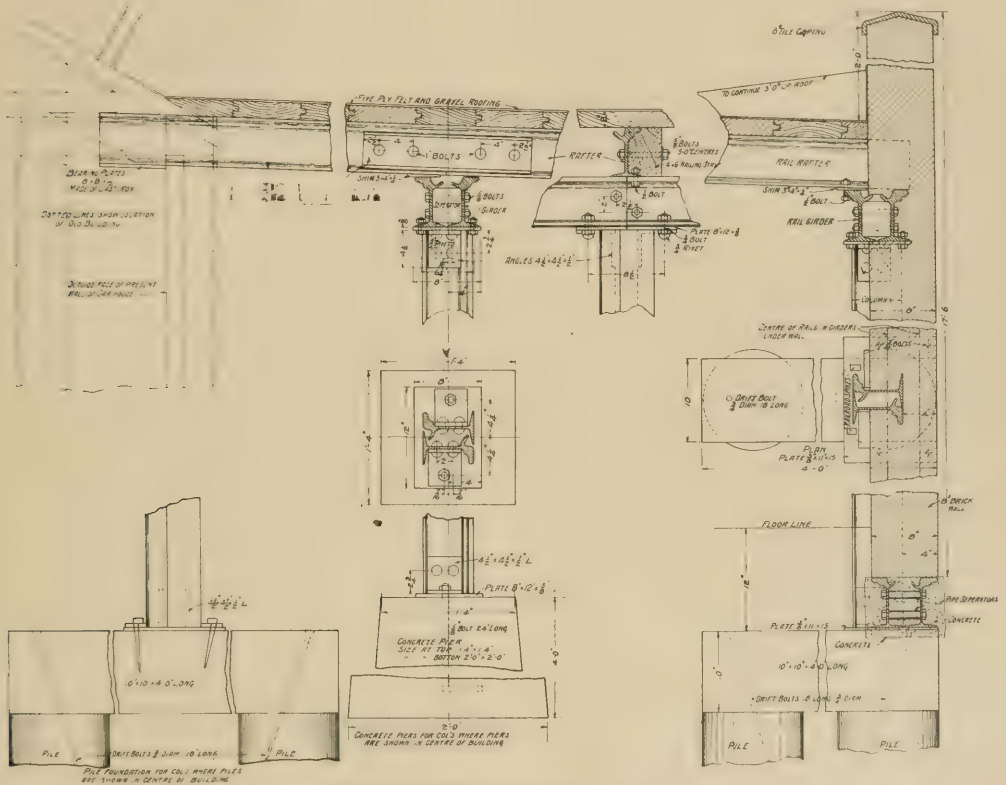
A gold chain was recently presented to Mr. C. E. Klein, a motor-man on the Dover & New Philadelphia road, by a number of his associates as an expression of friendship. It was presented on the eve of his departure to take charge of the fast car which will be run over the new Findlay-Fostoria line.

## BUILDING CAR BARNS OF OLD RAILS.

The companies controlled by the International Traction Co., of Buffalo, in the construction of new car barns have effected a considerable saving by utilizing old steel rails, both for the supporting columns of the buildings and for the roof girders. Most of the rails so used are old 6-in. girder sections in 30 ft. lengths, that have been so badly worn as to prohibit their further use in the track, but which still retain sufficient strength to make them perfectly safe for use as car house framing.

As shown in the drawings these roof girders are bolted to the supporting columns with the aid of angle plates similar to those used in anchoring the base of the columns, and in this case also bearing plates are interposed to form a true bearing surface.

In order to secure a convenient method of attaching the roofing, roof rafters each consisting of a single rail to which is fitted a wooden nailing strip, are placed at frequent intervals across the supporting girders, to which they are bolted in the manner indicated. The 2-in. roof boards, on which is placed the five-ply felt and gravel roofing, are nailed directly to the nailing strip. As the



### DETAILS OF CONSTRUCTION WITH OLD RAILS.

The accompanying detail drawings will render clear the method by which the rails are utilized.

For the most part the upright columns are formed of two rails placed together as shown, with the base of one rail fitting closely into the head of the other, so that when bound together at the top and bottom they form one rigid girder. These columns are supported either on piles or concrete piers, but in both cases the ends of the rails rest directly upon a  $3\frac{1}{2}$  in. cast iron bearing plate to which they are anchored by means of two  $4\frac{1}{2} \times 4\frac{1}{2} \times \frac{1}{2}$  in. angle plates, the upright sides of which fit closely against, and are riveted to, the shanks of the rails, these angles also serving the purpose of binding the rails together. The longitudinal sides of the angles are bolted through the bearing plate to the pier, the holding down bolt being embedded in the concrete. When the columns rest upon wooden piles instead of concrete piers, the angle plates are spiked to 10-in. stringers which in turn are anchored with 18-in. drift bolts passing diagonally into the ends of the piles.

To form the main supporting roof girders of the barns, two rails are bolted together with a filler of cast iron between; in this case the rails standing on their own bases, one rail not being inverted in relation to the other as is done in forming the upright columns.

roofs have a slight incline to allow for drainage, it is necessary to drive a wedge-shaped shim between the rail rafter and the head of one of the rails forming the main cross girders.

RELEASE OF LIABILITY BARS DAMAGE SUIT.

An employee of the West Chicago Street Railway Co., who was injured several months ago, signed a release of liability for the company in return for which he was given a situation as switchman. Later he brought suit for damages. No fraud having been affirmatively shown in the signing of the release, the trial judge held it to be a bar against any action for damages, and directed the jury to return a verdict for the corporation. The appellate court has just affirmed this decision.

The Moffat Railway Bearing Co. is the title of a new corporation which is the largest ever organized under the Maine state laws. Its capital stock is \$25,000,000, half common and half preferred. The object of the company is to manufacture railway car bearings and rolling stock.



## CORRESPONDENCE.

### BONDING V. OVERHEAD RETURN.

Editor "Review": Believing that the question of substituting an all wire return circuit for the bonded track return should be of interest to your readers, I send you a brief description of the return system used on our road, which is a 15-mile suburban line. Our experience leads me to think that the ideal construction for a suburban or interurban road is one in which the track return is made a very unimportant feature of the return circuit, and practically all of the current finds its way back to the power house over an overhead copper conductor of the same carrying capacity as the trolley wire. Of course the double overhead trolley wire system is not feasible or desirable owing to the objection of having two trolley poles on each car, and to the mechanical difficulties arising at overhead switches and crossings. But as the next best thing, a return wire carried on the line poles and tapped into the track at frequent intervals is not only practicable, but I believe highly desirable from every point of view. Our road is laid with 60-lb. T-rails on standard steam roadbed construction. The outgoing feeders tap into the trolley wire every 500 ft., and we have a bare return wire, carried on the side poles, and tapping into the track every 250 ft. We use no bonds whatever, but at each rail joint there are ordinary 8-bolt angle bars, screwed up to the rail as closely as the nuts will stand. We inspect the track frequently and maintain the joints in the best possible condition. For my own information I have recently removed the angle plates at various places along the track, and invariably I found several bright spots on the inside of each angle bar, proving that the plates were touching the rails at a number of points. The contraction and expansion of the rails tend to keep these spots bright. The track was laid between three and four years ago.

We carry the connecting wire, which is about a No. 00 section, heavily insulated, down the outside of our wooden poles. About 10 ft. from the ground the wire enters a galvanized iron pipe with its inside diameter just large enough to permit the insulated wire to be drawn through without injuring the insulation, but the fit is so close that when the pipe is bent the wire can not be withdrawn. A trench is dug from the foot of the pole to the track and the pipe is buried in this from the pole to the line of the rail, the insulated wire being brought up out of the ground at the joint, and soldered to the rail under the angle plates. If we were doing the work over again we would make the connection to a copper cross bond connecting the two rails. At the other end, the tapping wire is wound once or twice around the bare overhead return wire and soldered. As none of these soldered joints are underground there is no corroding action at these points. Where the wire enters and leaves the iron pipe, several turns of insulating tape are placed to keep moisture out of the pipe. As before stated these tapping wires are located every 250 ft.

There are not over 10 joints in each section and one of these in each rail would have to be bad to have an appreciable effect in interfering with the return. There is no excuse for having two bad joints in every ten. Moreover, the current will flow either forward or backward to the tapping wires, so that the possibility of having one whole section out of order is extremely slight.

Another important advantage is the protection from wire thieves. As the iron pipe makes two bends from the pole to the rail, the wire can not be drawn out, and there is no way in which thieves can carry off the copper except by cutting the pipe itself and digging out the trench. This is a larger job than most wire thieves will care to attempt.

The all-wire return will of course require a somewhat greater investment in copper, but not so much greater as might at first be supposed. In fact, I know of several roads about the same size as ours, which have more money invested in bonds and return feeders, but which are not getting as good results as we are. But aside from all other questions, we always know where our current is, and that is a great satisfaction. Yours truly,

SUPERINTENDENT.

(Proofs of the foregoing letter having been submitted to the manufacturers of a number of rail bonds, the following letters were received in reply.)

Editor "Review": Being much interested in the question of rail bonds, I have carefully read the letter of "Superintendent."

Any scheme which tends toward increasing the carrying capacity of the return circuit is most desirable. The plan, outlined by your correspondent, does not, however, give sufficient evidence of accomplishing this object to warrant its adoption. The return system of electric railroads should have a carrying capacity fully equal to that of the outgoing conductors, and any return system that fails in this particular is faulty.

Your correspondent does not mention the size wire he uses as a return circuit, but from his letter we would assume that it was not larger than a No. 00 wire. As he appears to consider that the track through the angle plates would act as an auxiliary to this return wire, I do not see that his method differs in any way from the old system originally used of a wire buried between the tracks and connected to each rail. The one advantage he offers over this system is that the wire not being underground, is not subject to corrosion. At a very much smaller cost than that of the copper necessary for his plan, rail bonds for use either under the fish plate or around it, of the most approved patterns could be secured.

A bonded track return, when properly installed, gives a return circuit equal in carrying capacity to the full carrying capacity of the rail, which in almost every case is ample. The plan outlined by your correspondent, however, depends entirely upon the overhead wire connected to the rail in a manner of very doubtful efficiency. I say doubtful advisedly, knowing from long and bitter experience that it is almost an impossibility to make a proper electrical connection between copper wire and a piece of steel rail by means of solder. We have in such a case three dissimilar metals in juxtaposition. The inevitable result is a generation of electricity through chemical action with all its attendant disadvantages and also a generation of electricity through thermal action due to changes of temperature. This might be improved by use of the stub end bond sold by all the better known manufacturers of bonds. However, setting aside this point and assuming that a method of proper connection has been developed, I would still condemn any method of securing the return circuit which depends in any way upon the contact between the fish plate and the rail. To keep this in condition so that the resistance would not be prohibitive, with even a very light current, would require constant and careful attention. A properly bonded rail with the ordinary attention given to such systems, could be installed and maintained at a very much less cost than the system described by your correspondent.

I do think that the plan would make a very fair auxiliary to use with an under-bonded system if the contacts were made by a riveted method instead of solder, but I do not think that it could be used by any road operating under usual conditions with any success.

BONDS.

Editor "Review": In his article upon Bonding v. Overhead Return, "Superintendent" does not give sufficient details to enable one to pass judgment upon his scheme. He says that on a 15-mile line he uses for return circuit an overhead copper conductor which has the same section as the trolley wire, and that he connects this wire to his 60-lb. rail every 250 ft. He does not give the weight of his trolley wire and feeders, percentage of drop, weight and number of cars, speed required, grades, location of power house nor consumption of coal and water per hour. But he says that there are other roads "which are not getting as good results" as his, though they have spent more money. This I do not doubt, since the average copper bond on light rail is very unsatisfactory after a few years' use.

He further states that his connecting wire is No. 00. From this I judge that the other wire is larger in section. Assuming that it is No. 0000 wire, this would at present cost him about \$10,000, and its resistance would be nearly 4 ohms. Bonds with a conductivity equal to his rail would not cost two-thirds of this sum, while the total track resistance when bonded in this way would be about one-half an ohm. In other words, he spends 50 per cent more money to get one-eighth the result.

This does not seem to be particularly brilliant engineering nor is it an example to be rashly followed. Yours truly,

HAROLD P. BROWN.

## HIGH SPEED RAILWAY EXPERIMENTS IN GERMANY.

During the visit of the Institution of Electrical Engineers in Germany the high speed experimental railway of Siemens & Halske, and the Berlin-Zossen road were visited and a short description of them was given in Engineering, London. In connection with the question of high speed railways mention is first made of the high speed military electric railway line Berlin-Zossen, now under construction, on which electric trains are to run at speeds of 200 or 250 kilometers, with motors fed from an overhead 10,000 volt triphase line. Part of the work, which will have no sidings whatever, is finished. But whether many people will care to travel at 150 miles per hour remains to be seen; many electricians certainly declare that they would be satisfied with a more modest speed, and until the real service is opened the discussion of the maximum possible speed may be suspended. The car, constructed by Siemens & Halske, has no plough-edge ends, because it is considered that at very high speeds the shape of the car front will have little influence compared with the effect which the air cushion travelling with the car will exercise. The question of a high-speed electric railway, which has been creeping up again and again during the past fifteen years, has been taken up by the "Studiengesellschaft für Elektrische Schnellbahnen," and two firms, the Allgemeine Electricitäts Gesellschaft and Siemens & Halske, are each experimenting and preparing complete outfits. The Zossen line is to be opened this summer, it is said.

The experimental track of Siemens & Halske, which has done duty since 1899, has a length of one mile. The construction of their high-tension trolley line has already been approved for the military railway. The three wires are stretched above one another on the same plane poles; a net of guard-wires is underneath. The line insulators are held by a strong vertical rod, bent over at its two extremities so as to form a bow, the chord of which is subdivided by strong spiral springs, so that the bells are elastically fixed. Against the wires three sliding bows rub laterally. Their bases were first arranged behind one another on the top of the locomotive or motor car. It has been found preferable to attach them all to a high contact pole, which, of course, swings a good deal when the locomotive is running through the short track, and does not permit, so far, of speeds of more than 60 kilometers—nearly 40 miles. The bows are copper or aluminum bars. At the bottom of the pole there are three rings, against which forked brushes bear to conduct the current down into the transformers. Each sliding bow contains an insulator, the connection with the rings being established by special wire branches and a strong spiral spring. The three levers all turn to the same side—the whole pole turns about its vertical axis and is swung in—and horn lightning arresters, with double horns, i. e., each horn consisting of two wires converging to a common point, are placed on the other. The lowest line wire is about 18 ft. above the sandy soil.

The experimental motor car is of normal gage, and has a length of 4 meters (13 ft.); it rests on two axles, with a wheelbase of 2.8 meters; the wheel diameter is 40 in.; and the whole car weighs 40 tons. The shape of the high-speed locomotive, which must not be confounded with the motor car, is that of the mining locomotive, adopted also on the London Central Electric Railway, the car being in the center; a locomotive for a 10,000 volt line requires, of course, a special complete outfit. The general plan has, in both cases, been to earth most carefully everything which is not highly insulated and placed out of reach. The locomotive is built in iron, and provided with a compressed-air brake and a hand brake; no electrical braking is intended. The central cab, in which Mr. Reichelt, the chief constructor of this department, and two men can comfortably ride, contains four levers for forward or backward motion, star-mesh connection, and for the motors and air-pump. The transformers, which are horizontally arranged, and the rheostats, driven by a chain, are placed in the sloping portions front and rear. The car is symmetrical as regards front and rear. Current is generated at 10,000 volts in a rope-driven dynamo on the spot, and passes into the line described. From the bows and rings a first branch is taken down to a small transformer, which reduces the tension to 1000 volts for the air-compressor motors. A second branch leads to the main transformers.

The two motors of the experimental car, each of 30 h. p., with a maximum output of 120 h. p., work at 750 volts. The Zossen loco-

motive has two bogies, each of two axles, and four motors, each of 250 h. p., able to stand a temporary overload of 1000 h. p. The main transformer cores of the locomotive are connected by double yokes, and cooled by longitudinal slots, through which the air rushes when the car is in motion. These slots are lined dust and water-proof. The sheet-iron case which encloses the transformers is suspended on the car beams. The primary windings are permanently joined in star fashion. The secondary terminals are led out to separate switches, which connect them in star fashion for 2,000 volts, or in mesh fashion for 1,150 volts. These switches, as well as the motor switches, are placed in closed boxes below the car floor. The switches are of the tubular or bayonette type, and are worked by compressed air, the lower part rising or falling. For switching-in, compressed air is admitted; cutting out is effected by means of a spring and latch mechanism; the compressor is driven by a 3 h. p. motor. The intermediate motor switches are of the same type; tubular fuses with tin strips are used. The triphase motors make 880 revolutions, and are constructed for 45 periods. The resistances are made of Krupp, and are assembled in flat boxes fixed to the car sides beneath the windows.

Mr. Reichelt permitted members to have a ride in the motor car, and also examination of the locomotive, which was, of course, not under current then. When he rushed past them on his locomotive, members kept at a respectful distance.

Some of the members paid a visit to the Wannseebahn, near by there, on which one electric train is now running every day. Its electric equipment is due to Siemens & Halske.

## FRANCHISE TROUBLES IN ATLANTA, GA.

In applying for a franchise to extend its lines over what is called the Boulevard route, the Atlanta Rapid Transit Co. last month met with a check in the aldermanic board in the shape of a condition attached to the franchise, requiring the company to sell tickets for three fares for 10 cents over the entire system inside the city. The franchise for the extension was granted unconditionally by the city council, but in the board of aldermen the following condition was added:

"That said Atlanta Rapid Transit Co., its successors and assigns shall never charge more than 10 cents for three fares, or tickets good for three fares, over any of its lines from the center of the city to any point within the city limits, or vice versa, that is from any point within the city limits to the center of the city, or for a shorter distance between any such points."

There was a tie vote upon this condition, which was decided by the mayor, who cast a deciding vote in favor of it. Secretary Atkinson of the Rapid Transit Co. states positively that the extension will not be constructed as long as this provision is in the ordinance.

## FIRE IN ST. LOUIS.

A severe fire occurred in St. Louis, July 10th, which destroyed the coal storage and supply house of the St. Louis Transit Co., at Park and Vandeventer avenues. Seven of the principal car lines in the city completely suspended operation at 7 o'clock in the morning for several hours.

The building destroyed was frame, 300 ft. long, 50 ft. high and 25 ft. wide. In it were stored 30,000 tons of coal and the heat from the flames was so intense that for a time the firemen were unable to get close enough to do effective work.

This building adjoins the boiler house on the south, and the heat became so intense that the firemen could not feed the furnace on the south side of the boiler house.

The building was covered with corrugated iron, and this kept the flames confined until the iron became red hot and dropped off, thus giving the firemen a chance to get streams of water where they would have effect.

Mr. Dupont, general manager of the company, estimates the loss to the storage building and the contents at \$50,600. He attributes the fire to spontaneous combustion.

The Cincinnati Traction Co. has recently installed at 5th and Walnut Sts., one of the electrically operated switches made by the American Switch Co., of Pittsburgh.

PLANS OF WASHINGTON TRACTION & ELECTRIC CO.

Mr. Allen L. McDermott, president and receiver of the Washington (D. C.) Traction & Electric Co., states that the various properties owned by his company will probably be sold under foreclosure some time near the end of the present year and will be bought in by the principal owners of the stock, who will then consolidate the roads now controlled by the syndicate. The company controls a system of electric roads as finely equipped as any in the country, but too much money was spent on them in the beginning, and certain branches are a source of steady loss, as they will not pay expenses for some years to come. The company now is simply a stock and bond owning company, but as an operating company after the roads have been consolidated it would be able to conduct the roads to much better advantage.

The plan for the issue of 55 per cent preferred stock and 55 per cent new bonds, bearing 4 per cent interest per annum instead of 4½ per cent, as do those upon which default of interest was made last May, has already been published in the "Review," and it will probably prevail.

WORCESTER RAILWAYS & INVESTMENT CO.

A new company has been formed in Worcester, Mass., called the Worcester Railways & Investment Co., which is modeled on the lines of the Massachusetts Electric Companies recently described in the "Review." This company has a capital of \$6,000,000 with which to purchase the stocks of the Worcester Consolidated Street Railway Co., including the stocks of the old Consolidated company, the Worcester & Suburban, the Leominster & Clinton, the Worcester & Marlborough and the Worcester Traction Co. Vermilye & Co., of New York, are managers for the syndicate which will control the new company. The trustees of the company are Col. A. George Bullock, Worcester; T. J. Coolidge, Jr., Boston; Samuel Carr, Boston; Hon. Stephen Salisbury, Worcester, and William Read, of Vermilye & Co., New York.

CONDUCTOR'S BLANKS AND HOLDER AT BUFFALO.

Mr. T. E. Mitten, general superintendent of the Buffalo Railway and allied companies has designed a set of conductor's blanks and a very convenient trip sheet holder, descriptions of which may prove of assistance to others who contemplate changes in the forms they are using.

The holder is made of pasteboard, leather-covered and folds in the middle. When open it measures 9x5½ in.; folded, 4½x5½ in.

BUFFALO RAILWAY AND ALLIED CO'S.  
Conductor's Trip Sheet.

Line \_\_\_\_\_ Date \_\_\_\_\_ 1901

Car No. \_\_\_\_\_ White Reg. No. \_\_\_\_\_ Red Reg. No. \_\_\_\_\_

Conductor \_\_\_\_\_ No. \_\_\_\_\_

Station \_\_\_\_\_

TRIP.	TIME.	TICKETS.				CASH FARE.	Transfers Collected	REGISTER READINGS.	Transfers Issued.
		D. H.	5c.	10c.	25c.				
1	In								
	Out								
2	In								
	Out								
3	In								
	Out								

FIG. 1.

On the inside of one cover is a short pocket for holding accident slips and "found articles" reports. On the other cover is pasted a list of instructions in case of accident which read as follows:

Give all aid possible to the injured person.  
Secure name and address of injured persons, owner of damaged property, and such other information as is necessary to enable you to make out "accident slip."

Secure names and addresses of all witnesses, whether passengers or bystanders, also number of passengers in car, and number of any other car in vicinity at time of accident.

Determine as far as possible extent of injury or damage.

Serious accidents must be at once reported to the claim department, Telephone Seneca No. 410.

Every accident, no matter how slight, occurring on, in connection with, or near your car must be duly reported.

Information concerning accidents, address of injured persons or

Record of Transfers Issued.

TIME ON.	SERIES NUMBER	COMMENCING NUMBER.	ENDING NUMBER.	TOTAL ISSUED.	TIME OFF.	
					Hours	Min.

Statement of Mileage.

Trips From	To
Trips From	To
Trips From	To
Trips From	To

Car Out	Run No.	Date	19
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TRAINMEN'S REPORT OF TIME.

		CONDUCTOR	MOTORMAN.	MOTORMAN.
On				
Off	Relieved by No.			
Time				
On				
Off	Relieved by No.			
Time				
Total Time				

Conductor will use Blank below for making Report of Over Time, Short Trips, Etc.

Conductor.	Motorman.	No.
Station Clerk	Motorman.	No.

FIG. 2.

witnesses, must not under any circumstances be given to any person except he be an officer of the company.

The accident slip is 4¾x8½ in. and on one side is ruled for the conductor's report and on the opposite side for the report of the superintendent or station master to whom the report is turned in.

The slip for reporting articles found in the cars are 3x4¾ in. and has at the bottom a blank receipt to be signed by the person to whom the articles are returned.

The trip sheet is 10½x8½ in. and is folded down the middle making a four page blank 5¼x8½ in., which is held in the cover by a rubber band. As thus folded pages 1 and 4 are the conductor's cash and ticket report, the upper portion of which is shown in Fig. 1. Pages 2 and 3 are similar and are shown reduced in Fig. 2.

July 4th the coal bunkers of the Sioux City Traction Co. at Third and Pavonia Sts. were totally destroyed by fire. They were built about 10 years ago at a cost of \$20,000, and it is understood that they were not insured.

The Savannah (Ga.), Thunderbolt & Isle of Hope Railway Co. has recently purchased nine 40-ft. cars from the John Stephenson Co., four of which have been delivered and are now in service. These cars are equipped with G. E. 67 motors and K to controllers.



# STORAGE BATTERIES IN ELECTRIC POWER STATIONS, CONTROLLED BY REVERSIBLE BOOSTERS.—I.

BY J. S. HIGHFIELD.

This paper was read before the Institution of Electrical Engineers May 9th and the illustrations herewith are reproduced from the Electrician, London.

The use of storage batteries in direct-current central stations has now become general, but there seems to be a great divergence of practice among station engineers in the matter of the proportion that the battery bears to the steam plant. A table gives the proportion of battery capacity to the steam plant capacity in many direct-current stations, the figures having been obtained through the courtesy of the engineers of the various towns in supplying the figures. There seems to be no good reason for this great diversity of practice, and this paper is written with the object of putting before the engineers what seem to be the chief points in considering the designing of batteries for the work they are called on to do in central stations, and to describe subsidiary apparatus which may be found of use and convenience in operating batteries. It is convenient to divide stations into three varieties—namely, (1) lighting and general supply stations, (2) traction stations, and (3) combined stations for supplying to the general town network and to a tramway system.

In laying down a station for a general town supply, where the load factor may not be more than 12 per cent, and where the difference of the magnitude of the load in winter and summer is great, it has been customary to instal a battery having a capacity, reckoned at a three-hour rate of discharge, of but a small proportion of the whole station plant. This battery is usually very useful in the first years of the supply, but as the load increases from year to year, the battery is worked altogether beyond its capacity, and so falls into a bad state of repair and into disuse, and additions to plants do not very often include corresponding additions to the battery. This ill-treatment of the battery is very frequent in stations where the battery works the night shift, as there is a great temptation to delay increasing the capacity of the battery or the hours of working the plant till the last possible moment, and the battery under these circumstances is frequently run down; needless to say, it is very soon irreparably damaged. It seems hardly necessary at this date to insist on the absolute necessity of using storage batteries with the greatest care, of giving them at least as much skilled attention as the rest of the station plant. If an armature becomes grounded or a commutator damaged, the repairs are not a very serious matter; but neglect of a battery, too heavy charging or discharging, insufficient charging and over-discharging damage to some extent every plate in the battery, and consistent treatment of this sort will rapidly reduce the storage capacity and the efficiency of working at the same time.

In an ordinary lighting and general supply station, the battery is nearly always divided into two parts—one, the main battery, consisting of a number of cells arrived at by dividing the pressure in volts maintained at the bus bars by 2.5, the usual voltage at which charge is assumed to be complete; the remaining part of the battery consists of such a number of cells as to make the whole number in the battery equal to the figure obtained by dividing the bus bar volts by 1.85, the lowest pressure to which it is usual to allow each cell to fall on discharge. This second, or regulating section of the battery, is connected to switches which enable more or less of the regulating cells to be connected to the bus bars; the arrangements differ somewhat in different stations, but substantially this is universal practice. For charging, a special dynamo is run at the necessary pressure or boosters are used to raise the bus bar pressure to that desired. These devices of heavy regulating switches, boosters, and their connections, are exceedingly costly, and very difficult to operate in practice; moreover, the risk of short circuits between the bars connecting to the regulating switches is somewhat great, and in most stations the battery switch gear is more complicated and more costly than any other part of the switching equipment. The arrangements for charging the battery are two—one is to disconnect the battery entirely from the working bus bars and to connect it to bars at a higher pressure, cutting out the regulating cells as they become charged; the other is to connect the cells to the

charging bars, and to connect a less number of cells to the supply bars. In this case the charging current is greater in the end cells than in the remainder of the battery; in either case it is quite impossible to properly charge the regulating cells, and it is nearly always found that these, excepting possibly the last two or three, which are rarely used, depreciate at a far greater rate than the other cells in the battery.

After trying the regulating cell system I decided to eliminate entirely this source of trouble and expense, and the arrangement I have used for the past two years is to regulate entirely by means of a variable-pressure booster, so designed that by varying the field strength the pressure can be varied from zero to a maximum in either direction. The booster has a double-wound armature working in one field, each arm of the battery is connected in series with one of the armature windings, and the field is varied by a 30-point rheostat and a reversing switch interlocked therewith in such a way as to vary the volts given by each armature from zero to 50, each step of the resistance serving to effect a variation of rather less than 2 volts. The booster is fitted with carbon brushes worked at very low current density, and no trouble is experienced when the current

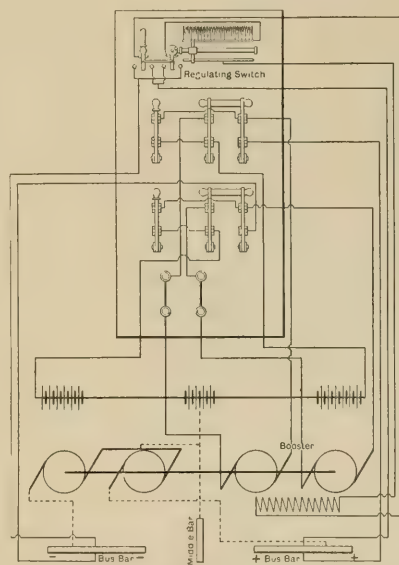


FIG. 1.

is large and the field strength small. The battery supplies a three-wire system, the middle point of the battery being connected to the neutral bus bar; a very good type of balancer is also used, so that the out-of-balance current dealt with by the battery is small. One half of the battery may be charged by disconnecting the other half entirely from the bus bars, and charging through the balancer. The arrangement of electrical connections is shown diagrammatically in Fig. 1. The switch gear required to connect or disconnect the booster and the battery is exceedingly simple, and, of course, the whole of the necessary regulating is done by varying the amount and direction of the boost as desired. The battery is always connected to the bus bars, and one of the most convenient purposes it serves is to act by means of the booster as the controller of the station pressure, which is regulated solely by the switch handle, which regulates the strength of the booster field and hence varies the amount of boost.

The arrangement here described was the first one I designed. It has proved an immense improvement on the regulating cell system, but has the objection that a sudden variation in the load causes a variation in the pressure. It is very desirable to make the regulation of the station as automatic as possible, provided that no very delicate gear is used, and the automatic booster to be shortly described, would certainly be an improvement on the one above men-

tioned. I am at present arranging to use an automatic booster in connection with a three-wire lighting battery. The arrangement of the switch gear shown on Fig. 1 is not the best. I am now arranging to use an interlocked gear designed to prevent all possibility of accident by a careless operator. The method of operation is as follows:—Should the pressure rise by reason of the diminishing load, the boost is varied so as to cause the battery to discharge less or to charge more. Should the pressure fall, the booster is regulated so as to work in the opposite sense. If the speed of the generators is arranged for full load at the correct pressure, by regulating the station pressure, by the booster and battery, the generators will always, in an almost automatic way, be kept at full load, provided always that the battery is of proper capacity. The battery, of course, also serves as a store of energy, which is used to drive the entire load when it is so small as not to be sufficient for a single generator. There are, therefore, three purposes which the battery serves to fill: (1) It serves, with suitable means of regulation, as a controller of the station pressure. (2) It serves as a store, so that the running generators may be always fully loaded, and also it may carry the peak of the load, and to serve to improve the load on the steam-raising plant. (3) It serves as a store of energy which may be drawn on at times when the load is within its capacity. In stations of small size up to, say, 1,000 kw., the battery is of immense use in steadying the pressure, especially when a few rather large motors are connected to the mains; in

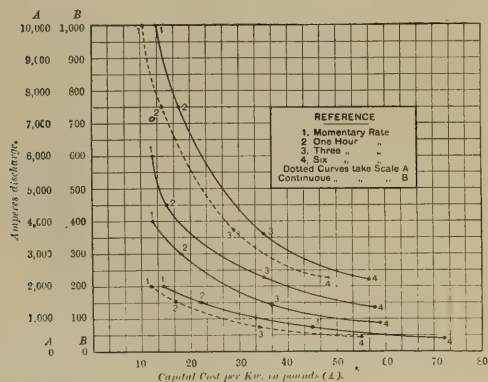


FIG. 2.

large station, where units of large size are used, this is not a matter of so much importance. The battery is also a great source of security in the case of partial short circuits on the mains; it will easily burn out a fault, which might damage the generators, and with very little fall in the pressure. I have had experience of several cases where the battery has burnt a bad main's fault clear, the first news of such an accident coming from the outside gang.

To fully fulfil the above purposes it is necessary to properly proportion the battery to the work which it has to do in relation to the work done directly by the running plant, and it is necessary to take into account the capital cost of batteries in order to decide to what extent it is advisable for financial reasons to install them in a central station. It is convenient to work out the cost of the battery per kilowatt of discharge at various rates. Fig. 2 gives the cost per kilowatt of storage batteries, including the booster and switch gear complete and ready for work, but excluding the cost of the battery house. The table applies to batteries for 480 to 500 volt circuits, consisting of 240 cells, which is the best number to use for 460 to 480 volt lighting circuits when the booster method of control is adopted. The gear is all designed to work at the one-hour rate—if designed for the three-hour rate a reduction of about 10 per cent would be made. The cost of steam and electrical plant—excluding buildings—may vary from £25 to £50 per kilowatt capacity. Taking £35 as the usual figure for small stations, it will be seen from the curves (Fig. 2) that at about a three-hour rate of discharge the battery costs per kilowatt of possible output the same amount as the running plant, and as the size of the battery increases the cost per kilowatt somewhat decreases. At a one-hour rate of discharge the

cost of the battery is less than the cost of plant of a similar output. The "peak" of a lighting station does not usually last for more than two or three hours in a town where late-closing shops make up a large proportion of the load. The proportion of the maximum load constituting the peak varies from one-fourth to one-sixth, that is to say, if the peak is defined as an amount of load constituting one-fourth to one-sixth of the maximum load, this peak does not remain on for more than three hours, it is usually less. If the battery is to take the whole of the peak it must, therefore, be designed to have a capacity, reckoned at the rate of discharge which will run it down in three hours, of at least one-fourth to one-sixth of the maximum load on the station. In a new station of moderate size the battery might be made to bear a larger proportion to the plant installed than this, as large batteries and their controlling gear are somewhat less costly than small ones, and are also less trouble, owing to the fact that they are usually more solidly constructed. A battery of sufficient size to carry the peak for three hours will be able to serve the three purposes set forth above in a very complete way, and the loss of energy in the battery will generally be amply compensated for by the increased economy due to working the engines at full load and to the improvement of the steam-raising plant load factor. The load factor of the steam-raising plant is usually very poor, the fuel wasted in raising steam and keeping hot long ranges of pipes is equal to a considerable portion of the fuel usefully consumed. It seems impossible to lay down general rules as to the working of boilers in electric works; the only thing to be said, a fact readily conceded, is that the greater the regularity of working of the steam-raising and distributing plant the greater will be the economy. In works of 1,000 kw. capacity or less it will be generally most economical to drive the load from midnight to 6 a. m. from the battery—in summer time the load may be often carried in this way for a longer period—and a battery designed to carry the peak for three hours will generally be sufficient to do this. The boiler fires would be banked during these hours, and one shift of men saved. In larger stations, however, the coal thus used would be nearly as much as if an engine were running all night, and probably in stations above 1,000 kw., and certainly in stations above 2,000 kw., it would be more economical to drive the load from the running plant, charging the battery to keep the engine at full load. Then on the load rising in the morning the battery would be discharged until the demand increased sufficiently to load up a second engine, again charging the battery.

Small stations supplying residential towns must be considered on a somewhat different basis from large stations supplying manufacturing towns in respect of the use of batteries as of other matters. In a small station the battery can supply economically a far greater proportion of the yearly output than in a large station. In stations of less capacity than 500 kw. the usual practice has been to put down at least two sizes of engines; it might be better practice to put down two or three engines of equal size and a battery of sufficient capacity to give the output of one engine for three hours. It is not difficult to predict the extent of the load in residential towns of small size, and if it be assumed that in, say, five years' time, 800 kw. will be required, a station laid down with two 100 kw. generators, and a battery capable of giving about 100 kw. for three hours, will make a far more economical station than one in which one or two smaller units are put down to start with. As the load on such a station increased, engines of similar size to those first installed should be put down, the plant being thus maintained of uniform pattern. In stations of larger size a greater number of units would be installed, and in order to load up the running engines to their full capacity it would usually be necessary to install a battery equal in capacity to the output of one engine for three hours, so that in general the ratio of the battery capacity to the total capacity of the plant will be less in large stations than small ones in inverse proportion to the number of units.

In determining the best size of battery for an existing station, the engineer might consider into what number of units he would divide the plant if he could design and erect an entirely new station. Most engineers in such a case would probably decide to make all the units of similar capacity; the battery should then be of such size as to take the whole output of one unit for a period of three hours, or alternatively two units, of, say, one-half of the capacity of the standard unit, might be installed, and a battery equal in capacity to one of these units. The nature of the all-night load



must be considered in this connection, however, and the size of the smallest unit and of the battery should largely be determined by the amount of the load from midnight to 6 a. m.

In the case of a station with a large street-lighting load it is not difficult to ensure that the engines are always nearly fully loaded, but even in such a case a large battery will also enable the steam-raising plant to be worked in a more uniform way, a matter as important for economy as the uniform working of the engines.

To consider a special case, a plant of 1,000 kw. will, with a load having a factor of 10 per cent turn out per annum 870,000 units. If by the use of a battery giving 250 kw. for three hours, which, as before explained, is in most cases capable of dealing with the peak, running plant of 750 kw. capacity could do the work, and turn out

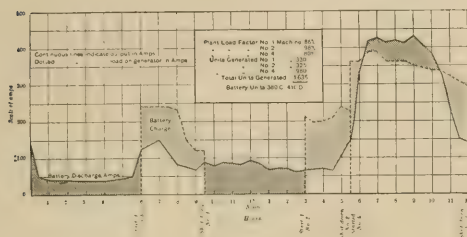


FIG. 3.

the same number of units, the plant load factor would be raised from 10 per cent to 13.4 per cent, an increase which would certainly result in greater economy in working; but such a battery would be in nearly every case capable of carrying the whole of the load from midnight to 6 a. m. The plant could then be shut down during these hours and one shift of men saved, the running hours being lessened to this extent, the plant load factor would be raised from 10 per cent, where no battery was used, to 17.8 per cent. In most towns also this battery would, in summer time, serve to carry the load during a part of the day, and the plant load factor would be thereby still further increased. The above factor applies to the whole plant over the whole year, but since the plant would be divided into, say, four units of 250 kw. each (one unit being spare) the plant actually working could be kept always fully loaded if the battery were charged and discharged in a proper manner to attain that end.

The question of the relation between cost of working and load factor will be further considered in referring to combined stations, but reference may here be made to the fact that a lighting station deals with a load which varies through a wide range during every day, but it varies in an easily predetermined manner. With properly-proportioned sub-divided plant it is easy to ensure that the running engines always work at or near their full load; the average load on the plant considered as a whole, however, simply depends on the outside load, as will, to a great extent, the load on the boilers. In a lighting station, therefore, the battery should be designed to equalize as much as possible the boiler working. A battery sufficiently large to obviate raising steam, even in a single boiler which might not be required for more than an hour, will enable a considerable saving to be made in fuel.

The efficiency of battery working is a most important factor, since every unit supplied from the battery costs more than the units supplied direct by an amount depending on the efficiency. I have results obtained from a battery of 240 cells capable of giving 100 kw. for three hours. The units were metered through a watt-hour meter, which recorded charge and discharge separately, and which was checked by the switchboard ammeters and voltmeters from time to time, and was found to be sensibly correct. The units of charge from July 1 to December 31 were 62,560, and of discharge, 46,390 for the same period, corresponding to an energy efficiency of 74 per cent. The battery is charged at varying rates to suit the load on the engines. The charging current starts at 170 to 200 amperes, and varies from time to time as the outside load varies, but it never exceeds 70 amperes when the cells are full. The maximum charging pressure per cell is 2.41 volts, the minimum discharging pressure 1.9 volts; the average charge per 24 hours is 341 units,

the average discharge, 253 units; the maximum discharging current is 200 amperes. The battery has cost for repairs a small amount, consisting of labor in filling the cells with water and in cleaning. Two faulty positive sections were replaced by the makers, otherwise no work has been done in keeping the battery in order.

The usual directions of the makers are impossible to carry out in practice, and I find the most convenient method of keeping note of the condition of the cells is to make a weekly test all round of the specific gravity of the electrolyte, being careful to take the readings only when the cells are fully charged by the switchboard voltmeter. By comparing the results with those last taken, it is easy to see if the proper amount of charge has been given during the week; if the specific gravity has fallen, rather more charge is given to bring it right up again. From the results obtained of battery working at various times, I am of opinion that charging with a constant current at the battery maker's usual figure is not so conducive to efficient working and to the long life of the cells as finishing up the charge at quite a small current. On the other hand, the charging current at the commencement, when the cells are empty, may safely be much greater than the maker's figure. It would be most interesting to have accurate figures over a great number of charges and discharges giving the efficiencies of various methods of working and at various rates of charge and discharge. The curves in Figs. 3 show the ordinary work done by the battery on the lighting load in the station of which I have charge.

There is one point to which I have not alluded, and that is the immense convenience that a battery is when repairs have to be done to steam pipes or valves. The advantage of being able to shut down entirely and still keep the mains alive is so great that for this reason alone a battery in a central station is almost a necessity, at any rate where a motor load exists. In such a case a shut down, even for a few hours on Sunday, is almost impossible, and on a week-day cannot be tolerated.

Apart from this use of batteries in the power station, there may arise occasions when the battery may be used in a sub-station at one or more important feeding points. About 15 per cent of the copper put down in feeders is only required for a few hours each day for, perhaps, one month in the year, from the middle of December to the middle of January. This copper can be saved by using a battery in a sub-station, provided, of course, that a site can be found at not too great a cost. In addition to the saving in feeders, the economical area of distribution can be extended, and the pressure can be maintained more nearly constant. It is not possible to lay down general rules for the use of batteries in this way, but I now have a case where it is necessary to give supply at a point about three miles from the station. The extent of the supply will be about 100 kw. There is an excellent site for a sub-station about two and a half miles from the station, and a battery at this point works out at a

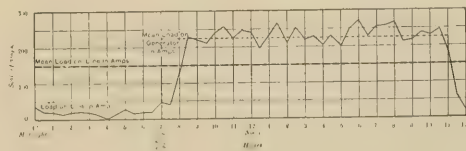


FIG. 4.

less cost than a boosted direct feeder, or a high-tension transmission scheme.

In power stations supplying energy to work tramways and railways, the character of the load is entirely different from that of a lighting load. The output varies but little according to the time of the year, or from day to day. There are peaks during which the output and the maximum load are greater than at other times, but not nearly to so great an extent as in lighting work. The load, however, varies very rapidly and through very wide limits, the variations becoming less as the number of cars or trains increases. In the case of a road operating 50 to 100 cars, the maximum loads are usually about three times the mean load. With 100 to 200 cars, the maximum loads are usually less than twice the mean load. Fig. 4 shows the variations of the mean load at any time during the day, this curve being plotted by taking the output in units every half-



hour, and from the readings working out the load. In this figure the horizontal line shows the average load, during the hours of running the plant necessary to turn out the metered units. It is evident from the curve that a generator of 200 kw. can easily give the output if a battery be used to discharge on the peaks. For such a load the battery may be used at the one-hour rate of discharge normally, and on occasions at even a greater rate. Such occasions might be when the road is very heavy through a snowfall or like reason, or when cars get bunched during holiday traffic. In the

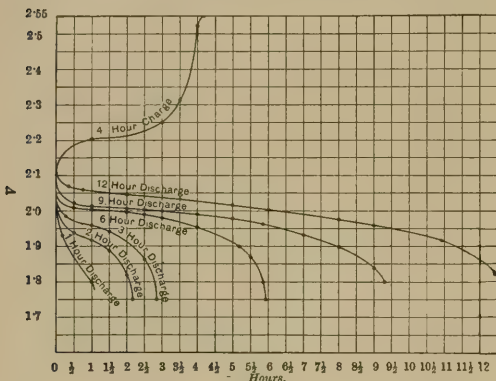


FIG. 5.

case of a traction load, therefore, the capital cost of the battery may be taken at the one-hour rate—that is, about £15 to £18 per kw. This is considerably less than the cost of the running plant.

For the load shown in Fig. 4 over 24 hours, the load factor is 23 per cent. Such a load cannot be very economical, since the steam plant would be, on the average, very lightly loaded.

The plant load factors for a lighting station and a traction station differ in one respect—in a lighting station, by using units of several sizes, the engines may be run nearly at their full load always, but the load on the boiler plant will vary considerably; in a traction station, on the other hand, the boilers will supply, during 16 hours,

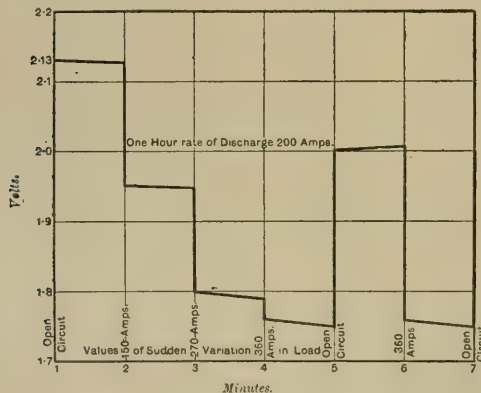


FIG. 6.

about the same amount of steam per hour. The engines must, however, be large enough to take the maximum load, and therefore work at only a small part of their full capacity.

If a battery be used in parallel with the steam plant on the load shown in Fig. 4, it will take up some portion of the peaks; but the conditions of battery discharge and charge must be such, that the variations in the battery pressure must be small, which would necessitate working the battery at a much slower rate than the one-hour rate allowed for above. The ideal arrangement would be to run the

generator at constant load, making the constant load as nearly the full load of the generator as possible, to work the necessary number of hours, say, 16 daily, to turn out the required number of units, and to allow the battery to take charge of all peaks, and to charge when the load is small, and to work the entire service for the remainder of the day.

It is here necessary to consider the nature of the battery as a reservoir or energy. Fig. 5 shows the well-known rise of voltage on charge and fall of voltage on discharge at various rates. Fig. 6 shows the fall in voltage due to throwing on the load in sudden steps, the fall in the latter case being due to the ohmic resistance of the cell, and possibly, to a less extent, to polarization.

In a battery working in parallel with a shunt-wound generator at such a speed as to give about the mean output, so that the battery neither gained nor lost very much, the number of cells should be determined by the formula, No. of cells = line volts ÷ 2.8. I have found that, when in the best condition for working in this way, a battery capable of giving 450 amperes for one hour, will discharge 200 amperes with a fall of pressure of 25 volts, and will charge 200 amperes with a rise of pressure of 25 volts, these limits being the greatest permissible on a 500-volt circuit.

With compound-wound generators, the pressure rises with the load, so that the battery working in parallel with the generator will do very little work.

In working a battery in simple parallel with shunt-wound generators, it is impossible to charge the battery during working hours, and at the same time have it available to discharge on any peaks; this is a great drawback, and necessitates running longer hours to complete the charge.

## STUDENT AND CONDUCTOR.

An example of what energy and perseverance will accomplish is shown in the career of Constantine Demeter Stephanove, a young Yale graduate, who while studying for his degree of Master of Arts at Yale supported himself by working as a conductor on a trolley car of the Fair Haven & Westville Railroad.

While generally known as a Greek, Mr. Stephanove is really a Macedonian, being a native of the town of Bansko. He left home at the age of 16 with the intention of acquiring an education which was necessary to further his ambition of helping his native land. He saw that education was the first necessity of his people.

Coming first to Canterbury, Conn., he secured work on a farm, where he learned the English language. This work he declares is the hardest he has ever done, as he was busy from daylight till dark. Having acquired a knowledge of the language, he entered the preparatory school at Monson, Mass., from which he graduated in 1895, and went at once to Yale. During the first part of his college course he waited on tables for a living and after a year or two secured work on the trolley. He was a conductor on the owl car, working from midnight until 7:30 in the morning. After his day at college he came home between 6 and 7 o'clock and allowed nothing to interfere with his sleeping until nearly midnight. After five hours of sleep he arose, prepared and ate his midnight meal and went to work on his car. All of his time outside of five hours of sleep was given to work and study.

Few of his classmates supposed that he was a trolley conductor, and many of the professors were surprised to hear of it. It was also a surprise to his railway friends to read in the papers recently that he was in Yale.

On graduating in 1899, Mr. Stephanove was still dissatisfied with his education, and continued to work and study until he recently received his degree. He will leave this country in the fall to go to Berlin, where he will take a course in civil law, which will fit him for his chosen work among the Macedonians.

The Chicago & Joliet Electric Railway Co. on July 3d increased its capital stock from \$605,000 to \$2,300,000. The road is in operation over part of the distance but the construction of a small length still remains to be completed.

An order permitting conductors and motormen to adopt a uniform shirt waist was recently issued by the management of the Burlington (Ia.) Railway & Light Co., and a large number of the men at once adopted the new style of uniform.

## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### NOT BOUND TO LOOK ALL OF THE TIME FOR CAR.

*R. F. Stevens Co. v. Brooklyn Heights Railroad Co.* (N. Y. Sup.), 68 N. Y. Supp. 1088. Mar. 8, 1901.

In affirming a judgment against the railroad company for damages caused by a collision of one of its cars with a milk wagon at a point where the driver of the latter could not look with safety in one direction all of the time, he being liable to danger on three sides, the second appellate division of the supreme court of New York says that it is not ordinarily necessary, in order to take the case to the jury, for the plaintiff to swear that he looked every instant of the time, or while passing over every foot of the ground.

### PASSENGER ON WRONG TRANSFER MUST OBEY DEMAND TO PAY FARE OR GET OFF CAR.

*Kiley v. Chicago City Railway Co.* (Ill.), 59 N. E. Rep. 794. Feb. 20, 1901.

In affirming a judgment for one dollar in favor of the party who was suing here for damages for a forcible expulsion from a street car, from which judgment such party appealed, the supreme court of Illinois holds that where a passenger is by mistake given a wrong transfer ticket, which the conductor of the car transferred to refuses to accept, insisting that the passenger pay another fare or get off, the passenger must do the one thing or the other, relying upon the right of holding the company responsible in a civil action for the consequences if thereby compelled to wrongfully leave the car. But the passenger refusing to pay the fare thus demanded has no right to resist being put off the car by the conductor, and if injuries are sustained by reason of a forcible expulsion on account of such resistance no damages can be recovered therefor.

### ABUTTERS MUST PUT UP WITH ANNOYANCE CAUSED BY INCREASED TRAFFIC.

*O'Reilly v. Perkins* (R. I.), 48 Atl. Rep. 6. Jan. 31, 1901.

The allegation of certain parties, who asked to have the erection of a brewery in a certain locality restrained, that the operation of the brewery or the business carried on there would result in the transportation over the tracks of the street railroad company of a largely increased quantity of merchandise the supreme court of Rhode Island says would be equally probable if the brewery were to be located anywhere on the line of the road miles away from the homes of the complainants. The company, if licensed to carry freight and passengers, must carry them in such quantities and numbers as increasing business population may demand. The additional annoyance to persons residing on the line of the road is clearly *damnum absque injuria*, or that kind of damage for which no action will lie.

### LETTING SCREW IN FLOOR OF CAR WORK UP.

*Collins Park & Belt Railroad Co. v. Ware* (Ga.), 37 S. E. Rep. 975. Jan. 26, 1901.

The supreme court of Georgia affirms in this case a judgment for \$1,000 damages in favor of a husband in an action brought on a petition wherein he alleged, in substance, that his wife, while a passenger on one of the company's cars, attempted to alight therefrom, and caught the heel of her shoe on a screw intended to fasten to the floor of the car the fender over the wheel, the screw in question having been negligently allowed to work up until it protruded for a half inch or an inch above the floor of the car; that she was, in consequence, thrown violently upon the ground and rocks of the street, and was severely and permanently injured; that the injury was not the result of any negligence on the part of his wife, but was due to the negligence of the company or its employees in leaving the screws in an unsafe condition, and in failing to keep the fenders of its car properly fastened down and confined to the floor.

### MAY CONSTRUCT STREET RAILWAYS IN PART THROUGH PRIVATE LANDS.

*Farnum & Haverhill & Andover Street Railway Co.* (Mass.), 59 N. E. Rep. 755. Mar. 2, 1901.

The supreme judicial court of Massachusetts holds that a street railway company organized under the general laws of that commonwealth can build its tracks and run its cars over land acquired by purchase outside of the limits of the streets or highways. It says that undoubtedly street railways, under the Massachusetts statutes, are intended to be located and used in the public streets, and they cannot be operated without a location approved by the local authorities. A location through the public streets, connected in any place with a track running through private lands, will not be likely to be approved by the authorities unless the general arrangement of the course is such as the public convenience requires. But the court is of the opinion, as above intimated, that the statutes permit the construction of street railways in part through private lands acquired by purchase, if all other requirements are complied with.

### CARE REQUIRED IN LOOKING AND LISTENING—WHERE A STREET CAR COMES IN ON ONE SIDE ONLY.

*Halliday v. Brooklyn Heights Railroad Co.* (N. Y. Sup.), 69 N. Y. Supp. 174. Mar. 8, 1901.

The law requires a person endeavoring to cross a street on which there are street railway tracks, the second appellate division of the supreme court of New York holds, to look and listen in accordance with the dictates of ordinary prudence, but does not require the guaranty of any specific result. Here, the crossing of the street was sought to be made at a point opposite the line of another street which ran into that street, but did not cross it. There was also evidence from which the jury could conclude that the motorman might reasonably anticipate that pedestrians would use the crossing, even though the street which ran in there on one side did not actually cross. These facts lead the court to remark that no case was cited to the effect that there was no obligation at such crossing to have the car under control, so that an accident could be averted in case some one stepped suddenly from behind wagons seen to obstruct the view of the crossing. However, the question of negligence on the part of the company, as well as that of contributory negligence on the part of the person injured, it holds was for the jury.

### WAGES OF CONDUCTOR EXEMPT AS THOSE OF A "LABORER."

*Stuart v. Poole* (Ga.), 38 S. E. Rep. 41. Feb. 28, 1901.

A street railway conductor whose duties are of a character depending more upon a mere physical power to perform manual labor than upon the possession by him of mental skill or business capacity, involving the exercise of his intellectual faculties, and the greater portion of whose time is occupied in performing labor of the former, and not of the latter, kind, the supreme court of Georgia holds, is a "laborer," within the meaning of the Civil Code, and his wages as such are exempt from the process of garnishment. For example, such a one, the court holds here, is a conductor whose duties are to keep the car in general order; to couple and uncouple trail cars when used; to keep lights dusted off and in proper condition; to keep the guard rails of the car in proper position; to attend to the trolley and keep it in place; to keep the seats of the car turned; to help passengers on and off the car; to help put the car back on the track if it gets off, and to help remove all obstructions from the track; to change switches, when there are switches, but not to open or close frogs; to get off and flag every railroad crossing; to look out for accidents at the rear of the car; besides having with the motorman joint charge of the car, giving orders for starting and stopping, collecting fares and issuing transfers, and keeping schedules.

### GREATER CARE REQUIRED TO KEEP STREETS IN REPAIR THAN IMPOSED ON CITIES.

Mahnke v. New Orleans City & Lake Railroad Co. (La.), 29 So. Rep. 52. Dec. 17, 1900.

Railway companies that, as part consideration for the acquisition of their franchises for running cars through the streets of cities, have bound themselves by contract to pave and keep in repair the streets between their rails, the supreme court of Louisiana holds, are held by stricter rules to the performance of their duty than are the municipal corporations themselves in the performance of their own obligations in this respect to the general public.

### ELECTRIC STREET CARS HAVE RIGHT OF WAY—DUTY TO LOOK JUST BEFORE CROSSING TRACK.

Burke v. Union Traction Co. (Pa.), 48 Atl. Rep. 470. Mar. 11, 1901.

Electric street railway companies, the supreme court of Pennsylvania says, have not the exclusive use of their tracks, but in their use their rights are superior to those of the traveling public, and their cars have the right of way. No one is warranted in assuming that if he first reaches the crossing he may go on, and that the whole duty of care and vigilance is then cast on the motorman. The duty to look for an approaching car is an absolute duty, and failure to do so is negligence per se, or of itself. This duty is not performed by looking when first entering on the street, but continues until the track is reached. When a person about to cross the track of a steam railroad has stopped, looked and listened, at an apparently proper place to see and hear, the question as to whether there was a second place where he should have stopped, if at all in doubt, is for the jury; but this question cannot arise in the crossing of the tracks of electric roads in cities, where the duty is to look just before crossing. In this case, the party suing checked his horse almost to a stop and looked as he reached the house line of the street, and afterwards gave no further attention to the cars. He drove on 32 feet, not quickly, to avoid danger, nor at an ordinary speed, but slowly, to allow a wagon to pass in front of him, and went directly in front of a moving car. If he had looked again after he was on the avenue, he would have seen what his witnesses saw—that a collision was inevitable. It was his duty to look again, and his disregard of this duty, the court adds, was properly held to prevent a recovery in this action against the company.

### CONDUCTOR STRIKING TREE WHILE STEPPING AROUND SUPERINTENDENT ON RUNNING BOARD.

Hall v. Wakefield & Stoneham Street Railway Co. (Mass.), 59 N. E. Rep. 668. Feb. 27, 1901.

A conductor going forward on the left-hand running board of an open car to collect fares and to distribute transfers was injured by striking a tree while stepping around a superintendent of the company, who was a large man and was standing on the running board. This tree was thirty-one inches from the body of the car, and eighteen and one-fourth inches from the outer edge of the running board. On the other side of the car were the poles, so near the car that no one was allowed on the running board on that side. The supreme judicial court of Massachusetts overrules exceptions to a verdict ordered for the company.

With regard to the contention that the company had failed to provide the conductor a safe place by reason of building the track too near the tree the court says that it was to be observed that the location of the road where the accident happened was not under the company's control, but was determined by the selectmen and road commissioners of the town, and that, so far as appeared, the company had no right to remove the tree. Then, it was suggested that the company should have put its poles on the same side as the tree. But if such a suggestion was open and had anything in it, the court says that the short answer was that the presence of the tree was a permanent condition of the employment, and that the conductor, who had been in the company's service for some time, knew of the tree and took the risk of the danger from it, on the principle made familiar by many decisions.

As to an effort to fasten liability on the company on account of the alleged negligence of the superintendent, the court states that it was to be observed that so far as the presence of a passenger on the running board enhanced the danger, that was a part of the risk which the conductor assumed. The possibility of such presence there was one of the obvious and permanent incidents of the business. Of course the presence was known to the conductor. However, the facts relied on to take the case out of the general rule were that this particular passenger happened to be a superintendent and that there were seats in the car so that he might have left the running board clear. But the court says that if the superintendent was superintending at the time, to the extent of having an eye on the way in which the car was managed, his superintendence as such did not contribute to the injury. And, apart from this, it declares, it is hard to see how it mattered to the company's liability who the particular person on the running board was.

### PASSENGERS NOT REQUIRED TO WATCH COURSE OF CAR.

Henry v. Grant Street Electric Railway Co. (Wash.), 64 Pac. Rep. 137. Mar. 11, 1901.

A passenger wishing to get off at a certain street notified the conductor thereof, and when the name of the street was called and the car was afterwards stopped got off. It was at night, and dark. At the place where he was accustomed to get off there was a plank roadway 35 or 40 feet wide. Just beyond it the track turned rather abruptly. On this occasion, the car went perhaps 50 feet beyond the regular stopping place, to where there was no protection for passengers, and the track passed over a trestle. Besides, the conductor, knowing the passenger's ultimate destination, pointed out and said, "Right across." The result was that the first step he took he stumbled and fell, sustaining injuries for which he recovered a judgment for \$4,000 damages. In affirming this, the supreme court of Washington holds that the company was guilty of negligence in passing the street where it was accustomed to discharge its passengers, and discharging the passenger in such a dangerous place, and that he was not guilty of contributory negligence in not noting, under the circumstances, the dangers surrounding the place where he alighted, and by caution protecting himself against such dangers. With regard to the suggestion that, being familiar with the locality, if he had used ordinary care for his own safety and noted the turning of the car he would have known that it has passed the street, the court says that it does not think the law calls upon a passenger to watch the course of a car, or to notice in what direction it is going. He has a right to rely upon the conductor's putting him off where he directs him to. It would simply be impracticable, it declares, for passengers on a street car to rely upon their own observations, especially upon a dark night.

### DUTY OF KEEPING PAVEMENT IN REPAIR IMPERATIVE.

Doyle v. City of New York (N. Y. Sup.), 69 N. Y. Supp. 120. Mar. 8, 1901.

A street railway company obtained the franchise to lay its tracks, upon a covenant reading: "The pavement to be kept in thorough repair by the said company within the tracks, and three feet each side thereof, with the best waterstone, under the direction of such competent authority as the common council may designate." The point was sought to be made that the covenant was only to repair the street with waterstone, because the street was paved with that material when the contract was made; that, as subsequently the street was paved with granite pavement, it must be assumed that the city did the work; and that, as the city changed from cobblestone to granite, the duty of the company to repair at all was abrogated. But not so thinks the second appellate division of the supreme court of New York. It says that the primary feature of the company's covenant was that it would keep the pavement between the tracks "in thorough repair." The method of doing it and the material were secondary and incidental. It made no difference how the street was paved at the time of the contract, or whether a different pavement was subsequently laid by the city. The duty of the company was clear and positive. It was to keep the pavement between the tracks "in thorough repair." The com-



pany might use waterstone or any other material to perform its duty, but the duty to keep in repair was imperative and emphatic.

Then, the court quotes part of section 98 of the railroad law which requires that every street surface railroad corporation so long as it shall continue to use any of its tracks in any street shall have and keep in repair that portion of such street between its tracks, the rails of its tracks and two feet in width outside of its tracks, under the supervision of the proper local authorities, and whenever required by them to do so, and in such manner as they may prescribe. This requirement the court holds well within the power of the legislature, even though the statute was enacted after the company obtained its franchise. The requirement that the work of keeping the pavement in permanent repair, "under the supervision of the proper local authorities, and whenever required by them to do so, and in such manner as they may prescribe," the court holds, does not relieve the company from making repairs until ordered so to do by the local authorities. That provision, it says, is for the benefit and protection of the city, and the company cannot shelter itself against its positive duty behind the failure of the city to order or supervise the repairs; for, as before stated, the primary duty of keeping the pavement is, both by contract and statute, devolved upon the company.

#### EJECTION OUTSIDE OF CITY OF INTOXICATED OR ILL PASSENGER WHO HAS NOT PAID FARE.

Hudson v. Lynn & Boston Railroad Co. (Mass.), 59 N. E. Rep. 647. Feb. 28, 1901.

The evidence in this case tended to show that a man taking an out-bound electric car in the night said as he paid his first fare that when he paid his next fare he would want a certain transfer. His second fare became payable as the car was passing over some marshes. When the conductor came to collect the second fare the man was sitting up asleep, having begun shortly after paying his first fare to act in a manner which would justify the conclusion that he was intoxicated, after which he fell asleep or into a stupor. Then, the conductor, after shaking him several times and failing to awaken him, stopped the car and put him off. The night was dark and rainy. There were no sidewalks and no buildings or shelter in the vicinity. About half an hour after being put off the car the man was ground upon the track, and was run over and killed by another car.

The supreme judicial court of Massachusetts is of the opinion that the man ceased to be a passenger when ejected from the car. Two things, it says, had occurred to give the company a right to terminate his relation as a passenger. The first was his conduct, which, whether in fact due to intoxication, to the effect of a drug, or to illness from some other cause, was such as to justify an inference that it was due to intoxication, and to found a just apprehension that unless he should be ejected it might result in acts of impropriety, rudeness, or disturbance on his part. The conductor was not bound to wait until some act of this kind had been committed, but could expel the passenger in order to prevent such misconduct as was to be apprehended from a person in his apparent condition.

The other circumstance which gave the company a right to eject him was the fact that he had not, upon demand, paid the fare for that part of his journey then being made. Section 197 of chapter 112 of the Public Statutes of Massachusetts, which is the law regulating the rights of passengers upon street railways in this respect, provides that "whosoever does not upon demand first pay such toll or fare shall not be entitled to be transported for any distance, and may be ejected from a street railway car." No doubt this was enacted before the introduction of electric cars, and when most street cars ran on streets where it would be safe to leave a passenger at any time. But the provision remains unchanged, and, the court holds, governs wherever the railway may be located. Therefore, by the terms of the statute, this man having not paid his fare upon demand, he was not thereafter entitled to be transported for any distance, and might be ejected from the car. This having been done, even if in an improper manner, his status as a passenger was terminated, although he may have had a right of action for his damages, if the ejection was effected in a wrong manner.

And the court holds that it was not the due and proper care required of the company in the exercise of its right to eject a pas-

senger whose conduct was improper, or who had not paid his fare upon demand.

#### AGREEMENT NOT TO REQUIRE TRACKS MOVED IS NOT BINDING.

Macon Consolidated Street Railroad Co. v. Mayor and Council of City of Macon (Ga.), 38 S. E. Rep. 60. Feb. 26, 1901.

Every municipal regulation which does not amount to a deprivation or impairment of the franchise of a street railroad company, the supreme court of Georgia says, it will be upheld, unless it is unreasonable and arbitrary. The discretion of the municipal authorities as to these matters is very broad, and it will not be interfered with save in the case just mentioned. Is a regulation by a city requiring a street railroad company to remove its tracks from one part of a street to another a legitimate exercise of its legislative power? The court thinks it is, provided the proposed change is not arbitrarily and capriciously required by the city, but is really necessary for the convenience and welfare of the public. The municipal authorities must necessarily, in the exercise of their discretion, be left to determine the necessity and propriety of the proposed change. The courts will not readily interfere with the governing authorities of a city in the performance of a discretionary act. It is only where it has passed the boundary of legislative and judicial discretion, and is exercising the municipal power arbitrarily to the injury and oppression of the citizen, that judicial interference will be justified.

More than this, the court holds that the municipal authorities cannot make a binding contract, in effect, that they will not in the future, no matter how much the public convenience or safety may demand it, attempt to regulate the location of the tracks in a certain street. And, a city having no power to make a contract whereby it surrenders its power to require a company's street railway tracks to be moved from one part of the street to another whenever such removal is necessary for the public welfare, such an agreement made by the city, the court holds, cannot be used as the foundation for an estoppel to prevent the city from exercising its discretionary power to require such a change to be made. The mayor and council are the representatives of the public, and are placed in power to conserve the interests of the public. They are, for this purpose, invested with certain governmental and legislative duties, and these cannot be bargained away. Hence, they have no power, the court holds in this case, to bind the city by an agreement that if the company will cease, for example, to use a switch connected with its line and construct a certain kind of turnout on the opposite side of the street, it will not be required to change the location of its tracks from the side to the center of the street.

#### ATTACHING EXTENSION REQUIREMENTS TO RENEWAL ORDINANCE—ADVANTAGE OF OLD COMPANY AS BIDDER—DISCRETION AS TO DEPOSIT, PAVING AND OTHER CONDITIONS.

Johnson v. City of New Orleans (La.), 29 So. Rep. 355. Feb. 18, 1901.

The situation with regard to a certain franchise was this: A street railway company applied to the city several years in advance of the expiration of its existing franchise (but not longer than was customarily done by railroad companies) for a renewal thereof. It asked only for a renewal as to its existing lines. At once it was met by a demand for extensions as finally ordered. Members of the city council refused to introduce an ordinance looking to the renewal unless the extensions were embodied therein as part of the system. The people in the sections wanting the extensions took the matter up, and by public meetings and petitions made clamorous demand for the same. For months the matter was under consideration. The railroad company did not want and were not seeking the extensions. It was the city council, representing the people behind its members, who made the demand. By means of the extensions thoroughfares would be opened not only for reaching the homes of the people, their schools and churches, but for the fire engines, police patrol, etc. By tacking on to a valuable franchise, seeking renewal, the stipulation that the extensions should

be constructed and operated as a part thereof, these thoroughfares could be obtained.

The supreme court of Louisiana is of the opinion that the council could legally pursue this policy, and while its exercise may have resulted in some advantage to the owners of the old or existing franchise, in the matter of bidding at the sale, the court does not find that other bidders were shut out from competing. Other persons or corporations could have put themselves in positions to have become competitors. The proposed extensions touched, crossed, or came in contact with the lines of other street railroad companies. The advantage to this one particular company was not of its seeking or connivance, and resulted merely from the situation it occupied as owner of the existing lines to which the extensions were attached. It was not, therefore, the court holds, an illegal advantage. No fraud or undue influence was shown, and, as far as the city was concerned, its rights, the court points out, were protected against the consequences of a bid too low in amount; for its guardians had the rights reserved to reject any and all bids. Hence, the court thinks that there was, in the matter of such sale, a sufficient compliance with the requirements of the city charter that the sale of a street railway franchise must be publicly offered and adjudicated to the highest bidder. In short, it holds that the sale of a franchise at public auction is not illegal because it happens that one purchaser, without his or its connivance or procurement, and without fraud, collusion, or undue influence being shown, is in a position, by reason of his or its situation, to bid a price higher than another.

Again, the court says that while the present charter directs the granting or renewal of street railway franchises to be offered to the highest bidder at public sale, there is nothing in the charter, and nothing intended thereby, prohibiting the city council from looking after and securing the extension of street car facilities in parts of the city needing the same, by attaching franchises therefor to existing franchises coming up for sale in renewal, and selling the same in block as continuous lines, forming a complete system, with one fare over the whole. This, it holds, is in the interest of the public—in the interest of the development of the city. The true policy of the city is as much to be found in promoting such extensions as it is in looking after the pecuniary considerations incident to the sale of such franchises.

With regard to the amount of money required to be deposited by bidders, to protect the city and to enforce compliance with the obligations of the contract, the court holds that the same was within the just discretion of the council, and the court, it says, will not interfere therewith. The same is true with regard to the stipulation that the purchaser of the franchise should be required to keep in good order and repair, and to pave and repave when required, the portions of streets occupied by the railway tracks, and the other stipulation that a purchaser, other than the owner of the existing franchise, should relieve the city of its obligation to take at its valuation the rolling stock, equipment, fixtures, etc., of the company operating the existing lines.

#### INJURY OF HEAVY WOMAN ALIGHTING AT TRANSFER PLACE WITH CONDUCTOR INSIDE CROWDED CAR.

Jacobs v. West End Street Railway Co. (Mass.), 59 N. E. Rep. 639. Mar. 1, 1901.

This the supreme judicial court of Massachusetts says was an exceedingly close case. On the one hand, as street cars are run, it is not negligence, it holds, to take on passengers when all the seats are occupied, when there is no more standing room in the passageway of the car, and the new passengers have to stand on the platforms, and even on the steps. Furthermore, a passenger takes the risks incident to the mode of travel he chooses to adopt; as, for example, the risk of being injured in the removal of an objectionable passenger from a crowded car.

On the other hand, it has been held, the court continues, that a street railway company may be held liable for negligence if it allows its car to be so crowded with passengers that one of them is crowded off a platform while the car is proceeding on its way. It has also been held that the duty which a street railway owes to its passengers is not terminated until the passenger has alighted from the car, and covers the time during which the passenger is

getting off. And, lastly, it may be that, if an aged woman passenger is pushed off the step by the turbulent behavior of the crowd behind her while she is alighting from the front platform under the very eyes of the motorman, there is evidence of negligence for the jury; and so, also, when the passenger is jostled by incoming passengers.

In this case there was no evidence that the injury which the passenger suffered was caused by any defect in the platform, but it appeared that it was caused by her tripping over "something" while she was on the rear platform on her way to the street. There was evidence that the crowd on the platform made it "impossible" for her "to get at and use the iron rail at the rear of the car" to steady herself as she was getting off; and it appeared "that the conductor was inside of the car"—"in the middle of the car"—while she was alighting.

It may be conceded in this case, the court says, that it is the duty of a conductor who is on the rear platform when a passenger is alighting to see to it that the passenger has an opportunity to alight with safety, and that it is his duty to see to it that passengers who are blocking the exit shall stand aside, or even alight from the car temporarily. Passengers who choose to take passage on a car which is so crowded that they have to stand on the platform or on the steps, and who thereby block the exit from the car, assume all inconveniences incident thereto, including that of temporarily alighting, when necessary, to allow a proper exit for passengers who wish to get off. It also may be conceded that the conductor's duty requires him, when not otherwise engaged, to be on the rear platform.

But a conductor has duties to perform which take him away from the rear platform, and, the greater the number of passengers, the longer the time during which it is necessary for him to be absent, and properly absent, from it. The duty of collecting tickets, for example, being one which cannot always be postponed, is a duty which, in a crowded car requires the conductor to be absent from the platform a good deal, and for some length of time; and, if a passenger wishes to alight while the conductor is so engaged, the inconvenience which she may endure in having to alight without his aid is one of those inconveniences which the passenger assumes by choosing to travel on a street car at a time of day when it is notorious that such conveyances are crowded.

There was no evidence in this case that the conductor was negligent in being absent from the rear platform when this passenger was alighting, and, the court says, unless she was entitled to go to the jury on the ground that the company should provide some one in addition to the conductor and motorman to care for the car and its passengers, there was no evidence of negligence in this case. As street cars are run, however, the court does not think that the omission to employ a third person could be found to be negligence.

The fact that the place where the passenger was getting off was a place where passengers were transferred to other lines, the court holds, made no difference. No distinction can be drawn between the duties devolving upon a street railway company when stopping at such a place for passengers to alight and those which they have when they stop at other places.

Neither does the court think that the fact that the passenger weighed over 200 pounds made a difference. The mere fact that a woman weighs over 200 pounds cannot, it says, make it the duty of the conductor to drop all other duties, and help her get off.

Neither was it material, in the court's opinion, that there was evidence that there were passengers "trying to get on as the passengers were alighting from the car," and "that there was a scuffle; a regular scuffle." There was no evidence that the woman was jostled by anybody.

For these reasons the court is of the opinion that there was no evidence on which the jury could find that the company was negligent, and it overrules exceptions to a judgment in the company's favor.

The franchise for one of the two parallel lines for which rights have been secured between Seattle and Tacoma has been sold to the holders of the other franchise, there being no room for two enterprises of this character. The company organized by Mr. Fred E. Sander has sold out its interests to the Seattle & Tacoma Interurban Railway Co.



## WESTINGHOUSE COMPANIES AT THE PAN-AMERICAN.

Among the most prominent and interesting of the electrical and transportation exhibits at the Pan-American Exposition are those of the Westinghouse Companies. These are located beneath the left of the main entrance to the Railway Exhibits Building, and occupy in all, over 6,000 sq. ft. of floor space.

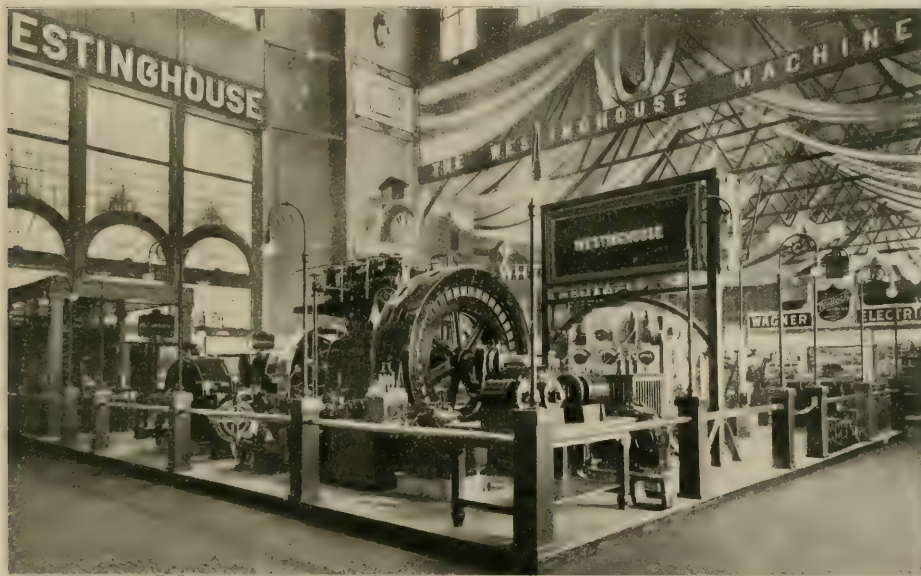
The exhibit of the Westinghouse Electric & Manufacturing Co. is in the Electricity Building. The dome of this building is tastefully draped with hanging green and lavender bunting, making a background upon which numerous strings of Nernst lamps are festooned with a 2,000-c. p. lamp placed in the center. There are over a hundred 400 c. p. Nernst lamps that contribute to this illumination which is the first public exhibition of the Nernst lamp in America.

The operation of two gas engine generating sets is a feature of interest here. The large unit consists of a 300-h. p. three cylinder, four cycle gas engine, direct coupled to a 2,200-volt, two-phase, revolving field alternator. The smaller unit is a three-cylinder, four

ply the four incandescent signs. These transformers present no radical departure from the excellent type which the Westinghouse company has standardized.

A novelty is a high voltage sign, which consists of two large glass plates covered on the back with metal foil with the name "Westinghouse" in its center. An alternating pressure having a maximum of 40,000 volts is applied between the foil on the back and the metal letters on the front.

Among the railway motors included in the railway exhibit are a Westinghouse 56 motor for heavy suburban and interurban service, a 50-C for heavy railway service, and a 69 motor for city and suburban service. These motors are split horizontally with their suspension on the lower half of the field. The pole faces are smooth and unbroken, and the armature has a ventilated winding. The 50-C motor is provided with a special cradle suspension from the car axle, thus removing the not inconsiderable weight of the motors from the car truck. This arrangement minimizes the wear of the rails, increases the life of the wheels and, what is more important, makes an easy riding car. There is also a large number of Type "C" induction motors adaptable where constant speed



WESTINGHOUSE COMPANIES' PAN-AMERICAN EXHIBIT.

cycle gas engine, direct connected to a 125-volt, direct current generator. The power furnished by the large unit is employed partly in supplying current to 130 Nernst lamps at 220 volts, and partly in operating numerous Westinghouse induction motors applied to stationary service. The small gas engine generating set is used for exciting the large alternating current generator, for lighting the switchboard, and for charging the storage sparking outfits for both gas engines. It is used also for operating the motor-generator outfit and for lighting four large electric signs, two of which are placed over the main entrance of the Electricity Building. The switchboard for controlling these generators is equipped with the latest type of measuring instruments, switches, circuit breakers and auxiliary apparatus. Other standard switchboards for lighting and power service are in place.

A 375-kw. alternator, revolving field type, 7,200 alternations, is of particular interest.

Of transformers there are to be seen a complete set of the company's D. D. transformers from 1/2 to 50 kw.; two sizes of man-hole type transformers, and two 100-kw. self-cooling, oil insulated transformers. The latter are used to lower the voltage of the 180 kv. machine from 2,200 to 110 volts, at which potential they sup-

ply the four incandescent signs. These transformers present no radical departure from the excellent type which the Westinghouse company has standardized.

The company exhibits a complete line of detail apparatus, including meters, lightning arresters, fuse blocks, switches, circuit breakers, etc. Included in this comprehensive and interesting exhibit are two large revolving photograph stands containing a great number of pictures which illustrate engineering work of importance, as well as various electrical and mechanical installations of the several companies.

In the Railway Exhibits Building, which is defined as containing all flanged wheel exhibits, are the exhibits of the Westinghouse Air Brake Co., which include a rack of high speed air brakes, with motor driven compressors; the American automatic slack adjuster; the Westinghouse friction draft gear shown by full-size models, suitable for cars with either wood or steel underframes; the Westinghouse electric power brake and heating apparatus; automatic air or steam couplers.

The electric power brake consists of two elements, a brake and



a car heater. The brake may be installed independently of the heater, but the heater is dependent upon the use of the brake. The system is shown in operation in two exhibits.

First: A standard single truck electric car is in service on a track extending 250 ft. from the main exhibit in the Railway Exhibits Building. This car is equipped with the electric brake and car heater, and is in charge of a regular street car motorman, who is in readiness at any time to demonstrate the operation of the system to those interested. When in action powerful magnets force the brake friction shoes upon the rails and set up a strong magnetic attraction between the shoes and the rails, while at the same time the drag or back action of these magnet shoes throws in action a system of levers that apply to the wheels brake shoes of the regular type. The current for exciting the magnets is supplied by the



CAR WITH ELECTRIC TRACK BRAKE.

motor which, through the proper wiring of the controllers, is at this time operated as a generator. With this electric brake system it is impossible to skid the wheels and any degree of braking power is secured from the slightest effect up to a braking effect exceeding the weight of the equipment.

Second: A double truck of the maximum traction type equipped with two 40-h. p. motors and with the electric brake, is operated on a short section of track by a stationary controller.

Westinghouse apparatus is also shown in connection with the exhibits of other companies.

### WIRE THIEVES BUSY.

The Chester (Pa.) Traction Co. was robbed of over half a ton of feed wire last month, the thieves making their escape without leaving any trace as to their identity. Similar depredations have been made before at the same place, just outside of Chester, and the work was very methodically done. Four cables were cut down for a distance of 1,200 ft. and a quantity of wire was left upon the ground, from which it is inferred that the thieves were frightened away before completing the work. The Postal Telegraph Co.'s lines were also visited by thieves the same night between West Chester and Philadelphia, and seven wires were cut. Recently these lines have been cut and wire stolen a number of times near the same place, but none of the thieves have ever been captured.

The Cincinnati Traction Co. is considering a project of running excursion cars to all points of interest in the city, for the benefit of visitors. The cars would make four trips a day, one in the morning and evening, and two in the afternoon, starting from the government building. It is proposed that parlor cars with a capacity of seating 35 persons, shall be used for this service. The routes to be taken or the rate of fare to be charged have not as yet been determined.

## LONDON UNDERGROUND RAILWAY TROUBLES.

The Metropolitan Ry. and the Metropolitan District Ry., the two old London "underground" systems which make use of a common track for part of their routes, are in considerable difficulty over the selection of a common system of electric power with which both lines are to be equipped. The Metropolitan company desires to adopt the Ganz method, while the District company, which is controlled by Mr. Yerkes, wishes to install an American system. A bill has been approved by a select committee of the House of Commons for an agreement between the two companies for the purpose of equipping their lines electrically, which thus advances the matter a short stage further, but the main question as to the system to be used is still in dispute between the companies.

The select committee has stipulated that if within a month the companies have failed to come to a decision as to the system to be installed, the question shall be referred to the Board of Trade, which will appoint a special tribunal to receive evidence and prepare a report on the subject. The tribunal will consist of an arbitrator who is not an electrical engineer, and an engineer appointed by each company, and on the conclusion of the inquiry the Board of Trade will determine what system of electrical working shall be applied to the railways.

The great point of difference between the two companies before the committee was with regard to the proposed reference to the Board of Trade in the event of the parties being unable to arrive at a compromise. The objection taken by the Metropolitan company was that the Board of Trade has given clear indication that it is not prepared to sanction the Ganz system until it has been tested, and it therefore wanted the question to be decided by a special tribunal, consisting of two electrical engineers, one to be named by either party, and an arbitrator, to be appointed by the Lord Chancellor.

The Metropolitan company particularly insisted that the gentleman to hold the enquiry must not be an electrical expert, "because all the experts had made up their minds." The company also wanted a period of four months from the passing of the bill in which to consider the matter, but, as was pointed out, any further delay would be most disastrous, looking at the fact that the District company is losing £800 a week by the competition of the Central London Railway, and the Metropolitan company £1,000 a week. The committee, as stated, eventually allowed one month for the companies to come to a decision as to the system to be used.

## FREIGHT CARS ON STREET RAILWAYS.

An important decision has recently been handed down in the case of the city of Ottawa vs. the Ottawa Electric Railway Co. The company has for a number of years claimed and exercised the right to run freight cars on the streets of the city. An action was brought against the company in October last by the city to compel the construction of an addition to its tracks commonly known as the Bell St. extension, and to enjoin the company from operating freight cars upon Sussex St. in particular and other streets of the city generally.

The defence which the company raised to the claim for an injunction to restrain the running of freight cars was: First. That the company possessed the power to run freight cars under its charter; and, second, that even if power to operate freight cars was not conferred by the statutes under which the company is incorporated, the city by reason of its having allowed sidings to be made into the lumber yards on Sussex St. and into the yards of various manufactories on the Chaudiere, the only object of which could have been to enable freight cars to be loaded or unloaded in such places and drawn over the lines of the railway, was now stopped from saying that the company had not power to draw freight cars on its lines of railway.

The court decided that the company had a right to operate freight cars subject to the consent or approval of the city and that this consent and approval has been given. In regard to the extension the court decided that it was a case for a reference for damages and judgment for the plaintiff was rendered for such damages as the master may find to be recoverable from the defendants.

# INTERURBAN STATISTICS.

The accompanying table contains information concerning the cost, gross and net earnings and traffic per capita of population served of four electric railway systems, which should be of interest to those engaged in promoting or operating electric lines. The statistics were furnished us by a street railway man of wide experience, who requests that his name be withheld:

Case I is a line  $1\frac{1}{2}$  miles long, connecting a town of 1,500 population with a town of 7,500, and serving an immediately tributary population of 20,600 people. The larger of the two terminal towns is a popular summer resort and during the warm weather has double its normal resident population. The line is a link in an interurban system which gives through connection to a city of 300,000 inhabitants, situated 7 miles from its eastern terminus. The same territory is served by two steam roads which give the same rate as the electric road, namely 25 cents one way, 35 cents per round trip, but the electric road obtains 90 per cent of the business.

Case II, is a line  $\frac{5}{8}$  miles long connecting two summer resorts. It is operated but 116 days in the year, from the last of May to the middle of September. It is a link in an interurban line running to a city of 300,000, situated about 19 miles from its eastern terminus. The population of the territory immediately served is 5,000 and there is a town of 7,500 at its eastern terminus.

Case III, is a line  $2\frac{3}{4}$  miles long connecting a city of 300,000, with a manufacturing city of 30,000. The population of the territory traversed including the smaller terminal city is 45,000.

# LIGHTNING PROTECTION OF HIGH TENSION LINES.

At the recent convention of the Canadian Electrical Association a paper was read by Mr. K. B. Thornton, of Montreal, entitled Notes on the Construction and Protection of Aerial Transmission and Distribution Lines, of which the subject of lightning protection for high tension lines forms an interesting part. The protection of aerial lines from the effects of lightning storms, is a matter which has received considerable attention from all central station engineers operating overhead systems.

With the advent of high tension transmission lines, the difficulty of effectively protecting same has been greatly increased.

Over-head systems may be affected in the three following ways:

- (1) By direct strokes.
- (2) By induced discharges.
- (3) By electrostatic induction.

Fortunately for electric installations, direct strokes do not frequently occur for probably no arrester would be of much service in preventing such a discharge from doing considerable damage.

Induced discharges following a lightning flash and static charges, due to surrounding atmosphere being charged, are the conditions which have to be specially provided against.

Owing to the high frequency of lightning discharges any inductance on the line offers an enormous impedance to a discharge, which fact accounts for the puncturing of transformer coils, the discharge taking the shortest and most direct path to ground.

	CASE I.		CASE II.		CASE III.		CASE IV.
	Year 1899.	Year 1900.	116 days in 1899.	114 days in 1900.	8 months in 1899.	Year 1900.	24 months May 1, 1899 to Jan. 1, 1901.
Cost of road.....	\$225,802.00	\$270,282.00	\$74,051.00	\$74,590.00	\$459,133.00	\$462,177.00	\$365,607.00
Cost per mile.....	19,200.00	23,500.00	13,464.00	13,616.00	19,537.00	19,665.00	24,500.00
Gross earnings.....	46,382.00	54,000.00	9,471.00	9,507.00	43,036.00	57,000.00	107,634.00
Gross earnings per mile per day.....	11.05	12.86	14.84	15.17	7.56	6.64	12.00
Operating expenses (60 per cent of gross receipts).....	27,829.00	32,400.00	5,682.00	5,704.00	25,821.00	34,200.00	64,580.00
Net earnings.....	18,553.00	21,600.00	3,789.00	3,803.00	17,215.00	22,800.00	43,054.00
5 per cent on investment (bond interest or dividends).....	11,290.00	13,514.00	3,703.00	3,745.00	15,304.00	23,109.00	30,467.00
Remainder.....	7,263.00	8,086.00	86.00	58.00	1,911.00	309.00*	12,587.00
Population of territory served.....	20,600	20,600	5,000	5,000	45,000	45,000	29,000
Gross earnings per annum per capita.....	\$2.25	\$2.62	\$1.90	\$1.90	\$0.95	\$1.26	\$2.22

\* Deficit.

Case IV, is an urban system comprising 15 miles of track situated in a city of 30,000.

If an allowance be made for depreciation all of these roads would show deficits. Assuming that three-quarters of the property depreciates and needs to be renewed in 10 years a yearly allowance of 6 per cent on the total cost (placed at 5 per cent interest) would in 10 years provide the fund necessary for renewal. If the life of the depreciable property is taken at 12 years, a yearly allowance of  $\frac{4}{3}$  per cent on the total cost will produce the fund necessary to renew the three-fourths.

Taking 5 per cent on the total cost of the road as a reasonable allowance for depreciation, the deficits in the four cases cited would be from \$472 per mile for Case I, to \$970 per mile for Case II.

These data are, of course, too meagre to warrant general conclusions. The figures given for operating expenses, 60 per cent of the gross earnings, are said to be very nearly exact for all four cases. The gross receipts in Case I, show an increase for the second year. In Case II, it may be that a bad summer season in 1900 prevented a greater increase in traffic, while in Case III, the eight months in 1899 may have included the best seasons for traffic, while only one-third the interest charges were deducted, thus making remainder larger than for two-thirds of 1900.

Work will soon be commenced on the unfinished section of the North River tunnel, at New York. It is projected to build a second tunnel paralleling the one which has been completed under the river for a distance of 4,000 ft., in order that larger cars may be operated than would be the case if, as at first projected, two lines of narrow cars were run through a single tunnel. It is estimated that the work will cost about \$675 per running foot, or \$5,000,000, including the track and car equipment.

Arresters are non-inductive resistances usually air gaps, one side being connected to the line and the other to earth, the resistance of these gaps being low enough for the lightning to choose same for a path to ground rather than through some of the apparatus connected to the lines.

The length of the gap is governed by the working voltage of the line, the general practice of the day being to make it as small as possible without the ordinary current jumping across. However, this has the disadvantage that arresters are apt to be too sensitive and cause trouble due to dust, cobwebs and dirt accumulating, or the fusing over the spark gaps due to repeated discharges, thereby causing a short circuit on the line or a heavy ground as the dynamo current follows the lightning discharge across the gap.

A lightning arrester, in addition to affording a short path to ground, must also perform the duty of an arc breaking circuit breaker to immediately interrupt the flow of the line current to ground and extinguish the arc which is formed.

Owing to the fact that any inductance in the line offers considerable resistance to the passage of a lightning discharge, choke coils are sometimes introduced in series with the line, between the arrester and the central station, the combination of arresters and choke coils forming a very reliable means of protecting the apparatus in the station.

It is not a general practice to install a choke coil in conjunction with every arrester placed on the line, owing to the high cost which would be involved; however, it is a good scheme to place such a combination to protect any large and expensive apparatus connected to the circuits.

These choke coils are usually constructed of flat copper strip wound on a non-conducting core, the layers being insulated with mica or some other insulator.



Any self induction in the way of coils or turns in the ground wire of an arrester must be avoided and when they are being put up, the linemen should be watched, as it is a favorite trick to take up any slack in a wire by making a little coil; any such coils would be nothing more or less than choke coils which would completely offset the value of the arrester, rendering it virtually useless.

The ground wire is a most important feature in the installation of a lightning arrester, and there is no doubt that many failures of arresters to protect lines are due to poor ground connections.

To effectively protect a circuit, arresters should be placed at the end of all lines and at points where they branch off in different directions and they should be inspected and cleaned from time to time.

Despite the many devices used on the various types of arresters to extinguish the arc formed, the line current is occasionally not broken, thereby causing a short circuit or dead ground. To avoid this fuses are sometimes placed on the ground wire of single pole arresters and in both leads of double pole arresters; this, however, makes it specially necessary that an inspection be made after every storm so that should any fuse be blown it can be replaced before the next storm.

Owing to the somewhat uncertain action on lightning arresters barb wire has been used on transmission lines as a protection against lightning, and the results obtained have clearly demonstrated that it is a most satisfactory means of protection.

Barb wires is usually strung on pins on top of the poles and also at the ends of top cross-arm. In some places a special two-pin cross-arm has been used above the line wires, to carry the barb wires, and in other places a single line of barb wire is strung on top of the pole.

Experience has shown that it is advisable to fasten the barb wire to glass insulators on pins rather than to staple it to the pole owing to the superior mechanical support, the insulator of course not being used for insulating purposes.

Some engineers consider that the trouble caused by using barb wire offsets its value as a protective device; and for that reason its use has been abandoned in one or two instances.

A description of the methods adopted to protect the Chambly 12,000 volt transmission lines from lightning may be of interest as the results obtained on the two lines have been eminently satisfactory.

Two duplicate lines are run from Chambly to Montreal, the total distance being about 17 miles for each line, of which  $14\frac{1}{2}$  miles are aerial and  $2\frac{1}{2}$  miles underground cables. The underground cable is divided up in three sections, the first section being about a mile and a half from the power house, the second about 15 miles from the power house, and the third at the Montreal end.

The country through which the lines pass is very flat and marshy towards the Montreal end. Three lines of barb wire on glass insulators are run on each pole line, two lines being run on the ends of the top cross-arm about 15 in. from the line wire and the third on a pin on top of the pole.

The barb wire is composed of two twisted No. 12 B. W. G. galvanized iron wires with one four point barb every 5 in., and is connected at each pole by means of a soldered joint to the ground wire. This ground wire is stapled down the face of the pole and is twisted several times round the butt, after running through an iron pipe about 8 ft. long, which projects above the level of the ground, preventing the wire from being cut or broken, as well as affording an additional ground.

The ground wire and pipe were stapled on the pole when the poles were being erected.

As the poles on the transmission lines are set 90 ft. apart the barb wire lines are grounded about 58 times per mile; this frequent grounding being one of the most important points in the protection.

It was the intention before putting the lines into use, to place lightning arresters in addition to the barb wire, but as they were not available in time the lines were put into operation without them.

Our experience with the first series of storms showed that well grounded barb wire was a very effective protection, and the lines were therefore operated under these conditions for one entire summer.

Recently arresters of the air gap type have been installed at the power house at Richelieu as additional protection.

During one particularly severe storm the local distribution lines in Montreal and Chambly, which were not protected by barb wire,

were considerably affected, while no effects were felt on the transmission lines at all, although trees were struck in its immediate neighborhood.

It was at first thought that the barb wire would rust and break down very quickly, but after two years operation an inspection shows that it is in a very good condition, and as yet there has never been a single case of it breaking.

In the discussion which followed Mr. B. F. Reesor stated that his company used barb wire on top of the poles, but not on the cross arms, and that it is fastened with staples instead of insulators. Mr. Reesor was somewhat opposed to the barb wire lightning arrester for the reason that there is danger of the barb wire dragging or breaking and getting tangled up with the live wire, although so far he had experienced no trouble in this direction. Neither had he had any trouble with lightning discharges for which he was willing to give the barb wire credit.

Mr. P. G. Gossler: It is particularly interesting to me to hear Mr. Reesor's experience with his barb wire protection. I think it would be very beneficial and certainly instructive to hear the result of the experience in other plants. The experience we have had on the Chambly line has been exceedingly satisfactory, and I think demonstrates clearly the safe-guard that barb wire as a lightning protection affords. When our line was first constructed it was intended to have the ordinary air gap arresters located at each place where aerial lines were connected with the cable, as it has been shown in a great many cases that there is liable to be trouble where aerial lines are connected with underground cables. This was not done as the arresters were not available in time and the line was put into use without them; we therefore anticipated considerable trouble at the points in the transmission lines, where the aerial and underground systems joined. The first storm that came along, came about midnight, and I think we were all pretty well scared because we expected to see the cables break down; the barb wire, however, fixed that, and we ran one entire summer, through a season when, according to the records of McGill College there were more storms than for three years together for the past seven years. Since that time it was thought inadvisable to place air gap lightning arresters where the aerial and cable sections joined, inasmuch as they would necessarily be some distance from the station and not under constant observation.

Mr. F. W. Martin said that in Hamilton he operated a 22,000-volt line during most of this summer without any lightning arresters on at all, and so far no trouble with lightning has occurred. He was not in favor of the air gap arresters for this service.

Mr. P. G. Gossler: About six weeks after we put the transmission line into use there was one very heavy storm which occurred early in the evening when we could see the storm traveling. The storm struck Montreal first and simply demoralized the local distribution system, and then started in a direction due east, which would be right towards Chambly, following along our main transmission line. We were fortunate enough to not have our telephone communication interrupted, and followed the progress of the storm till it got to Chambly. When it got there, there were several local lines which were simply paralyzed and all the transformers destroyed; however, during that entire storm, possibly covering an hour, there was not a single discharge on the 34 miles of transmission line. That seemed to us almost conclusive—it was conclusive evidence of the protection afforded by barb wire, and as shown on those lines was a very reliable safeguard. I may say for the three seasons that line has been in use there has never been a single discharge on the line or any interruption whatever.

Mr. B. F. Reesor: We have a six-inch plate soldered to every ground wire at the bottom of the pole; and we have on our high voltage line air gap arresters at each end; we have repeatedly seen during a heavy storm a discharge going through these air gaps; at the same time our experience has been that while storms were going on and our local lines were punctured and broken down our transmission line was not affected in any way.

Mr. H. A. Moore brought up the question whether the use of any other than barb wire would be of service in protecting lines. The objections to the use of barb wire seem to be its lack of good mechanical properties, its liability to corrosion and the generally poor quality of iron in barb wire. This, it was later brought out,



was merely a question of the expense of building a stronger barb wire.

President A. A. Dion: This discussion is very interesting. I came here with the impression that barb wire as a protection for transmission lines was not, to use a common expression, what it is cracked up to be. I have read of several instances where it was said that barb wire by breaking frequently and causing line troubles, had become such a nuisance it had to be abandoned. I am very glad to hear from others here today that barb wire is an effective protection against lightning and that the line troubles through its use have been exaggerated. From the evidence we have heard here today I would think the protection of long distance transmission from lightning was pretty well solved. There is that very important point, the protection of internal distribution lines throughout the city, which is not solved. This is a good subject for discussion, as to whether the advantages of the barb wire system can be extended to city lines. If the trouble due to breakage is so great as to prevent the use of barb wire throughout the streets, then why not, as suggested by Mr. Moore, get some substitute, a steel wire or some wire that can be depended upon to stand as much strain as your ordinary wire; then it would seem we might get a more effective protection than we get now. The protection from air gap lightning arresters placed at the station end of the line, in connection with choke coils and supplemented by air gap lightning arresters on other points on the distribution lines, are not an effective protection against lightning. That is the teaching of experience. The station apparatus, to my experience, is pretty well protected, but the transformers are not.

### GRAND RAPIDS INTERURBAN INSPECTED.

The initial trip over the Grand Rapids, Holland & Lake Michigan Rapid Railway to Jenison was made last month by a party consisting of the officers of the company and a number of guests. Mr. Benjamin S. Hanchet, jr., vice-president of the company, acted as host and all along the route the first car on the line was greeted with much enthusiasm. Several stops were made along the route at all of which the party were greeted with cheers and other demonstrations. It is expected that the new road will be opened to traffic about September 1st.

### PARK AT LIMA, O.

The Lima Electric Railway & Light Co., of Lima, O., of which Mr. Jos. B. Mayer is president and Mr. Louis H. Mountney general superintendent, opened its new park on June 30th. This is known as



MCBETH'S PARK PAVILION

"McBeth's Park" and is situated about three miles from Lima; it comprises about 45 acres of land. One of the attractions is a fine lake well stocked with fish, and a handsome pavilion has been built. Every afternoon and evening a vaudeville show is given in the

pavilion and also concerts by the McBeth Park Band. After evening performances the floor is cleared for dancing.

On the lake are a steam launch and a number of row boats for hire to patrons. A merry-go-round is also included in the equipment.

Concerning the patronage Mr. Mountney writes us as follows: "The park has been quite popular with Lima people as there are



LAKE AT MCBETH'S PARK.

no other places of amusement near here, and we are carrying large crowds to the park nightly, and on Sunday the attendance is very large all day and evening. The park is kept up with the highest attractions and no liquor is sold on the grounds. We are getting the best class of people for our patrons, and the best of order prevails. We are also getting a number of excursions and picnics in consequence of this. The steam railroads are running special excursion trains from outside towns, and the nightly attendance is increasing. Cars are run to the park every 15 minutes and when the vaudeville show is out, a number of cars are in waiting to take the people home without delay."

### NEW PLANS FOR PITTSBURG ELEVATED.

It is stated that arrangements have been made with the Pennsylvania Railroad Co. for the use of the new Union depot by the new elevated traction systems of Pittsburgh. The Liberty Avenue elevated line will cross the Pennsylvania tracks 38 ft. above the street grade and 25 ft. above the depot floor. It is thought that the height will not be too great for an easy flight of steps to the depot, so that passengers from all sections of the city can reach the depot waiting-room quickly and without the necessity of walking any considerable distance. This will introduce some changes in the underground portion of the route which is to be over two miles in length. The depot plan is generally favored by the Pennsylvania road officials.

### BOSTON ELEVATED IN OPERATION.

The Boston Elevated Railway Co., which has devoted much time and care to the proper equipment of the new elevated service, has had the road in operation for nearly two months with very gratifying results. Though the conditions are most exacting and extremely severe upon the equipment, the Sprague multiple unit system which was adopted after the most exhaustive tests has proven to be entirely satisfactory.

At all stations, both on the elevated and in the subway, transfers are issued to surface lines. This makes the service unique, as nearly every station is practically a terminal and the number of passengers getting on and off the trains at each station is far in excess of that in any other elevated service. The road has proven so popular that the 100 cars now in operation are found to be insufficient, and the company has just awarded the Sprague Electric Co. a contract for 50 additional multiple unit equipments.

## NOTES FROM NORRISTOWN, PA.

The Roxborough, Chestnut Hill & Norristown Railway Co., running from Wissahickon in the city of Philadelphia to Norristown, Pa., with branches to Manyunk and Chestnut Hill, is controlled by the United Power & Transportation Co., of Philadelphia. The system, which comprises 24 miles of road, is nearly all single track with turnouts, and operates through a portion of the richest and most thickly settled farming section in Pennsylvania. The line is built for practically the entire distance on the public highway which surmounts several high hills, this situation giving the road a number of grades as severe as 12 per cent, but making it one of the finest scenic routes in the East. At one point passengers on the cars can see into seven different counties at one time. As can be imagined the scenic attractions give the road a large amount of purely pleasure traffic especially during the summer months, and on Saturdays and Sundays the company finds it necessary to run a number of extra cars to accommodate those riders that take advantage of the opportunity provided by the trolley for getting away from the city into the fresher air of the country. The company does not provide a park or other pleasure resort as it finds that just the ride itself draws about all the traffic the road can handle. The road is divided into five cent sections, averaging about five miles each.

Connecting with the Roxborough, Chestnut Hill & Norristown Ry. at Norristown, is the Schuylkill Valley Traction Co., which is also controlled by the United Power & Transportation Co., the Roxborough road and the Schuylkill road forming practically one system. The Schuylkill system comprises 28 miles of track running from Manyunk, just over the city line of Philadelphia, to and through Norristown and nearby villages.

Power for operating the two properties is taken from two stations, one at Roxborough and one at Norristown. The Roxborough power house contains one 800-kw. Westinghouse generator, belted to a marine-type engine, and two 200-kw. generators belted to a high speed engine. There is also a 400-amp. booster for sustaining the voltage at the end of the line.

The Norristown station contains one 400-kw. machine belted to a 350-h. p. Allis-Corliss engine, and one 150-kw. generator belted to a 200-h. p. Buckeye engine. There is a 250-amp. booster at this station.

There is now in course of erection a new station which will in a measure supersede the two just mentioned. The equipment of this new house has not been fully decided upon but it will include two 500-kw. Westinghouse generators direct connected to two Pennsylvania Iron Works engines taking steam from Heine boilers. The company is also building a new brick combined car house and repair shop, 105 x 395 ft., which will have accommodation for 60 cars.

The Roxborough and Schuylkill companies at present have about 85 cars, most of them of Brill make. Of these 35 are double truck and 13 are of the new Brill convertible type. All cars that enter the city limits of Philadelphia are required to carry a notice showing that the regular license of \$50 per car required by a city ordinance has been paid. Whenever the company desires to run extra cars on Saturdays and Sundays, it takes out a special license for these, paying 25 cents per day for each extra car. These special licenses are taken out Saturday morning and are returned Monday morning.

The United Power & Transportation Co. is now building an extension from Collegeville, the terminal of the Schuylkill Valley Traction Co., to Sonitaga Park, a distance of 8.2 miles, this extension being controlled under the name of the Trappe & Limerick Electric Ry. The track is laid with 9 in. 60-ft. girder rails in the city of Norristown, and 70-lb. T rail with "Continuous" rail joints in the country. Mayer & Englund "protected" bonds will also be installed. The overhead work was furnished by H. W. Johns Co. Bracket suspension was adopted with 30 and 32-ft. poles, set 5 ft. from the nearest rail, the trolley wire being carried 18 ft. above the center of the track.

The Roxborough company has had a great deal of trouble from wire and bond thieves, and has succeeded in sending several of these criminals to jail where they are serving terms of varying length. As an aid to putting a stop to this annoyance the following notice has been posted in each car: "\$500 reward will be paid by the Roxborough, Chestnut Hill & Norristown Railway Co. for the arrest and conviction of any person or persons stealing copper

railway bonds or copper wire on the line of said railway; or for the arrest and conviction of any person receiving such stolen wire."

The superintendent of the Roxborough and the Schuylkill systems and also of the new Trappe & Limerick Electric Ry. is Mr. Geo. Hoeger, who is directly under Mr. F. L. Fuller, general superintendent of the United Power & Transportation Co.

## CROSSING A SINK HOLE.

In building the Grand Rapids, Holland & Lake Michigan Rapid Ry., a sink hole was encountered near Holland which gave considerable trouble to the Detroit Construction Co., which has the contract for constructing the line. Mr. L. B. Wilson, consulting engineer for the Detroit Construction Co., advises us that this hole consisted of muck heavily saturated for a depth of about 40 ft.; on the surface was a comparatively firm crust, which on being loaded with the base of a proposed fill gave way and allowed the fill to sink. Under the 40 ft. of muck is a layer of gravel 8 or 10 ft. thick.

A temporary track has been built across the surface of the muck supported on closely laid long timbers, and ties laid without any spaces between them. This serves very well to support the track temporarily during the construction of a bridge carried on piles, which penetrate the underlying gravel to the depth of 4 ft. The work of building the permanent bridge is a slow process as the piles have all to be spliced.

## CINCINNATI, NEWPORT & COVINGTON.

The comparative monthly statement of the Cincinnati, Newport & Covington Railway Co. for the months of June, 1901 and 1900 has been issued as follows: Gross receipts, June 1901, \$72,201, June 1900, \$73,946; operating expenses, June 1901, \$39,749, June 1900, \$31,246; net earnings, June 1901, \$42,452, June 1900, \$42,700; tolls, taxes, damages and rent, June 1901, \$12,397, June 1900, \$12,314; net profit, June 1901, \$30,054, June 1900, \$30,385; ratio of expense to earnings, June 1901, .4120, June 1900, .4225; same, including damages, taxes and rent, June 1901, .4773, June 1900, .4863.

## ABSTRACTS FROM THE INTERSTATE COMMERCE COMMISSION'S REPORT.

The Interstate Commerce Commission, issued under date of July 11th, an abstract of statistics of the steam railways in the United States for the year ending June 30, 1900, compiled from summaries which will appear in the Thirtieth Statistical Report of that body. The number of railway corporations included in the report was 2,023; of this number 1,067 maintain operating accounts, 847 being classed as independent operating roads and 220 as subsidiary roads. The abstract shows the total single-track railway mileage in the United States on June 30, 1900, to have been 193,345.78 miles, an increase of 4,051.12 for that year, which is a greater increase than that of any other year since 1893. The states and territories showing an increase in mileage in excess of 100 miles are Alabama, Arkansas, California, Idaho, Illinois, Iowa, Louisiana, Minnesota, Mississippi, Nebraska, North Carolina, Oregon, Pennsylvania, South Carolina, Texas and Oklahoma.

That portion of the abstract covering the equipment of railways in the United States shows 37,663 locomotives to have been in the service on June 30, 1900, or 960 more than on the corresponding date of the year previous. The total number of cars of all classes is reported at 1,450,838, an increase of 74,922 being shown in this item. Of the total number 34,713 are assigned to passenger service, 1,365,531 to freight service, and 50,594 to the direct service of the railways. The cars owned by private companies and firms and used by railways are not included in the report. It is shown that the railways of the United States used on an average 20 locomotives and 753 cars per 100 miles of line; that 58,488 passengers were carried and 1,626,179 passenger miles accomplished per passenger locomotive; and that 51,013 tons of freight were carried and 6,556,731 ton miles accomplished per freight locomotive. All these items show an increase when compared with corresponding figures for the year 1899. There was also a decrease in the number of passenger cars per 1,000,000 passengers carried, and a decrease in the number



of freight cars per 1,000,000 tons of freight carried. Both locomotives and cars being embraced in the term equipment, it appears that the total equipment of the railways on the date stated was 1,488,501. Of this number, 1,005,729 were fitted with train brakes, the increase in this item being 107,655; and 1,404,132 were fitted with automatic couplers, the increase being 266,413.

The amount of railway capital outstanding June 30, 1900, is shown to have been \$11,491,034,960. This amount assigned to a mileage basis represents a capitalization of \$61,490 per mile of line. Of this amount \$5,845,579,593 existed in the form of stock, of which \$4,522,291,838 was common stock, and \$1,323,287,755 preferred stock. The amount which existed in the form of funded debt was \$5,645,455,367. This amount was classified as mortgage bonds, \$4,900,626,823; miscellaneous obligations, \$464,983,347; income bonds, \$219,536,883; and equipment trust obligations, \$60,308,320. The amount of current liabilities not included in the foregoing capital statement was \$594,787,870, or \$3,183 per mile of line. The amount of capital stock paying no dividend was \$3,176,609,698, or 54.34 per cent of the total amount outstanding.

The number of passengers carried during the year ending June 30, 1900, was 576,865,230, showing an increase for the year of 53,688,722. The number of tons of freight carried was 1,101,680,238, an increase of 141,916,655.

Gross earnings from the operation of the railways in the United States for the time stated, covering an operated mileage of 192,556.03 miles, were \$1,487,044,814, being \$173,434,696 more than for the preceding fiscal year. The operating expenses were \$961,428,511, the increase in this item being \$104,459,512.

### MIAMI & ERIE CANAL ROUTE.

Work was commenced in June by the Miami & Erie Canal Transportation Co. on its line between Hamilton and Dayton. The entire route has been divided into six working sections, and grading gangs are being put to work as fast as the engineers are able to lay out the grades.

Seventy miles of 70-lb. rails have been ordered from the Carnegie company and 150,000 ties have been contracted for. Some of the rails are now at hand at Franklin and at Cincinnati, but the greater portion of the order will not be delivered until October, at which time the entire order will be filled. Track laying will be begun about September 1st where material is delivered, and as soon as the rails are all at hand the work will be pushed rapidly to completion.

### TRACKS DESTROYED BY FIRE.

Late in the afternoon of July 25th a fire started in the sawmill district of Davenport, Ia., and burned over an area equivalent to



VIEW OF TRACKS AFTER FIRE.

20 city blocks, laying waste immense lumber yards and destroying over 50 residences, entailing a loss estimated at \$750,000.

The flames started in piles of kindling wood in the yards of the Rock Island Fuel Co. and were carried by a brisk breeze into the

adjacent lumber yards. The fire spread so rapidly workmen had to flee for their lives, leaving clothing and other belongings behind.

The sawmill and lumber yard of Weyerhaeuser & Denkmann, on East Front St., were totally destroyed.

The accompanying engravings were made from photographs sent us by Mr. James F. Lardner, secretary and treasurer of the Tri-City Railway Co., of Davenport. Mr. Lardner writes as follows:



RAIL LIFTED 4 FT. AT END.

"The sawmill was on the south of our East Front St. track and the lumber yard on the north side, and the fire was so hot that it melted our trolley wire and burned and warped our track so badly that we had to completely rebuild 2,300 ft. of it, the rails being so badly warped as to be entirely useless. Thinking that your readers might be interested in them, I am sending you some photographs taken of our track after the fire. The rails in warping raised at the ends, pulling up ties and brick paving in some places to the height of 4 ft."

### IMPROVEMENTS AT EASTON, PA.

The Lehigh Valley Traction Co., which is the lessee of the Easton, Palmer & Bethlehem Street Railway Co., the Easton Transit Co., the Easton Consolidated Electric Co., and associated companies in the city of Easton, is making preparations to operate all the properties mentioned and others connecting with them as a general system. In order to accomplish this it was necessary to secure permission from the city of Easton to change the gage of all the street car tracks in the city which are now laid to a gage of 5 ft. 2½ in. The city council has sanctioned this change of gage with the provision that in case of double tracks the inside rails shall be moved six inches closer to the outside rails which will not be moved, thus leaving a greater distance between tracks which is necessary for the operation of the large new cars which are in use on the suburban lines. Where single track exists each of the rails is to be moved 3 in. towards the center of the track. In consideration for the permission to change its gage the company is limited to a charge of 10 cents for a single fare between Easton and the borough of Bethlehem. The construction of the new track is to be commenced at once.

### CLEVELAND UNION SUBURBAN STATION.

The Electric Terminal Co. has received the deeds for the property on which the union station for the suburban electric railways is to be built. The cost of the various properties on this site was about \$100,000. The station will be built as soon as franchises for laying the tracks to connect with it can be procured.

At the new union station there will be facilities for handling baggage, and it will be possible for through passengers to make their journeys by electric cars much more conveniently than at present. It is predicted that the union station will result in a large increase in the through passenger business of the suburban roads.



## IMPROVEMENTS AT OTTUMWA, IA.

After a hard fight the Ottumwa Electric & Steam Co., of Ottumwa, Ia., has secured extensions of its franchises for 25 years from July 8, 1901. The old franchises had 17 years yet to run but as the present owners wished to increase the capital and issue bonds, new franchises were desired. When submitted to a popular vote as required by laws of Iowa, the franchises were approved by an overwhelming majority.

The company and its predecessors have conducted a lighting, steam heating and railway business for the past 12 years. At present time the company is operating about seven and a half miles of track over grades of as high as 11 per cent; has 137 street arc-lamps of the G. E. Alternating or the "Hartford" system of lighting, over 100 commercial alternating arc-lamps and about 6,000 incandescent lamps wired up; does a general motor business on a 500-volt current and has a steam-heating system with city mains, of about three miles of pipes of various sizes installed by the American District Steam Co., of Lockport, N. Y.

The new franchises are the first granted in any of the larger cities of Iowa, and the provisions will doubtless be of general interest to others in the business.

Within 18 months, at least  $2\frac{1}{2}$  miles of new railway track is to be built, and after September 1st, tickets shall be sold at the rate of 24 for one dollar, and school tickets good between 8 a. m. and 5 p. m. on school days shall be sold to school children at 3 cents each.

The rate on arc-lamps of nominal 2,000-c. p., shall not exceed \$75 for an all-night schedule, nor \$67 for a moonlight, dark-night (or an all dark-night) schedule. The rates per kilowatt-hour for incandescent lighting shall be as follows:

One to 10 kw., 13 cents; 11 to 25 kw., 12 cents; 26 to 50 kw., 11 cents; 51 to 150 kw., 10 cents; 151 to 250 kw., 9½ cents; 251 to 300 kw., 9 cents; 301 to 400 kw., 8 cents.

The former rates were 15 cents for commercial and 18 for residential lighting, with a sliding scale down to the present rates for 151 kw. Power circuit rates remain unchanged, as they are now 20 cents per kw. h. with a minimum charge according to size of motor. All city or municipal buildings (not including school houses) and the city library are lighted free of expense.

Under the steam heating franchise, the rates now in use shall be the maximum rates charged, but they shall be reduced in ratio to the price of coal. No minimum or meter rentals shall be charged and all city buildings (as named in the foregoing paragraph) shall be heated free. The company can never abandon any of its mains without giving six months' notice (in the current year) of its abandonment, but no part of the system furnishing heat to a city building can ever be abandoned without forfeiting the entire franchise.

Extensive improvements are contemplated and the company is in the market for a large amount of new material, such as poles of various lengths, rails, ties and wire (both bare and weather-proof) as well as some equipment and other construction articles.

April 1st Mr. Royal H. Holbrook was appointed superintendent of the company. Many of our readers will remember that Mr. Holbrook was chief engineer of the Cedar Rapids & Marion City Railway Co. for ten years, in which position he made a most enviable record. He has been a regular attendant at the street railway conventions and has visited all the large power stations between Buffalo and the Pacific Coast, so that he has a wide acquaintance.

## STRIKE ON MAHONING VALLEY FAILS.

A short-lived strike occurred in July among the laborers who are building the extension of the Mahoning Valley railway from Lovellville to the Ohio state line.

The laborers asked for an advance in wages from \$1.50 per day of 10 hours to \$1.65 for nine hours or \$1.75 for 10 hours. On the following day a committee of them came up from Edenburg, where the strike started, and unsuccessfully tried to induce the men at the Lovellville end to come out. The leaders were arrested and the project dismissed.

Thirty-five of the instigators of the strike at Edenburg were discharged and their places filled, all the others returning to work. The 50 teams which were also thrown out of work were returned.

## REQUIREMENTS FOR STREET CAR MEN.

If the conductors and motormen employed on important electric railway lines be contrasted with many of the crews which operated the cars in the days of horse propulsion, one cannot fail to notice the great improvement which has taken place in the past few years

*This blank must be filled up by the hands of the applicant, and the entire paper correctly answered, and to be accompanied with the sum of \$1 a dollar (\$20.00), and sum to be returned when the application is rejected or when the applicant has given his bond as required.*

## Worcester and Webster Street Railway Co.

WORCESTER, MASS.

I hereby make application for a position as **Motorman** upon your road, pledging myself, as applicant, to faithfully and honestly discharge all duties required of me to the best of my ability, and to strictly comply with all rules and regulations made by said Corporation; and I do hereby affirm that the following declarations made, and answers given, are true, without reservation of any kind whatever.

Each applicant will be required to pass a satisfactory physical examination before being accepted.

1. What is your full name?
  2. What is your age? Height? Weight?
  3. Are you married? If so, state how many children you have.
  4. Are there others dependent on you for support besides wife and children?
  5. Give names and particulars.
  6. Have you a profession or trade? What?
  7. Do you use intoxicating liquors? If so, to what extent?
  8. Do you use tobacco in any way? If so, how?
  9. Where were you last employed? Give name of person or firm.
  10. Were you discharged or did you resign? State reason in earlier case.
  11. Were you ever employed by any steam railroad? Or any city passenger railway? If so, state when, where and in what capacity you were employed?
  12. Why did you leave?
  13. Fill in the following blanks, giving dates of your employment and names of employers during the past five years.
- | From what date | To what date | Employer | At Address | In service of |
|----------------|--------------|----------|------------|---------------|
|                |              |          |            |               |
|                |              |          |            |               |
|                |              |          |            |               |
|                |              |          |            |               |
|                |              |          |            |               |
14. Do you desire to run a motor car as a business?
  15. Do you understand the dangers to life and limb which accompany the position you desire to obtain?
  16. Will you give a bond in a satisfactory Surety Company, in the sum of three hundred dollars (\$300.00) for the faithful performance of your duties while in the employ of the Worcester and Webster Street Railway Company.
  17. Will you agree to carry an accident insurance policy for a reasonable amount, in order to protect yourself and family against accidents, caused by or through the negligence of the employer, employees, or otherwise during the time you are in the service of said company? and will you further agree, for yourself, your heirs, administrators, and assigns, that you will hold said Corporation harmless from all liability for personal injuries caused to you in any manner whatever, during and term of your service?
  18. Give names, occupation and address of as many persons as possible for reference—not less than three—who are not related to you.

Name	Occupation	P. O. Address	Not related to you

I hereby certify that I can read and write the English language, and that I personally filled out this application, and declare that the foregoing answers made by me are true.

Dated at Worcester, Mass., this \_\_\_\_\_ day of \_\_\_\_\_  
(Signature of Applicant.) [L. S.]  
(Post Office Address in full.)  
Signature witnessed by \_\_\_\_\_

If this application is declined the company reserves the right to withhold the reason therefor, as all information relative thereto is regarded as confidential. If accepted, the applicant will be duly notified to call at this office.

## APPLICATION FORM FOR MOTORMEN.

in the personnel of the service. While formerly almost any man who could drive a team or make change was eligible as a conductor or driver, we find today on many of the best roads very stringent qualifications as to character, habits, personal appearance and manners required in applicants for these positions. The shabbily

pressed, dirty or uncouth conductor is a thing of the past on most railways, and in his place is found a neatly uniformed man of cleanly appearance and gentlemanly manners. The character of the employes has kept pace with the improvements in the street railway service.

In order to secure employes of requisite intelligence and character

INQUIRY DIVISION.

Worcester & Webster Street Railway Company,  
WORCESTER, MASS.

Worcester, Mass. \_\_\_\_\_

To Mr. \_\_\_\_\_

Has applied to the Inquiry Division of the Inquiry of \_\_\_\_\_

and has given a list of his references. Will you kindly give below such of relation as you possess regarding the character, habits, and worth of said applicant.

You will oblige the applicant and this Company by complying with the above request and returning the form to us at your earliest convenience.

THE INFORMATION YOU GIVE WILL MAKE NO USE OF YOUR NAME, AND BEING COMPLETELY CONFIDENTIAL, IT WILL BE KEPT AS SUCH. IT WILL BE KEPT AS SUCH. IT WILL BE KEPT AS SUCH.

Respectfully yours,

Worcester & Webster Street Railway Company,  
WORCESTER, MASS.

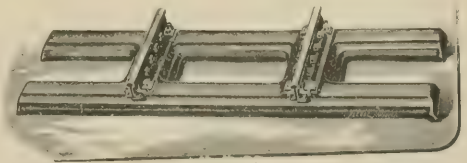
QUESTIONS.	ANSWERS.
1. Are you personally acquainted with the applicant?	(a) Yes (b) No
2. Have you ever employed him? If so, for how long, and what was the cause for his leaving your service? State full name.	(a) Yes (b) No
3. Is he a native-born citizen of the U. S.?	(a) Yes (b) No
4. Has he ever been convicted of any crime? If so, what was the crime? State full name.	(a) Yes (b) No
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100. Is he a native-born citizen of the U. S.?	(a) Yes (b) No

SPECIAL JOINT TIES.

The accompanying illustration shows a "coupled joint-tie" for railways which has been recently placed on the German market by the Kalk Machine Tool Manufacturing Co. The following description is taken from a circular issued by the maker:

The joint consists of two (or of several) ties connected at the points which come under the rails; the ties and what may be called the "longitudinal sleepers" are pressed from sheet steel and form a single piece.

According to whether a supported or suspended joint is desired, and whether the rails are to be fastened to the sleepers with or without spikes, the surface of the longitudinal portions may be at



SPECIAL JOINT TIES.

the same level with the cross ties or either below or above them.

The stress of the weight resting upon one side of the joint-fastening is transmitted chiefly by the joint-ties; for the latter being dependent upon each other in their movements commence to act simultaneously as soon as the wheels of the train approach the joint. By this means the fish-plates are relieved from considerable stress and they naturally will last longer and serve their purpose better.

The alternate movement of the two single joint ties which is so destructive to the roadbed is thus done away with. The cost of maintenance is therefore reduced, the violent shocks caused by the train passing over the joints are avoided and a greater degree of safety in travel secured.

This device can be used with any existing system of superstructure and does not require the alteration of any of the track material in use; the ties can be made of any size and shape.

FORM FOR EMPLOYEES' REFERENCES

For many roads have prepared regular forms of application for employes, including references from several responsible parties, which send the applicants to the Inquiry Division of the Worcester & Webster Street Railway Company. The Inquiry Division of the Worcester & Webster Street Railway Company has taken as a sample of the methods which are employed to secure the right kind of men for street railway service.

## THE LIVERPOOL-MANCHESTER MONORAIL ROAD.

A paper read before the Society of Arts, London, on the Monorail System, by Mr. F. B. Behr, its inventor, gives some interesting details in regard to the proposed electric road between Liverpool and Manchester, England. The first practical exposition of this system was made in 1897 at the Brussels Exhibition, and the details of that experimental road were published in the "Review" for July, 1897. During the first trials a speed of 70 miles per hour was developed on the curves of 540 yd. radius, and after lightening the car and providing more station capacity a speed of 83 miles on the curves was recorded.

The following are extracts from Mr. Behr's paper:

The structure itself consisted of a single rail elevated about four feet from the ground, and supported on A-shaped steel trestles. The legs of these trestles were riveted to steel sleepers resting simply on the ballast. These triangular supports were placed about three feet three inches apart, and at each side were fixed laterally two rails, one about eighteen inches above the other. These are the so-called guide rails, their object being:

1. To brace the whole system together and increase its stability.
2. To engage the horizontal guide wheels of the car and prevent oscillation.
3. To counteract the effect of centrifugal force when rounding the curves.

The electrical conductor was a steel rail fixed on porcelain insulators attached to the sleepers. These rails were joined together by copper strips to preserve the electrical continuity. The return circuit for the electrical current was made through the line itself.

The car was over 60 ft. long and 10 ft. 10 in. wide.

It consisted of two bogies flexibly coupled together by a specially designed joint.

The part of the carriage below the main rail contained the whole of the mechanism, viz., four electrical motors of about 200 h. p. each, suspended from the girders, and connected to the axles of the driving wheels by specially designed chains.

A rigid iron arm was fixed between the body of the motors and the axles, to which they were coupled. This arrangement made the propelling force absolutely self-contained, so that it could not be affected by any shocks or oscillation that the car might receive.

There were 32 horizontal guide wheels acting on the guide rails for the purposes above described. The whole weight of the car was supported by eight double-flanged main wheels,  $4\frac{1}{2}$  ft. in diameter, the center wheels being driven, the two outer wheels being leading and trailing respectively. The ends of the car were pointed, to diminish the air resistance. The triangular spaces enclosed in these ends were reserved for the driver and conductor. The driver, or electrician, had under his hand the devices for starting, regulating speed and stopping.

Traveling at the highest rate of speed attained was extremely pleasant, and there was a feeling of perfect safety. The absence of vibration was marked, and no accident of the slightest kind happened during the whole of the experiments, notwithstanding the many thousands of people who came to see the line. The main results of the trial were that, given a proper line of sufficient extent to acquire the proper speed, and a properly constructed electrical station, very high speeds up to 120 to 130 miles per hour can be attained with absolute safety and moderate expense.

As the conditions of the proposed line between Manchester and Liverpool will practically do away with all the difficulties and drawbacks of the Brussels experimental line, it will be easy to attain the proposed speed of 110 miles an hour at a moderate cost on that line. The gradients will be easy and suitable for high speeds, the curves will not exceed 150 yd. radius, the electrical station will be constructed with the very best and modern machinery, and with ample power.

Starting from the station in Deansgate, in Manchester, in the very busiest part of the town, it terminates, after a run of 34 miles, behind the cathedral in Liverpool, situated also in the most central part of that town.

The train will consist of one carriage, containing either 60 or 90 passengers. The trains will start every 19 minutes from either end, and will perform the journey in 20 minutes. The electrical station will be situated exactly half way at Warrington, and will have a capacity of about 7,500 h. p.

The full speed of 110 miles will be attained within  $1\frac{1}{4}$  miles from the start by an acceleration of 1.5 ft. per second.

The carrying capacity of the rolling stock, if only the smaller carriage is used, will be 12,000 passengers per day, viz., 6,000 in each direction, and with the larger carriage this can be increased to 18,000 per day.

A very simple and effective set of signals has been devised for this line, and both air and electric brakes will be used on the cars. Such a construction presents almost absolute safety from collisions on the line or of accidents of any kind which can be foreseen, and the braking and signal devices are only made so complete in case of emergencies.

Experiments by many eminent engineers have shown that with the air brake it is possible to secure a retardation of three miles per second. That is to say, that the speed of a train traveling 60 miles per hour can be reduced each second by three miles, and, therefore, it can be brought to a stop in 20 seconds. During this period the train will traverse a distance of about 300 yd. A train traveling at 30 miles per hour can be stopped in 10 seconds, during which time it will have traversed a distance of 73 yd. These actual experiences, therefore, show that, with the Westinghouse brake alone, it probably will be possible to stop a train traveling 110 miles per hour in 37 seconds, during which time it will have traveled 995 yd.

The electric brakes consist of the car motors run as generators by the car wheels after the station current is cut off. Resistances are provided to utilize the current developed by the motors running as dynamos.

The power required to stop the train in 500 yd. is about  $8\frac{1}{4}$  h. p. or 197 lb. per square inch on the area of the brake disc.

The main advantage of this electric brake is that it is most effective at the very highest speeds, as of course, a high speed is more effective for generating electrical energy than a slow speed.

With the utilization, therefore, of both the electric brake and the air brake, it is a matter of mathematical certainty that it will be perfectly possible to exercise a retarding force amply sufficient to bring the train to a standstill, from a speed of 110 miles per hour in a distance of about 500 yd., instead of 995 yd. as above stated.

Such a rate of retardation, however, is only desired in case of dire emergencies and not in the usual operation of the trains.

Now, in the ordinary way of working our existing railways there are many occasions in which it might be important to stop the train as rapidly as possible; for instance, if a train could be seen in front, or some shunting operations were not completed, or other causes too many to enumerate. But no brake, however powerful, is of the slightest use today to avoid a sudden obstacle, such as a stone placed on the rail, or a broken rail, as it is impossible for the driver to be aware of such obstacles until he is very close to them, or practically upon them. For these cases, therefore, the stoppage at 300 yd. or 200 yd., or even 100 yd., is quite useless.

On the proposed railway there are no level crossings, no switches, no shunting operations, and, in fact, nothing that will require the train to be brought to a standstill, except in the event of one train preceding another breaking down. Therefore, by clearly explaining the method of signaling the position of each train in relation to the other, the necessity for applying the brakes and the distance in which the trains would have to be stopped in case of a breakdown would be clearly appreciated. Beyond this the brakes need only be used for stopping as you approach the stations.

The method of signalling is as follows: In the case of the line from Manchester to Liverpool the length is  $34\frac{1}{2}$  miles.

As the distance will be traversed in 20 minutes, and a train is to start every 10 minutes in the ordinary way, when everything goes all right, the second train will only leave the station at Manchester when the first has reached Warrington, a distance of  $17\frac{1}{4}$  miles.

The purpose of signalling the line will be divided into five sections of about seven miles each. As trains leave Manchester station a danger signal is put up electrically at that station. A second similar danger signal is put up as the train passes point seven miles, the first remains at danger, and the train travels on; when it reaches 14 miles it puts up a third danger signal, and simultaneously the block is removed at Manchester station, so that the second train can leave when the time comes.



Now assuming that the first train has met with an accident after passing point 14 miles, the second train would travel at full speed, but when it passes point 7 miles, the danger signal at that point not having been removed by the first train, as this never reached point 21 miles, the driver of the second train would be informed that the first train had met with an accident beyond point 14 miles, and, therefore, that he had to slow down, but that for such lowering of his speed he had a clear run of over 7 miles.

Therefore there could be no difficulty in any case to stop even without using the brakes by simply cutting off the current.

Whenever the train passes over a point where the danger signal is put up, this danger signal is also reproduced by a very simple and inexpensive contrivance in the cabin of the electrician, so that the conductor may hear it and see it, even if there was a thick fog.

Of course it is useful to have a powerful air brake to stop as rapidly as possible at the station. This can be done easily in 1,000 yd. on the level without using the electrical brake at all, and as we have a rise of 24 ft. in the last 1,500 yd. going into Liverpool and a rise of 40 ft. in the last 1,200 yd. going into Manchester, the cutting off of the current and the application of an ordinary air brake about 1,200 yd. from the station, will stop the train quietly and comfortably at the stations.

The bill to authorize the construction of this railway system between Manchester and Liverpool has already passed the House of Lords and came up before a committee of the House of Commons early in July. The promoters stated that the whole question comes down to whether there should be competition allowed with the existing railways, and they contended that the committee, in the public interest, should say whether such competition should be allowed. It was contemplated that the proposed express should run from 110 to 120 miles an hour. This was secured by the use of the monorail, by the generation of the power at a central station at Warrington, and its transmission to comparatively light motors on the cars themselves. Therefore the cars had not nearly so much to carry as the ordinary railway. Electrical apparatus, too, had rotary and not reciprocating action, and that was a very great advantage in favor of electric traction. The only point which gave the Lords' committee concern was the question of the centre of gravity of the cars. The promoters pledged themselves that the centre of gravity should be at least 12 in. below the top rail, and that requirement had now been embodied in the bill. Manchester and Liverpool were selected for this experiment, not merely for historical reasons, but in order to make it a successful commercial experiment. The promoters must have two great centres of population, one at each end. It was not suggested that the monorail was going to stop there. Probably next year there would be a proposal for a monorail between London and Brighton, and they believed that for communication between large towns the monorail would be the means by which the fast traffic would be carried in the future.

Mr. Behr, on examination by the committee, stated that the idea of the monorail system was at least a century old; but he had for the first time designed and invented those details which alone rendered it practicable and applicable to ordinary railway traveling. He explained in great detail the circumstances which preceded the parliamentary promotion of the scheme, the construction of the permanent way and passenger cars, the signaling apparatus and brake power. Much of his evidence was illustrated by demonstration given on the model of the proposed line, which ran from side to side of the committee room.

At the resumed sitting of the select committee further evidence was given by Mr. Behr as to the traffic between Liverpool and Manchester which he anticipated the new railway would get. He pointed out that now the passenger traffic per day between the two towns was about 8,500 persons. He had designed two sets of carriages, one which would carry 10,000 passengers, and another 7,500 a day. There would be 204 trains a day, and if each carried eight third-class passengers at the existing fares the working expenses would be covered, while if 20 passengers were carried it would enable 5 per cent. to be paid on the capital. He based this estimate on the figure of 8d. per car mile for working expenses. The total capital would be £2,500,000.

## A HEAVY ELECTRIC LOCOMOTIVE.

The accompanying engraving shows an electric locomotive built for the Ashville & Craggy Mountain Railway Co., by the J. G. Brill Co. It is unusually complete in its appointments, and from its weight and power is capable of handling heavy traffic. The length over the end sills is 22 ft. and the width 7 ft. The approximate weight of the car and trucks is 16,000 lb. For operation 4000 lb. of ballast is added which with the weight of the electric equipment, brought the total up to 32,000 lb. The large platforms make it quite convenient to use as a construction car, and it is also furnished with the usual draw bar and connections so that it can be used to operate a train. For this purpose it is fitted with a complete Westinghouse air brake equipment and air compressor.

The cab is quite large, and occupies the center of the platform



A NOVEL ELECTRIC LOCOMOTIVE.

In it are placed the conductor's, air and hand brake handles, and all the other apparatus connected with the car which requires to be housed. The trucks are of the No. 27 G pattern which gives ample space for the large motors employed. The wheels are 30 in. in diameter with 2½ in. tread and ⅞ in. flange. Looking over the design a railroad man expressed his opinion as follows: "Such a locomotive is capable of doing almost anything; it could climb a ladder if necessary," meaning of course that it could handle a train on a grade when any ordinary machine would be helpless.

## TROLLEY EXTENSION AT JACKSONVILLE.

A considerable extension of the Main Street Railroad Co., of Jacksonville, Fla., was completed and formally opened last month. The addition extends to Evergreen Cemetery, some distance outside the city. A special car was run over the extension on the occasion of the opening of the line in which Superintendent Satchwell of the railroad company entertained the mayor and a number of prominent citizens of Jacksonville. The route runs through an area of pretty scenery which makes the ride a pleasant one. A waiting room for passengers is to be erected at the terminus of the line which will be fitted up attractively.

A corps of surveyors from the Long Island R. R. are at work on the 2½-mile electric line from Northport station, N. Y., to the village.

A new electric mail car route between Springfield, Mass., and Northampton will be opened September 1st. The route will include Chicopee, Chicopee Falls and Holyoke, and one round trip a day will be made. The plans for a mail car submitted by the Wason Manufacturing Co. have been approved by the street railway company and the postal authorities.

FT. WORTH-DALLAS INTERURBAN.

The state of Texas has had heretofore no interurban electric railways, and it is but recently that the first one was opened to the public. Plans for a second road of this character to connect Ft. Worth and Dallas, Tex., have been in progress for some time and the preliminary work of grading is now well under way. The

Arlington, Grand Prairie and Oak Cliff. The line will connect at both termini with a number of railroads centering both at Ft. Worth and Dallas, and it parallels the lines of the Texas & Pacific Ry. between these cities.

The company is incorporated under the laws of Texas and is capitalized at \$2,000,000 stock and \$2,000,000 bonds. Only \$1,500,000 of each, however, will be issued at present, the remainder to be



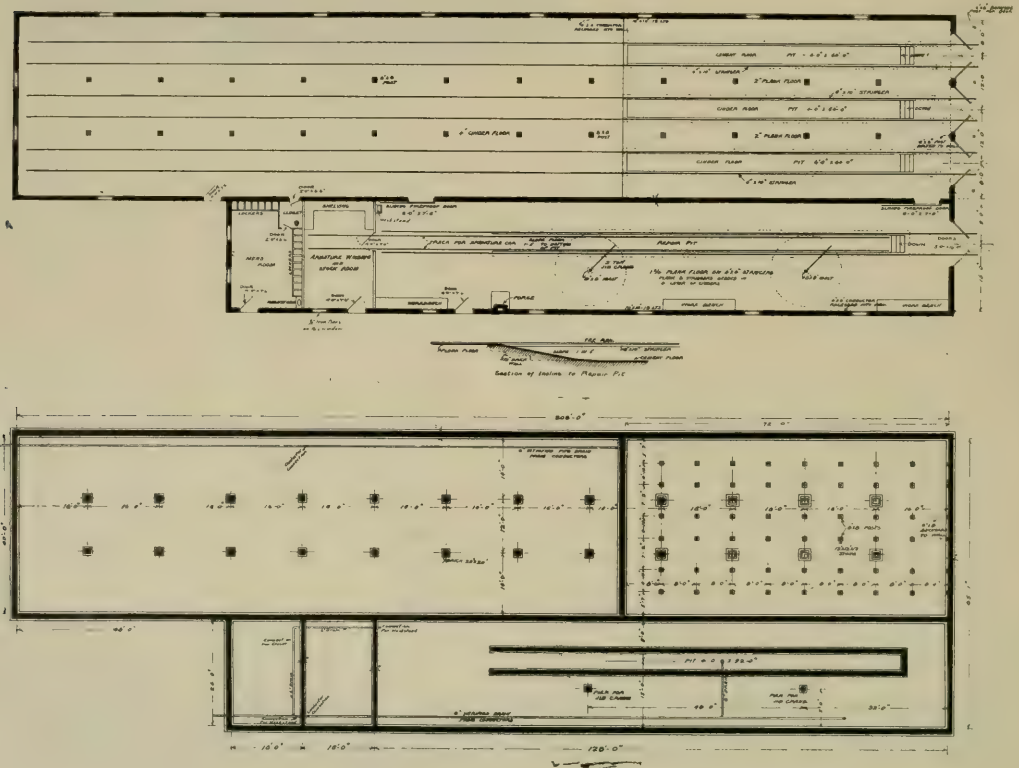
MAP OF FT. WORTH-DALLAS LINES.

name of this company is the Northern Texas Traction Co. and the road is being built by a syndicate of Cleveland capitalists. Special legislation was required to enable roads of this character to be constructed in the state.

The accompanying map of the line shows the route of this railway which runs almost exactly east and west between Ft. Worth and Dallas, passing through the intermediate towns of Handley,

retained in the treasury for future use in extending and improving the property. Its officers are George T. Bishop, president; John Sherwin, first vice-president; George F. McKay, secretary and treasurer, Cleveland; F. M. Haines, second vice-president and general manager; C. A. Taylor, assistant secretary and treasurer, Ft. Worth, Texas.

Besides the interurban line the company also owns the city rail-

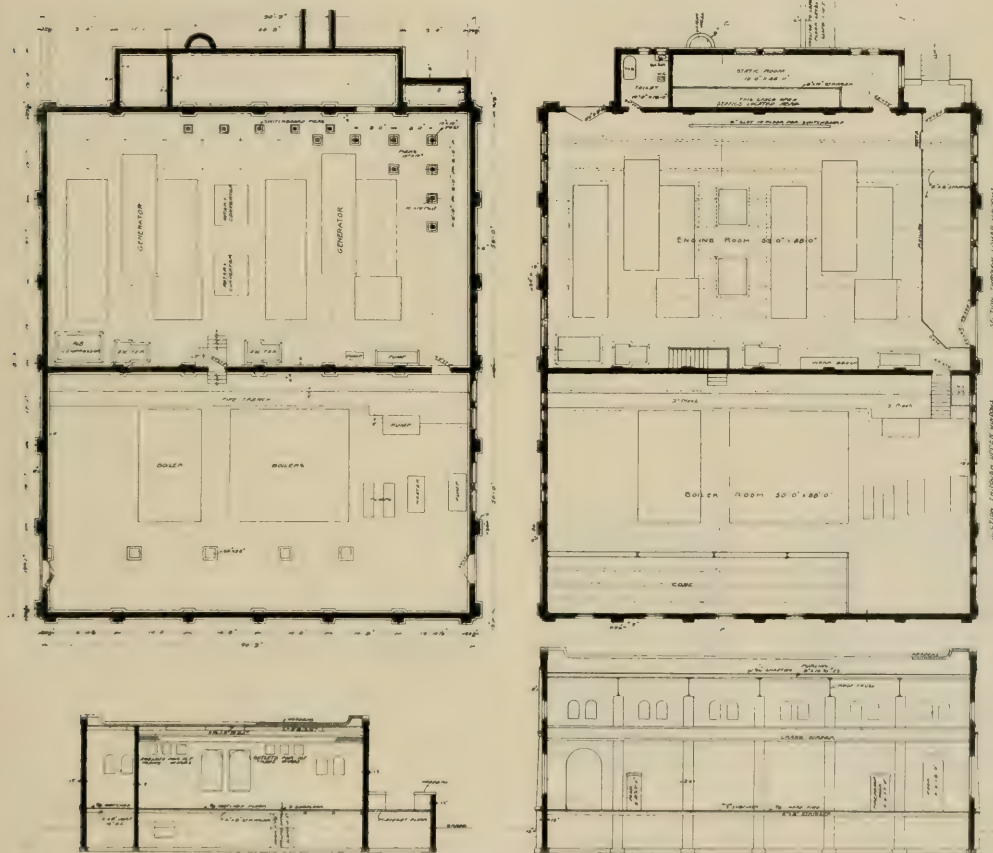


FLOOR AND FOUNDATION PLANS OF CAR BARN.

way systems of Ft. Worth which include about 22 miles of electric lines the franchises for which extend until 1975. The line to Dallas on which work has been commenced will be built on a private right of way with favorable franchises in towns along the route and in Dallas, where it reaches the center of the business district on its own tracks. Heretofore the people of these cities have had no summer resort to visit, but an up-to-date one is being prepared by the company at a lake on the line about ten miles from Ft. Worth, where the power station will also be located. At this point the line passes through what is known as the "Cross Timbers," a tract of woodland 300 miles long and only 1 to 3 miles wide, forming in itself an attractive spot for excursionists in a country where there are 10 months of summer. The power for the road will be

arrangement of the power house and of the car barn which will be adjacent to it. The over all dimensions of the power house are 90x118 ft. and it is divided into three compartments, viz: boiler room, 90x50 ft.; engine room, 90x52 ft.; transformer room, 12x60 ft. The latter is in the nature of an extension to the main building so that the transformers may be entirely isolated. The building will be of brick with steel roof trusses and a composition roof.

The sub-station at Cockerell Summit will contain two 300-kw. rotary converters and that near Ft. Worth two 400-kw. rotaries. The plant will have a capacity for eventually furnishing power to operate the Ft. Worth city lines as well as the interurban. One of each of the sub-station units is sufficient to operate the interurban on an hourly schedule, leaving the other units in reserve.



PLANS AND ELEVATIONS OF POWER HOUSE.

generated as alternating current in the power house, and raised by means of step up transformers to 15,000 volts, and transmitted at this pressure to the two sub-stations, one of which is located near F. Worth, and the other at Cockerell Summit, about six miles from Dallas. The power house equipment will consist of three 300-h. p. Stirling water-tube boilers, arranged for burning coal or oil, two C. & G. Cooper Co. corliss cross-compound condensing engines of 900 h. p. each, running at 100 r. p. m. The electric equipment will be of the Westinghouse type and consist of two 600 kw. three-phase alternators, and two 250 kw. rotary converters in the power house, and the necessary transformers to raise the current to the higher voltage for transmission to the sub-stations.

The illustrations herewith show the plan, elevation and general

There will be a traveling crane in the engine room for handling the heavy machinery. This crane and the steel roof trusses will be furnished by the Browning Engineering Co., of Cleveland. The car house, which is illustrated herewith, which is situated near the power house, has storage room for 12 cars, and a repair and machine shop in addition. This building will be of the same general style as the power house. The portion of the building used for car storage is 208 ft. long and 40 ft. wide, and adjoining this so as to form part of the same building are the repair shops which are 24x162 ft. in area.

The car barn will contain three parallel tracks 12 ft. between centers and each track has a pit just inside the car house door, where the car mechanism will be cleaned and inspected.



The sub-stations are one story brick buildings, 33x37 ft. In addition to these buildings, there is an office building next to the main track at the power house, which will contain a superintendent's office, waiting room, and employees' room, and a large sheltered platform for the benefit of excursionists to the park. There will also be a cottage at the Cockerell Summit sub-station.

The rolling stock will consist of eight passenger cars, equipped with four 50 h. p. Westinghouse motors each; two of the cars will have baggage compartments. One is a regular baggage car and there are three open trail cars. These will be made by the G. C. Kuhlman Car Co. and mounted on McGuire Manufacturing Co. trucks.

The air brakes will use the stored air system, having a compressor in the power house and large storage tanks at a convenient point



ELEVATION OF BOILER, ENGINE AND TRANSFORMER ROOMS.

near the main track, where cars receive a charge of air in their storage tanks at a pressure of about 300 lbs. per sq. in. This pressure is reduced for use in the brake cylinders. This equipment will be furnished by the Christensen Engineering Co., of Milwaukee. The overhead construction is to be furnished and erected by the Electrical Installation Co., of Chicago, and will be of heavy and substantial construction. Three No. 2 wires will carry the high tension current to the Cockerell Summit sub-station, a distance of about 19 miles, and three No. 6 wires will carry the current to the Ft. Worth sub-station, a distance of 5½ miles. One direct current feeder will run the entire length of the line, and will



GEO. T. BISHOP.



GEO. F. MCKAY.

be supplemented by another feeder from Cockerell Summit sub-station toward Dallas. The trolley consists of two No. 000 Figure 8 wires; the feeder and high tension wire will be aluminum, and the trolley wire hard drawn copper. E. P. Roberts & Co., of Cleveland, have charge of the electrical and mechanical engineering and the construction of the buildings.

The track construction and bridges are planned to be very substantial and as the maximum grade is but two per cent, a high rate of speed can be maintained with safety. The civil engineering work is being done under the personal superintendence of the general manager, Mr. Haines, who is also chief civil engineer of the company.

The Twin City Rapid Transit Co., Minneapolis, has declared a dividend of two per cent on its common stock, payable August 15th. This is an increase of one-half of one per cent over the previous semi-annual declaration.

## GLASGOW TRAMWAYS.

Messrs. Robert W. Blackwell & Co., of London, have sent us a copy of the Glasgow Herald, which contains the following extract from the report of Mr. H. F. Parshall, consulting engineer, made to the Glasgow Tramway Committee, June 25th:

The electrical machinery in the sub-stations, and all of the underground cables have given entirely satisfactory results. There have been no electrical difficulties whatsoever. In the power station the boiler-house arrangements are approaching completion. The coal-handling machinery has been tested and found satisfactory. The first economizer has now been put in satisfactory working order, and the second one is well forward. The outside coal-handling machine has been tested and found satisfactory. Generally every-

thing in operation in connection with the boiler house is working well. As regards the engine room, the two Stewart engines, which have been working for some weeks at about half-load, were taken out of work on June 14th and one handed over to the Stewart company for general overhauling, the second engine being held as a stand-by for the working of the auxiliary power plant in case of failure of supply from Dalhousie. This second machine will be turned over to the Stewart company as soon as the first machine is put in working order. What I am asking the Stewart company to do is to make such arrangements as will enable me to use the engines under usual working conditions. As yet we

have been unable to work these engines with the governor, and have had to work them always with a man at the throttle. The little trouble at first experienced from warm pins with the Allis engines has entirely disappeared. No. 1 Allis engine has been carrying the car load for eleven days, and the No. 2 for sixteen days. The average load on an engine for 250 cars amounts to some 1,400 kw. The average output from the station amounts to .93 Board of Trade units per car-mile, which figure will indicate to you that the system generally is working efficiently and well. As regards the Musgrave engines, the first commenced turning round on Monday last. There have been some incipient troubles from heating, but not more than might reasonably be expected in starting a new engine. The engine will be put on artificial load on Saturday first, provided things go on satisfactorily, and it is expected it will be in satisfactory working order for car load in a week from that time. We are pressing the contractors for the cranes to complete their contract. As you know, these contractors have been a cause of serious delay in connection with the execution of the engine contracts. They are now, however, actually at work overhauling one 50-ton crane, and report the 30-ton crane ready for trial. The condenser and auxiliary plant generally are working satisfactorily, and have given no unusual trouble from the beginning.

## EMERGENCY REPAIR STATIONS IN BROOKLYN.

President Greatsinger of the Brooklyn Rapid Transit Co. has approved plans for a number of emergency repair stations to be erected on the company's route in several parts of the borough. One will be located on Flushing Ave. between Nostrand and Marcy Aves.; one at Coney Island, and others in the Eastern District, Ridgewood and South Brooklyn. The plan is calculated to obviate the long delays in effecting repairs on the lines, frequently occasioned by the distance which the repair wagon has to travel to the scene of the accident. The emergency buildings will be uniform in design, constructed of brick, and each equipped with a complement of tools for repair work. Five men will comprise the crew of each station, and will be provided with living rooms on the second floor. A brass sliding pole, such as is used in the stations of the fire department, will be placed in each of the buildings in order that the men may answer an emergency summons with all possible dispatch.

The report recently circulated that the company had ordered 12 automobile repair wagons is without foundation.



# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

## TEST OF OSHKOSH STREET RAILWAY POWER PLANT.

By courtesy of Mr. E. E. Downs, general manager of the Winnebago Traction Co., Oshkosh, Wis., we have received a copy of the report of a power plant and sub-station test of the Oshkosh railway system, submitted as a thesis by Arthur Charles King, Albert Adams Nicolaus and Ray Palmer to the faculty of the University of Wisconsin. From the report we take the following extracts:

The object of this test was to determine the working efficiency of all apparatus, including boilers, engines, generators, rotary converters, etc., of the plant when running under normal working conditions. There was no change made before or during the test to make the conditions different from those occurring in a regular daily (18 hour) run.

This electric railway system, which is owned and operated by the Winnebago Traction Co., consists of a main generating power house with the main car barns attached; a local city street railway system, 17 miles in length and operating 14 cars; a single track interurban line connecting Neenah with Oshkosh, a distance of 14 miles; and a sub-station with car house attached, located on the interurban line, 9½ miles from the main station.

For ordinary traffic on the interurban line during the winter season two double truck cars built by the St. Louis Car Co. ran hourly between the two places, one starting from each end at the beginning of every hour. During the summer months four cars run on the line ordinarily, but for special days six cars run on scheduled time.

The station is located on Lake Winnebago near the entrance of the Fox River.

The boiler room contains three Babcock & Wilcox water tube boilers, each rated at 250 boiler h. p. capacity, having 1930 sq. ft. of grate surface; one jet condenser; two feed water pumps, one being used as an auxiliary; and one home-made feed water heater. This heater consists of a section of 12-in. pipe with caps screwed on each end. A 4-in. pipe from the underside of the discharge pipe from the condenser carries feed water into the heater at the top, and the feed pump draws the hot water from the bottom. The heat is supplied by exhaust steam from the feed and condenser pumps. This steam enters the heater from the top in a pipe which extends to the bottom of the heater and which is perforated to distribute the steam.

The engine room is equipped with two simple condensing Hamilton-Corliss engines, each rated at 440 h. p. The cylinders are 20x42 in. The speed is 90 r. p. m.

Engine No. 1, having a fly wheel of 17 ft. in diameter and 38 in. in width, is belted direct to a 6,600 volt, three-phase, revolving field General Electric alternator of 300 kw. capacity; this generator is excited by a four pole 13 1-2 kw., 125 volt exciter.

The exciter is belt driven from the generator when running and is also used to light the building at night. An Ames engine drives the exciter for lighting purposes when the generator is shut down.

Three 60-kw. oil-cooled transformers with a ratio of transformation from 6,600 volts to 372 volts and one General Electric, four pole, 150-kw. rotary converter were placed on the side of the room.

Engine No. 2, with a fly wheel of 16 ft. in diameter and 26 in. in width, is belted in tandem to two 225-kw. General Electric direct current generators.

The switchboard is located in the center at the head end of the room and consists of eight panels; four panels of polished slate are used for the switching and indicating apparatus of the two direct current machine circuits, two being feeder panels and two generator panels; three panels (gray marble) are for the three-phase circuits, one for the alternating generator, one for the transmission

line and one for the high voltage circuits between alternator and transformers in the main station; and the eighth panel (gray marble) contains the indicating and switching apparatus for the direct current side of the rotary converter.

The switchboard at the sub-station is made up of two panels (gray marble), one for the high voltage transmission line and the other for the direct current side of the rotary converter. All switchboard panels are of the General Electric type.

The arrangement of alternating and direct current machinery in the main station permits of four different systems of furnishing power.

First: The engine driving the alternator is allowed to remain idle and the alternating machinery is entirely cut out. The entire system (city and interurban) is then operated by the two direct current generators driven by engine No. 2.

The three-phase wires and a 300,000 c. m. feeder are used as direct current feeders for the interurban system. Two cars have been operated on the interurban line and run on schedule time by this system, but the voltage is necessarily uneconomically low on the Neenah end of the interurban line.

Second: Engine No. 1 and the alternator remain idle, while the main station rotary converter is operated from the two direct current generators, generating at 372 volts (alternating) which is raised by the transformers to 6,600 volts and transmitted to the sub-station, where it is transformed and converted to 550 volts direct current by the sub-station rotary converter.

Third: The direct current generators are shut down and both lines are operated by the rotaries.

Fourth: Both engines and all generators are run, using direct currents for the city, and alternating for the interurban line.

The first system of operation is not economical on account of the loss of power on interurban service through low voltage, and the third system throws too much load on the rotary in the main station for regular operation. These systems are, therefore, used only in case of emergency.

The second system may be used for light loads, as it requires the running of but one engine (under nearly full load) and gives great economy, while maintaining a fairly uniform pressure, throughout. If there be, however, considerable inductance in the circuit (which is especially the case when the sub-station is run under light loads) there will be a considerable magnetic reaction in the armature of the station rotary. This armature reaction (caused by a lagging current) tends to weaken the field of the station rotary and so causes it to speed up. The effect is to increase the speed in the substation rotary also, since the two machines run in synchronism. The general tendency would be to cause considerable fluctuation in the direct current pressure at the sub-station. This may be regulated by exciting the fields of the station rotary by means of an exciter directly driven from the rotary. Any increase in speed means a corresponding increase in field strength, and, therefore, a tendency to reduce the speed.

This station test was made under the conditions of the fourth system of operation, all engines and generators running, giving the full power of the station when necessary.

The alternator supplies power for the interurban trolley line which consists of a pair of No. 000 wires. These trolley wires are fed from two points. The power passes from the alternator through two sets of three converters. One set of transformers and one rotary are installed in the sub-station and the other at the main station. From the direct current side of the rotary in the main station, the direct current leads are connected in parallel with the main station direct current generator bus bars, and from these a feeder of 300,000 c. m. cross section runs to the city limits and taps into the interurban line.

Three other feeding point is near the sub-station. The power is transmitted to the sub-station under the alternator pressure of 6,600 volts by three No. 6 copper wires, which are located on a cross arm placed just above the trolley wire arm and is fed into the trolley wire by means of a 300,000 c. m. feeder after passing through the transformers and rotary converter in the sub-station.

The labor necessary to run the main station for 24 hours consists of one head engineer, two assistant engineers and two firemen. One assistant engineer and one fireman were on duty at any one time.

The sub-station was operated by one man. Living rooms were fixed up within the sub-station so that the attendant, with his family, might live there. All the additional labor necessary to carry on the test was entirely independent of the station employees and consisted of student and other interested observers.

Every necessary precaution was used to obtain the best of results. All indicating and integrating instruments were calibrated and the data obtained were corrected accordingly.

The alternating current instruments were calibrated at a frequency of 25 cycles.

The following program was followed at the main station during the 18 hour test run which was started on Friday morning, Dec. 28, 1900. The fires in the three boilers had been banked as usual for about five hours previous to the starting of the test.

The boiler test began at 5 a. m., when the fires were drawn and the height of the water in the gages noted. Throughout the run the three boilers supplied steam to the single header at an average pressure of 128 lbs.

Pocahontas coal was used, which cost \$4.35 per ton, delivered at the power house. All coal used during the test was weighed on scales placed in front of the boilers.

At 5:30 a. m., engine No. 2 driving the direct current generators was started and ran until 11:05 p. m. without a shut down. Engine No. 1 was started at 6:05 a. m. and ran until 12:10 p. m. with a shut down from 7:35 a. m. to 8 a. m., caused by the breaking of a bolt which held one of the crank pin brasses.

The rotary converter at the sub-station was started at 6:20 a. m., and ran until 11:20 p. m., being thrown out from 7:35 a. m. to 8:00 a. m., when engine No. 1 was shut down.

Indicator cards and the electrical readings were taken every five minutes throughout the test.

The general results of the test were as follows:

#### BOILERS.

Steam pressure by gage, 127.8 lb.  
Draft in stack, 4.11 in. water.  
Temperature of feed water entering heat, 88 deg.  
Temperature of feed water entering boilers, 135.5 deg.  
Dry coal per hour, 1,096 lb.  
Caloric value of fuel by oxygen calorimeter, 14,390 B. t. u.  
Moisture in steam, 1.94 per cent.  
Water evaporated (corrected for moisture) per hour, 9,495 lb.  
Equivalent evaporation from and at 212 deg. per hour, 10,690 lb.  
Water from and at 212 deg. per pound of dry coal, 9.75 lb.  
Cost of fuel per 1,000 lb. water from and at 212 deg., \$2.25.

#### PUMPS.

Steam used by feed pump per hour, 335 lb.  
Steam used by condenser pump per hour, 690 lb.

#### ENGINES.

Average vacuum, 18.4 in.  
No. 1: Average i. h. p., 183.0; average e. h. p., 151.6.  
Maximum i. h. p., 383.3; maximum e. h. p., 314.0.  
Friction load (including excitation), 29.4 h. p.  
No. 2: Average i. h. p., 207.0; average e. h. p., 189.0.  
Maximum i. h. p., 307.7; maximum e. h. p., 262.7.  
Friction load (including excitation and exceter), 39.2 h. p.

#### ROTARY CONVERTERS.

Main station: Average output, 50.6 kw.  
Maximum output, 75.4 kw.  
Sub-station: Average output, 58.8 kw.  
Maximum output, 119.1 kw.

#### TRANSMISSION LINE.

Average line current, 8 amperes.  
Average CR loss, 3.8 kw.

#### GENERAL RESULTS.

Total watt-hours delivered to switchboard, 4,455,000.  
Total watt-hours delivered to feeders, 3,910,000.  
Dry steam charged to engines per i. h. p. per hour, 24.8 lb.  
Dry steam charged to plant i. h. p. per hour, 25.8 lb.  
Water charged to engines per i. h. p. per hour, 25.55 lb.  
Water charged to plant per i. h. p. per hour, 26.50 lb.  
Coal per i. h. p. per hour, 3.02 lb.  
Watt-hours per pound of coal, 215.8 lb.  
Watt-hours per pound of water, 24.6 lb.  
Kilowatts per dollar's worth of coal, 99.04 lb.  
Cost of fuel per kilowatt hour, \$.01009.

#### SUMMARY OF B. T. U.

B. T. U.	Per cent. of Coal Energy.
B. t. u. in 1 lb. dry fuel.....	10,950,000
Total B. t. u. in fuel consumed .....	294,950
Brought to boiler in feed water .....	18,741,000
Utilized by the boilers .....	193,770,000
Lost in chimney, cinders and radiation .....	101,108,000
Delivered to feed pump .....	6,230,000
Delivered to tank pump .....	1,095,000
Lost in radiation (boiler to engine) .....	1,450,000
Delivered to engines and condenser .....	203,680,000
Delivered to exhaust .....	185,420,000
Converted into work, engine No. 1 .....	9,789,000
Converted into work, engine No. 2 .....	8,475,000
Consumed by engine and generator losses, engine No. 1 .....	1,487,000
Consumed by engine and generator losses, engine No. 2 .....	1,067,000
Delivered to switchboard by alternator .....	8,302,000
Delivered by d. c. machines .....	6,485,000
Delivered by rotary converters .....	6,485,000
Total delivered to feeders .....	13,293,000

#### OIL AS FUEL.

The recent large yield of the Texas and California oil fields has called attention to the relative merits of oil as compared with coal as fuel, and some interesting data on this subject have been furnished in regard to oil-burning locomotives by Mr. Howard Stillman, mechanical engineer of tests of the Southern Pacific Railroad. This road has used oil for fuel on locomotives for several years and is rapidly extending this service. Tests of two locomotives under exactly the same conditions on a 224-mile run show that 168.9 gallons of oil are equal to one ton of coal with respect to the amount of water evaporated from and at 212 degrees. These tests were made with California oil, with which there is more trouble experienced than with coal on account of leaky flues, seams, etc. This is due to the more rapid changes of temperature in the fire-box with oil fuel and is more noticeable in the case of locomotive than with other boilers on account of the irregular service, shutting off steam, stopping and starting.

There is some difference between the California and the Texas product. The former oil contains more or less water of a salty or alkali nature, the effect of the alkali being to flux and melt out the fire brick to such an extent that removals are quite an item. The Texas oil is free from alkali, and it has been observed that no destructive element is present to destroy the fire-brick.

The Texas oils are the more fluid and flow easily in pipes and burners. It is useful chiefly as fuel and has but little value for refining purposes, but the enormous quantities in which it flows should make it a cheap source of fuel for steam production. California oil generally has to be pumped from wells 800 to 1,200 ft. in depth and a 50-barrel per day well is counted a good one. There are four wells in Texas which yield 100 times this amount under pressure from below.

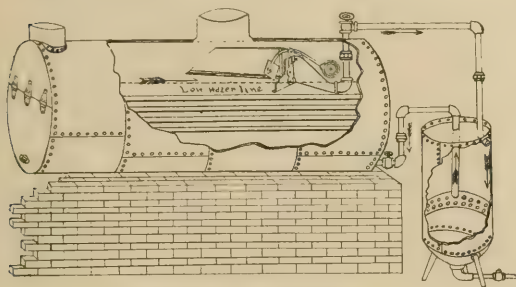
A through service between Minneapolis and Stillwater was inaugurated successfully July 14th. The traffic from Minneapolis has been very heavy and more cars will be added by the company to accommodate the increasing number of patrons of the line.



# MECHANICAL BOILER CLEANER.

Those of our readers who are having difficulty with bad boiler waters will undoubtedly be interested in the following description of a purely mechanical method of removing impurities, which has been used with marked success. This device is known as the "Peerless" mechanical boiler cleaner and is made by the Peerless Mechanical Boiler Cleaner Co., of Kansas City; the construction will be apparent by reference to the illustration.

As is well known ebullition in the boiler produces a seething or surging of the water that carries all impurities such as mud, salts



PEERLESS BOILER CLEANER.

precipitated by heat, sludge, or other solid and foul matter to the surface. If this foreign matter is not removed from the boiler it settles and is deposited upon the tubes or shell forming scale.

The object of the mechanical cleaner is to remove the impurities while in the scum on the surface of the water. A skimmer is mounted within the boiler so as to be always on the scum line, and carry off the scum without passing an unnecessary quantity of water through the precipitator. The skimmer is set above the flues and preferably at the extreme back end of the boiler with the opening facing to the front of the boiler so as to receive the scum as it flows with the water toward the back head. In order to gather all of the scum and not allow any of it to flow past the skimmer a pair of metal adjustable wings or guides of the proper width, about 9 in., to always extend above and below the water line are hung at one end perpendicularly on suitable hangers, one on each side of the opening to the scum receiver, the other end extending to the boiler shell forming a V-shaped guide. At the back of the receiver is an opening connected with the outlet pipe which conducts the scum to the precipitating chamber which is outside of the boiler. The scum receiver is stationary and of the proper height (about 6 in.) to always extend above and below the water line in the boiler; an adjustable gate one-half this height and the same width as the receiver is attached to one end of a curved rod on the other end of which is a float, the rod being mounted on a pivot on top of the scum receiver.

When the scum line in the boiler rises slightly above the center of the scum receiver the float rises with it, causing the gate to close tightly over the lower half of the inlet or opening of the scum receiver and shut out the water below the scum line. The stratum of water containing the scum continues to pass into the receiver over the top of the gate; as the scum line recedes the float lowers with the receding water, throwing open the gate again.

The scale forming matter is thus carried to the settling chamber

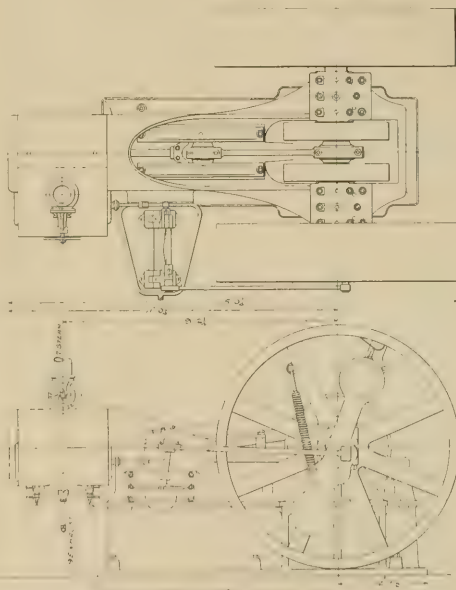
by the stratum of water which enters the skimmer. The circulation is entirely natural.

The "Peerless" boiler cleaners have been installed by a large number of power plants; among the street railway companies using them are the Sioux City (Ia.) Traction Co., the Omaha & Council Bluffs Railway & Bridge Co., the Des Moines City Railway Co., the St. Joseph Light, Heat & Power Co., and the Southwest Missouri Electric Ry. The Sioux City Traction Co. has them on all of its boilers, both tubular and water-tube and recommends them very highly. The Omaha & Council Bluffs road has Babcock & Wilcox boilers, the Southwest Missouri, Cahall boilers, and the Des Moines City Ry. has tubular boilers.

# PHENIX IRON WORKS AT PAN-AMERICAN.

The Phoenix Iron Works Co., of Meadville, Pa., is exhibiting at the Pan-American Exposition one of its latest designs of the Dick & Church automatic cut-off engine, of which it is the maker. This engine has a cylinder 20½x18 in. and runs at 210 r. p. m.; with steam at 120 lb. initial pressure and cutting off at one-fourth stroke the engine develops 400 h. p. The governor wheel is 84x23 in. and is equipped with the Rites inertia governor; the belt wheel is 84x30½ in. The main bearings are 9¼x8½ in. and the crank pin 9¼x9¼ in. The crank shaft is a solid, open-hearth steel forging and the connecting rod, cross-head pin and piston rod are also of open hearth steel. The cross-head is a steel casting and works in locomotive guides.

The engine has a piston valve of the double head type, which



PHENIX IRON WORKS ENGINE AT PAN-AMERICAN.

has double the wearing surface usually provided with this type of valve. Great care has been taken to reduce the clearances to a minimum.

A cast iron sub-base of sufficient height to bring the wheels clear of the engine room floor is provided.

The Metropolitan West Side Elevated which has for several months been operating during rush hours extra "shuttle" trains on its Garfield Park branch which do not run around the loop but stop at Canal St., west of the river, is erecting additional tracks at the Canal St. station and will extend the shuttle service to the southern branches of the road.

### PORTABLE SUB-STATION.

The accompanying engraving shows an exterior view of the portable sub-station car recently completed for the Union Traction Co. of Indiana. This station is intended for use in case of an emergency arising from an accident to one of the sub-station rotary converters, or for temporarily increasing the capacity of any station. In connection with the article describing the power generating and distributing system of this company in our April issue,



PORTABLE SUB-STATION CAR.

the drawings of this car were published, page 212. The general dimensions are: Length, 21 ft. 6 in.; width, 8 ft. 8 in.; height of peak of roof above the rail, 10 ft. 6 in. The equipment includes one 250-kw. rotary converter, three 8 $\frac{1}{2}$ -kw. static transformers and high and low tension switchboards. The estimated weight of the rotary and static transformers is 26,100 lb. The sub-stations are all provided with tracks so that the car can be run into the building, and connected to the batteries, line and feeder.

The car was built by the St. Louis Car Co.

### FRANCHISE TAX IN TOLEDO.

In these days when so-called reformers and alleged patriots consider their duty to attack street railways in every way possible, it is a relief to find a city official so fair and clear-minded as Mr. W. Brailey, city solicitor, of Toledo, O. Mayor Sam. Jones of that city desiring to emulate the example of Mayor Johnson, of Cleveland, who had forced the Board of Equalization of that city to raise the appraisement of the Cleveland Electric Railway Co. and of the Cleveland City Railway Co. to nearly ten times what they had ever been before induced the Board of Equalization at Toledo to summon the Traction company of that city before it. Having done so Mayor Jones called upon Mayor Johnson to aid him, but the latter pleaded business engagements and sent his expert, Professor Bemis.

The Board of Equalization in Toledo, however, was not so susceptible to the influence of the mayor as was the Cleveland board, and first submitted the question of the right to tax a street railway franchise to the city solicitor.

Mr. Brailey's reply, dated Aug. 3, 1901, to the inquiries is here given in full.

"I have the honor to submit to your board the answers to the following questions:

"1.—Has the Board of Equalization the power to tax a street railway franchise?

"2.—In determining the true value of property of a street railway corporation for the purpose of taxation, can the franchise and good will of a corporation be considered for the purpose of arriving at its true value in money?

"My answer to your first question is in the negative, Section of article 2, section 2 of article 12, and section 4 of article 13 of the constitution of Ohio, are the foundation for all Ohio laws pertaining to taxation so far as street railways are concerned. The constitution of Ohio does not empower the Legislature to pass any laws taxing street railway franchises. The Supreme Court of Ohio in

construing our constitution in an analogous case as early as 1853, held, 'that a corporate franchise was a mere privilege or grant of authority by the government and is not property of any description and consequently not subject to taxation.'

"In 1876 the Supreme Court had before it section 2 of article 12 of the constitution, which defines what property may be taxed and at that time, held, 'that the privilege of exercising corporate powers was not property within the meaning of this section.'

"Dec. 19, 1899, the Supreme Court of Ohio again held, 'that intangible property could not be assessed for taxation.'

"The decisions of our Supreme Court holding that a franchise is not taxable have never been overruled or modified in this state, and is therefore the law of Ohio, so that your honorable board must assess all the tangible property of street railway companies according to its true value and money.

"As to your second question it is my opinion that for the purpose of taxation, the good will of a street car company (if any such it has, which is doubted), and the franchise of the same, that is, the naked right to operate, can not be taken into consideration in arriving at the true value in money of the tangible property (as neither is taxable in itself) to any greater extent than to ascertain any enhancement in the value of the tangible property by reason of its use with the franchise or right to operate, See 61 Ohio State Statutes, 352.

"To determine the value or enhancement in value of property of the Toledo Traction Co., you are not limited by law in the interrogation of the officers of the company, and every avenue which leads to information bearing on that question is open to you; you have the power to administer oaths, compel answers to vital questions as for instance, the number of cars, the miles of trackage, all property of every description connected with the entire system, all moneys, credits, investments in bonds, stocks or otherwise, the income produced by the property, net earnings, etc.

"Respectfully,

"W. R. BRAILEY,

"City Solicitor."

The Board of Equalization having considered the opinion of Mr. Brailey, disposed of the matter by passing the following resolution.

"Resolved, That inasmuch as the Toledo Traction Co., at the request of certain citizens, has been cited to appear before this board at the eleventh hour of its session, and the claim made that this company was not paying on a fair valuation of its property in this city, the board, having heard all the evidence and argument submitted by both sides and taken advice from the city solicitor as to its rights in the matter, does hereby determine to accept said company's returns for the following reasons:

"1.—Said company's return on its tangible property compares favorably with the returns made by other corporations, companies and individuals, and no evidence has been submitted to this board to justify any increase of the company's valuation of tangible property.

"2.—The city solicitor, who, as the people's legal representative is our legal adviser, informs us that we can not tax intangible values such as franchises, good-will, etc., and the question involved is now before the courts of Cuyahoga County for judicial determination, and it is therefore unnecessary for this board to involve this county in an expensive law suit to determine the same points of law.

"3.—The system of taxation in force in Lucas County does not give this board the time and opportunity to make such complete investigation of public service corporations as is necessary to fairly and justly equalize the burdens of taxation and treat all corporations and individuals alike."

### ELECTRIC TRACTION IN THE ADIRONDACKS.

A project for the construction of an electric railway in the Adirondacks, for the purpose of developing Long Lake as a summer resort, is credited to Paul Smith and Wallace Murray, of Gloversville, who control water powers in the district through which the road will run. The route proposed is from North Creek through Minerva and Newcomb to Long Lake in Hamilton County, N. Y., and will afford access to a number of private and club preserves. At Long Lake there are five hotels, which are now accessible only by an 18-mile drive from the railroad terminus.

## ENTERTAINMENTS AT THE A. S. R. A. CONVENTION.

The New York local entertainment committee of the American Street Railway Association held a meeting on Thursday evening, August 8th, at which a general discussion took place as to the best ways and means of entertaining the delegates and visitors to the coming convention in the fall. The meeting was held at the Cafe Martin and was preceded by an elaborate banquet tendered the committee by Mr. H. A. Robinson of the Metropolitan Street Railway Co.

It was decided early in the evening that the meeting should take the form of a discussion only, all suggestions to be referred to a sub-committee for decisive action. The chairman, Mr. Robinson, named Messrs. Sanderson, McGraw, Meneely, Cooke and Martin as members of the sub-committee and then called for suggestions from all present as to the forms of amusements, trips, etc., that would probably prove of greatest interest and pleasure. The discussion soon developed that it was the sense of those present that New York in itself offered so large a variety of amusement and entertainments as to make a set program of excursions out of the question. It was practically decided, therefore, to limit the pre-arranged amusement features to one or two trips for the ladies, including an automobile ride, and possibly a trolley trip through Brooklyn to Coney Island for both ladies and gentlemen. It is also probable that a musical concert and reception for the first morning will be arranged for the visiting ladies.

The members of the entertainment committee present included the following: Messrs. Vreeland, Robinson, Reed, of the Metropolitan Street Railway Co.; Mr. Cooke, president of the Compressed Air Co.; Maj. Evans, of the Lorain Steel Co.; Mr. Barr, of the Weber Railway Joint Manufacturing Co.; Mr. Webster, of Babcock & Wilcox Manufacturing Co.; Mr. H. M. Littell; Mr. Sanderson, president of the Cleveland Vehicle Co.; Mr. T. C. Penington, secretary of the A. S. R. A.; Mr. Meneely, representing Mr. Greatsinger of the Brooklyn Rapid Transit Co.; Messrs. McGraw, Wakeman and Martin of the McGraw Publishing Co.; and C. B. Fairchild, jr., eastern editor of the "Street Railway Review."

## NEW YORK STATE ASSOCIATION.

The next annual meeting of this association will be held at Rochester, September 10th and 11th. The full program has not been arranged but several papers will be read upon subjects of general interest, including "The Legal Side of the Paving Question," "The Rights of Street Railways in the Courts," and other matters of interest to the operating men. The usual banquet will probably be held at Powers' Hotel which will be the convention headquarters. Mr. T. J. Nicholl, general manager of the Rochester Ry. is leaving no stone unturned to make the convention a most pleasant as well as an instructive and valuable meeting, and it is believed that with the Pan-American Exposition as a kind of side attraction the Rochester convention will be a record-breaker in the history of the New York convention.

## ILLINOIS STATE ELECTRIC ASSOCIATION.

It is announced that the annual meeting of the Illinois State Electrical Association will be held at Rock Island September 24th and 25th instead of November 27th, as at first decided. An interesting program has been arranged and it is hoped to have a large attendance.

The secretary of the association is Mr. H. E. Chubbuck, manager of the Quincy Horse Railway & Carrying Co.

## NEW MICHIGAN RESORT.

The Michigan Traction Co. of Kalamazoo is developing plans for an attractive resort at Gull Lake, near that city, which may be opened to the public early next summer. The Railways Company General, of Philadelphia, which controls the Michigan Traction Co., is reported to have secured options on desirable property at Gull Lake for the purpose. A dancing pavilion, summer theater, and restaurant are among the projected improvements. A bath house and bathing chute may also be erected.

## CONVENTION EXHIBITS.

Under date of July 25th the Committee on Exhibits of the American Street Railway Association, advised intending exhibitors of the allotment of floor space at Madison Square Garden. It was stated that owing to the great demand for space the committee found it necessary to reduce the space of applicants desiring more than 100 sq. ft. by 20 per cent; no reduction was made in cases where 100 sq. ft. or less was wanted.

The allotment as shown in the accompanying diagram is final and not subject to revision. Payment for space at the rate of 10 cents per sq. ft. should be made to Mr. T. C. Penington, Treasurer A. S. R. A., 2020 State St., Chicago, on or before October 1st, as the committee reserves the right to cancel allotments not paid for by that date.

The committee has appointed Mr. Marcus Nathan superintendent of exhibits, and all future communications should be addressed to him at Grand Central Palace, Lexington Ave., New York.

August 7th Mr. Nathan sent the following letter to exhibitors:

"The number and variety of exhibits, the complexity of the work, and the very limited time in which it must be done has heretofore led to delays, to disappointments, to excessive charges.

"Under direction of the Exhibit Committee, I have received propositions from reliable concerns who have had considerable experience in this line and who have ample facilities to execute promptly all orders in their various branches of work that may be required at this Exhibition.

"You will find herein propositions covering signs, railings, trucking and platforms, stained or covered, but it is impossible to quote cost price on furniture, on decorating, or on construction work.

"The needs of exhibitors will vary. The important thing is to write me your wishes now, so that I can let you know the cost in time to have all orders placed by September 1st, thus insuring punctuality as well as economy."

The scale of prices is:

### Signs.

Two feet high of oilcloth, stretched on wooden frames, neatly backed with denim, brown flock ground with gilt letters, lettering not to exceed two full lines; signs delivered at exhibitor's space:

Not exceeding 10 ft. in length	\$ 5.85
Over 10 ft. and not exceeding 15 ft. in length	7.90
Over 15 ft. and not exceeding 20 ft. in length	11.70
Over 20 ft. and not exceeding 30 ft. in length	15.00
Over 30 ft. in length, at 50 cents per lineal foot.	

Band moldings on signs (if required) at the rate of 5 cents per running foot, extra.

### Railings.

Iron pipe railing neatly bronzed, to enclose space, or for supporting signs, at a cost not to exceed 20 cents per running foot of railing, (counting railing and uprights) erected and removed at close of exhibition. Materials to remain property of contractor.

### Platforms.

Wooden platforms 7/8-in. pine, 5 in. high, with under supports spaced from 10 to 18 in. centers, at 8 cents per sq. ft. Material to remain property of contractor.

Staining platforms (two coats with varnish) at a cost not to exceed 2 cents per sq. ft., according to size of space.

Covering platforms with denim at a cost not to exceed 5 cents per sq. ft., according to size of space.

### Trucking Exhibits.

Trucking exhibits 7 1/2 cents per 100 lb., delivered to exhibitors' spaces. Erecting heavy exhibits where rigging is required, to be charged for extra. Estimates furnished.

### Rules and Regulations Governing Exhibition

1. The Exhibition will open Oct. 9, 1901.

The building will be open for the reception of exhibits, commencing Oct. 5, 1901. They should be consigned to the exhibitors to whom they belong, care of Madison Square Garden, New York, freight prepaid. Under no circumstances will exhibits be received on which there are charges of any kind.

All apparatus or material for exhibits should be shipped so as to arrive in New York not later than Saturday, October 5th.

2. Exhibitors should give notification in writing before September 1st, of such corrections as are desired in their spaces, in the



nature of electric lights or power, all such connections to be made at the exhibitor's expense.

The building will be well lighted, but any exhibitor so arranging his exhibit as to shut off the light, must provide interior lighting at his own expense.

Current for special lighting or power will be furnished at the lowest market prices.

3. All electrical construction must be done in strict accordance with the rules of the New York Board of Fire Underwriters and Municipal Departments, covering such work, and certificates for same must be secured prior to the opening of the exhibition.

4. The floor of the exhibition building is constructed so as to support fairly heavy weights, but in order to insure the safety of apparatus exhibited and to prevent any damage to the floor, exhibitors should submit to the Director of Exhibits by September 1st, a floor plan diagram showing proposed arrangement of their exhibits, and in the case of heavy apparatus description of the article to be exhibited with their weights. The director can then, at small expense to the exhibitor, arrange with the official carpenter

Signs, banners, etc., containing advertisements thereon, will not be allowed, except upon space of exhibitors to whom they belong, and no exhibitor will be permitted to display advertising signs or decorations beyond the line of his exhibit.

Signs shall not exceed 2 ft. in height.

Signs of oil cloth with brown flock ground and gilt letters are recommended.

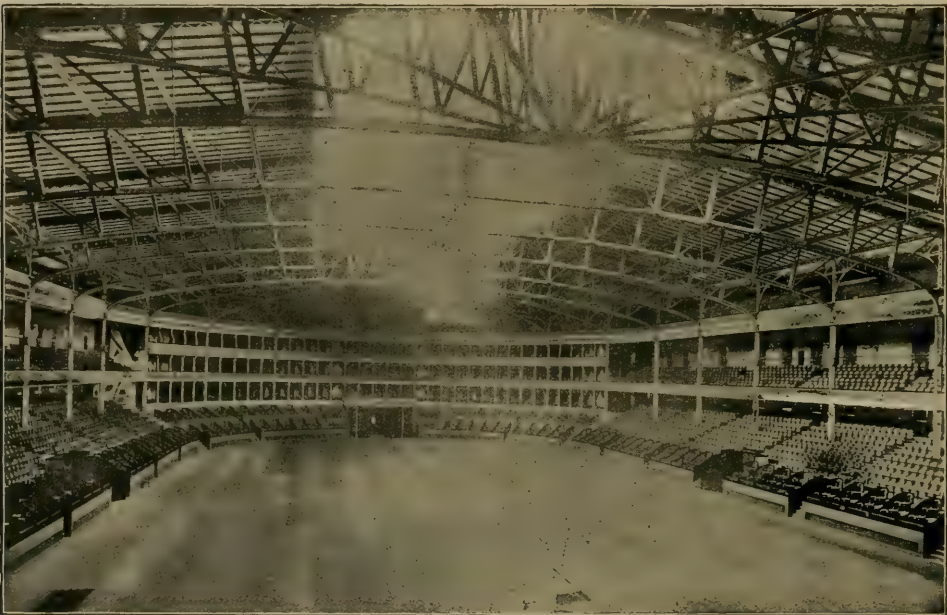
Lower edge of signs in sections A, B, C, D, E, F, G, N, T, U, V, W, X, and Y, shall be 10 ft. from floor line of the building.

Signs in sections G, H, I, J, K, L, M, M<sub>3</sub>, shall be placed on the back line of the exhibitor's space, so that the top of the sign shall not extend over 12 in. above the floor line of the balcony.

Signs in sections O, P, R, and S, shall be fastened to the front of the balcony overhead.

In sections A, B, C, D, E, and F, where signs placed at this height might interfere with view of exhibit, the sign may be so placed that lower edge shall be 16 ft. from floor line of the building.

7. Exhibitors may distribute catalogs, price lists, souvenirs, etc., only from their respectively allotted space.



AMPHITHEATER, MADISON SQUARE GARDEN.

of the exhibition building to construct extra supports under that part of the floor where heavy apparatus is to be placed, thereby placing responsibility upon the owners of the building for any possible damage to the floor.

5. Height of platform shall not exceed 5 in. unless by special permission.

Decorations, booths, or other structures, shall be so arranged as not to exclude the light from adjoining exhibits, and in every instance the sides of these decorations, booths, or structures, facing an adjoining exhibit shall be neatly finished so as not to present a bare or ugly appearance in the adjoining exhibitor's space.

In sections A, B, C, D, E, F, H, H<sub>3</sub>, I, J, K, L, M, M<sub>3</sub>, W, X, and Y, decorations, booths, or structures, shall not exceed 10 ft. in height. The committee would suggest however that no booths or structure be erected in these sections.

6. It has been considered advisable to adopt rules to govern the size, appearance, and location of signs, so as to bring the signs into some sort of uniformity and prevent one exhibitor's sign from interfering or shutting out the view of signs in the adjoining exhibits.

8. No nails, tacks, or screws, shall be placed or driven into the floor or walls, and all decorating or signs must be put up without defacing the building. Exhibitors will be held responsible for any damage to the floor, walls, or other parts of the building, caused by the act or negligence of the exhibitor or his agents.

#### ASSIGNMENT OF EXHIBIT SPACE.

1. Street Railway Review.
2. Rochester Car Wheel Works.
3. Baltimore Car Wheel Works.
4. New York Car Wheel Works.
5. United States Steel Co.
6. Harold P. Brown.
7. Weber Rail Joint Manufacturing Co.
8. Continuous Rail Joint Co. of America.
9. Crocker-Wheeler Co.
10. Peckham Manufacturing Co.
11. Taunton Locomotive Manufacturing Co.
12. General Electric Co.

Diagram of Madison Square Garden, New York City.

Streets shown: Madison Avenue, 4th Avenue, 27th Street.

Key areas and sections labeled:

- Office
- Main Entrance
- Providence Court - 317 North 1st Street
- Sections: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
- Entrances: Entrance I, Entrance II, Entrance III.
- Other labels: 4th Avenue, 27th Street, Madison Avenue, Madison Square Garden, Madison Square Garden, Madison Square Garden.

13. Westinghouse Electric & Manufacturing Co.
14. Street Railway Journal.
15. Knoll Air Brake Co.
16. Christensen Engineering Co.
17. Pennsylvania Steel Co.
18. Taylor Electric Truck Co.
19. Wm. Wharton, Jr., & Co.
20. Lorain Steel Co.
21. G. P. Morgan Air Brake Co.
22. Trammey and Railway World.
23. J. R. McCordell & Co.
24. Pittsburgh Reduction Co.
25. Generalized Engineering Co.
26. Pentasteele Co., Curtiss Supply Co., Adams & Westlake.
27. Heywood Bros. & Wakefield Co.
28. American Italian & Reed Manufacturing Co.
29. American Railway Supply Co.
30. McLaughlin Car Company Co.
31. W. T. Van Dusen Co.
32. Morris Electric Co.
33. H. W. Johns Manufacturing Co.
34. American Vitified Conditit Co.
35. H. B. Camp Co.
36. Consolidated Car Tender Co.
37. Cold Street Car Heating Co.
38. Bay State Electric Heat & Light Co.
39. Consolidated Car Heating Co.
40. Electrical Review.
41. St. Louis Car Co.
42. Standard Tint Co.
43. Bishop Paint Porch Co.
44. Standard Varnish Works.
45. Ohio Brass Co.
46. National Lead Co.
47. Burroughs & Dugan Railway Appliance Co.
48. Atlas Railway Supply Co.
49. Carter-Daniels Co.
50. Allen & J. M. Anderson.
51. R. D. Nuttall
52. Frank Ridlon Co.
53. Mayer & Enghelund Co.
54. Brooklyn Heights Railway Co.
55. J. G. Brill Co.
56. St. Louis Register Co.
57. New Haven Car Register Co.
58. International Register Co.
59. Sterling-Melker Co.
60. Fowler & Roberts Manufacturing Co.
61. Olmer Car Register Co.
62. Diamond State Steel Co.
63. Badger Electric Heating & Power Co.
64. Paces Iron Works.
65. American Brake Shoe Co.
66. Allison Foundry Co.
67. Wheel Trimming Brake Shoe Co.
68. Kinsman Manufacturing Co.
69. Pearson Jack Co.
70. Baker-Avener Co.
71. Herman Pfeiffer Co.
72. National Lock Washer Co.
73. F. H. Newcomb.
74. G. F. Brandau.
75. American Reaming Railway Co.
76. Van Dusen & Bacon Co.
77. United States Prospector Co.
78. Kellogg Manufacturing Co.
79. F. H. Lovell & Co.
80. Frady Brass Co.
81. Columbia Machine Works
82. Crane Co.
83. Dearborn Drug & Chemical Works.
84. Francis Granger.
85. DeWitt Sand Box Co.
86. National Carbon Co.
87. Western Electric Supply Co.
88. Parralake Carlson Works.

## NEW WELDED RAIL JOINT.

The Heil Rail Joint Welding Co., of Milwaukee, was organized in May last to engage in the business of cast-welding rail joints and manufacturing the welding apparatus. The company has the

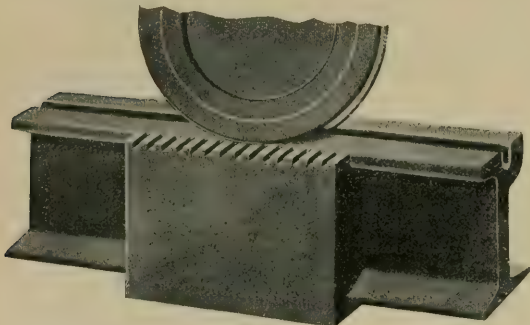
best of financial backing and in view of wide field open to it we predict an unqualified success. The officers are: President, Charles Abresch; vice-president, R. J. O'Hara; secretary and treasurer, L. Wieland; second vice-president and general manager, J. P. Heil.

Mr. Heil was formerly with the Falk Co. and has been in the business of welding rail joints for the past eight years, stating that he made the first cast-welded joints for the Citizens Street R. R. of St. Louis, in 1894. Mr. O'Hara was with the Falk Co. five years, being assistant superintendent.



J. P. HEIL.

The Heil joint is made from 12 to 14 in. long, 8 to 10 in. wide and in depth extends 2 in. below the bottom of the rail, and is rectangular in shape which is a radical departure from former practice in casting rail joints. The reasons for adapting this shape are: First, the plane side and bottom permit the paving blocks to be properly fitted about the joint, and in consequence any vibra-



HEIL RAIL JOINT.

tion of the rails under passing loads does abrade the paving adjacent; secondly, ties may be placed under the joints if desired. An advantage of the short length is that there is room for the joint between the ties as regularly spaced.

The company uses an improved form of clamp for holding the rails during the process of welding which has obviated all trouble from buckling. A bar which is machined to fit the rail head is placed on top of the rails and fastened near the ends by clamps which extend down and hook over bars under the rails. When welding old track it is desirable to lift the end of the receiving rail higher than that of the other, and this is provided for by an ingenious design of the clamping bar. This form of clamp was designed by Mr. Heil and first used by him in the work of welding 3,000 joints for the *Compania de Tramways Electricos de Buenos Ayres* Belgrano, in 1899-1900.

The company will sell or rent welding outfits or will contract to do the work, with a guarantee that the result will be satisfactory. The improved outfit comprises a cupola wagon, with a 30-in. motor-driven fan, an air compressor and sand blast car and a grinder car.

The Youngstown (O.) & Sharon Street Railway Co. carried 80,000 passengers over its lines from July 15th to 21st inclusive. This is a greater business than that of any other week in the history of the company.

## OHIO NOTES.

The Columbus Railway Co. is experiencing considerable difficulty in getting steel rails for a number of proposed improvements and extensions that have been planned for this season. The strike of the steel workers complicates the situation.

Car No. 40 on the Dayton, Springfield & Urbana Street R. R. ran into an open switch near Springfield about 9 o'clock in the evening of August 2d and struck a number of freight cars, injuring 25 persons, three of them seriously. Ten of the passengers suffered broken legs. An investigation of the switch showed that it had been locked open, which is believed to have been the deed of some miscreant. The officials are making every effort to place the responsibility for the accident.

Representatives of the Chillicothe, Mt. Sterling & Columbus Electric Railway Co. are endeavoring to persuade General Manager Fisher of the Columbus, London & Springfield Ry. to take up the work of financing and building their proposed line. The Chillicothe parties interested in the new road have secured a franchise in that city and have secured franchises from the commissioners of the counties through which the line will pass. A public right of way has been secured the entire distance. Mr. Fisher informed the representatives of the Chillicothe company who called on him that his company did not build on a public right of way, and that unless a private right of way were secured he would consider no proposition looking toward the acquisition of the franchise and the construction of the road.

## THE OLDEST RAILROAD IN AMERICA.

Anthracite coal was discovered at Mauch Chunk, Pa., in 1791, by Philip Ginter and a few years later the Lehigh Coal Mine Co. was formed to exploit the coal. This company failed because there was no market, people not knowing how to burn the fuel. In 1818 the Lehigh Navigation Co. and the Lehigh Coal Co., which were afterwards merged, were organized and were more successful. In order to bring the coal down the mountain the Switch-Back Railroad which claims the distinction of being the oldest railroad in America, was built and opened for business in 1827. The cars were hauled up by mules, loaded with coal, and allowed to descend by gravity, the mules being taken on board for the down trip. The construction of the Lehigh Valley R. R. and the branches of the Central R. R. of New Jersey into the coal regions ended the usefulness of the Switch-Back as a coal road and it is now operated as a pleasure road from the middle of May to November 1st each year, by the Mauch Chunk, Summit Hill & Switch-Back Railroad Co.

The original section of the line was the lower or return portion only, the idea of inclines up the two mountains being adopted in 1844. The road now is a continuous double loop, and with the exception of the two inclines which are ascended by means of cables, the run is made by gravity. The length of the route is about 18 miles. Electric cars meet all passenger trains at Mauch Chunk and take travelers directly to the Switch-Back station. The manager of this unique road is Alonzo P. Blakslee.

## LARGE HEATING CONTRACT.

The Consolidated Car-Heating Co. has just closed, after open competition, what is believed to be the largest contract for electric heaters that has ever been awarded. This is for the entire electric heating equipment of the Manhattan Ry., New York City, and is for 1,200 cars, 18 heaters to the car, or a total of 21,600 heaters.

These 21,600 heaters will contain 64,800 heating coils in the construction of which over 1,350 miles of wire with a heating surface of 58,722 sq. ft., will be used. The porcelain cores which support these coils, if placed end to end, would extend for a distance of 12 miles. The heater to be furnished is of special form particularly designed for this road, but it differs only in form from the company's standard heaters, which have now thoroughly proved their worth by service for nine consecutive years.



# AN INTERESTING STEPHENSON CAR.

The accompanying illustration shows a car recently built by the John Stephenson Co. which embodies some new features. It has a 16-ft. body and is 6 ft. 6 in. wide over all. The platforms are 5 ft. 4 in. long and the body is 13 ft. in height. The car has extra large windows and a new feature is the absence of ventilators in the roof, which have been replaced by small windows under the eaves where the letter board is usually found. The top seats have



STEPHENSON CAR FOR ENGLAND.

a seating capacity for 26 people. These are cross seats with a new design for the seat part which turns over, so that in case of rain the dry side may always be turned upward. The inside seats are arranged longitudinally and seat 24 persons. The finish inside is of mahogany with plate glass and the outside is painted in maroon and decorated with the coat of arms of Cheltenham, England.

The stairways to the roof have been reversed, as shown, so that the motorman stands under the steps. The body is mounted on Peekham No. 9 A. X. trucks. The car was built for Mr. Evans, of Orange, N. J., purchasing agent in this country for the railway.

# EVERETT-MOORE SYNDICATE.

The activity of the Everett-Moore syndicate has continued during the past month and several additional lines have been acquired. July 28th it was announced by Mr. Moore that the syndicate had secured control of the Detroit, Rochester, Romeo & Lake Orion and the Detroit, Utica & Romeo roads, and on August 8th the property of the Toledo, Fremont & Norwalk Railroad Co. was transferred to the syndicate.

Reports had been circulated that the Cleveland City Ry. and the Toledo & Western Electric Ry. had also been acquired, but these rumors were denied by Mr. Moore.

The total earnings for June of the Detroit United Ry., the Toledo Traction Co., the Northern Ohio Traction Co., the Cleveland, Painesville & Eastern R. R., the Cleveland & Chagrin Falls Electric Ry., the Sandusky & Interurban Electric Ry. and the Cleveland Electric Ry. were \$501,652, an increase of \$62,803 over June, 1900.

In an interview last month Mr. Moore said:

"Although at present our negotiations have not reached a stage where I can say that all the suburban railways in this part of Ohio and Michigan are under the control of our syndicate, nevertheless the results, which will eventually crystallize, will bring about an absolute consolidation of all the companies in and around these cities into one great corporation. New stock will then be issued to holders of stock in the individual companies.

"Our syndicate already controls nineteen railways, electric light, heat and power companies in, between and radiating out from Cleveland, Toledo and Detroit. Our capitalization at present is \$100,000,000, which will be increased eventually, when we take in the rest of the companies."

The Securities Company of Cleveland has been organized by E. W. Moore, Henry A. Everett, Frank S. Barton, Charles W. Wason and H. B. McGraw, with a capital of \$100,000, and will assist in handling the finances of the syndicate interests.

# CHICAGO UNION TRACTION CO.

The annual meeting of the Chicago Union Traction Co. was held on July 23d, the old board of directors being re-elected. The income account for the year ending June 30, 1901, is as follows:

<b>Earnings—</b>	
Passenger receipts .....	\$7,269,815.81
Chartered cars .....	4,222.40
Mail .....	15,101.13
<b>Gross earnings from operation.....</b>	<b>\$7,289,139.34</b>
<b>Expenses—</b>	
Maintenance, way and structures.....	\$ 198,928.82
Maintenance, equipment .....	351,937.85
Transportation .....	2,735,302.31
General .....	655,065.55
<b>Total operating expenses.....</b>	<b>\$3,942,194.24</b>
<b>Net earnings from operation.....</b>	<b>\$3,346,945.10</b>
<b>Income—</b>	
Advertising .....	\$ 33,525.00
Rent of land and buildings.....	33,653.57
Rent of tracks and terminals.....	19,000.00
Income from stocks and bonds owned and leased.....	778,215.50
Interest on deposits and loans.....	12,416.78
Miscellaneous .....	1,387.50
Premium on bonds sold.....	662.52
<b>Total income from other sources.....</b>	<b>\$ 809,670.87</b>
<b>Gross income .....</b>	<b>\$4,016,615.97</b>
<b>Deductions—</b>	
Taxes accrued .....	\$ 320,205.92
Interest on loans accrued.....	70,166.07
Rentals accrued .....	3,665,080.00
Premium on bonds purchased.....	2,468.75
<b>Total deductions from income.....</b>	<b>\$4,058,040.74</b>
<b>Net income .....</b>	<b>\$ 158,575.23</b>
<b>Surplus from last year.....</b>	<b>4,975.54</b>
<b>Total applicable to dividends.....</b>	<b>\$ 162,650.77</b>
<b>Dividend on preferred stock, 1 1/4 per cent.....</b>	<b>150,000.00</b>
<b>Surplus as per balance sheet.....</b>	<b>\$ 12,650.77</b>

The additions to the property for the year were \$766,746, of which \$50,959 was in track construction, \$50,053 in line construction, \$47,410 in land and buildings and \$388,967 in equipment.

President Roach's report to the stockholders was as follows:

"The last twelve months have been eventful in many respects in the management of our properties. It has been a period of adversities such as we may safely hope hereafter to escape. One year ago we were confronted with conditions that were anything but encouraging. The operation of the Northwestern Elevated road through our territory resulted in a direct loss in traffic of from \$1,500 to \$2,000 daily, which, together with the unsettled labor question the greater part of the year and with the losses attendant upon the suspension of building operations, materially affected our receipts. In addition to this loss of traffic, operating expenses were increased by raising the wages of the employees of the North Side lines to conform to the rate paid by the larger West Side system.

"While the foregoing items of loss and expense prevent our showing an increase of receipts as compared with the year previous, nevertheless we have met all our fixed charges, paid the first quarterly dividend on our preferred stock, maintained our credit, improved the efficiency and standard of our rolling stock, roadbed and general equipment, and are now able to show a surplus of \$12,650.

"The physical condition of the company is better than at any time heretofore. During the year fifty large double-truck box cars and fifteen large double-truck open cars, of the most modern types, have been added to our rolling stock equipment. Several miles of track have been extended into new territory. A large amount of reconstruction of track and roadbed has been accomplished, so

that today our right of way shows a decided improvement over conditions existing last year.

"Among the economies effected during the year were the consolidation of the carshops and storehouses, the centralization of the North Side electric cars in a newly constructed carhouse of almost unlimited capacity, and the disposal, by lease, of all unused real estate upon a self-sustaining basis. We have also thoroughly overhauled our electric power houses and installed new machinery, which has resulted in a large saving in the cost of production of power and a marked increase in the efficiency of the several plants.

"The most amicable relations exist between the company and its employees. Our trainmen are neater in appearance, more gentlemanly in conduct, more solicitous for the welfare of our patrons and more careful of our property than ever before. This has resulted in a more reliable and satisfactory service, which we believe has tended to lessen criticism and create a kindlier feeling in the minds of those of our patrons who appreciate the difficulties of operating this great street railway system under the existing conditions.

"Judging from the month of June (which was the closing month of the fiscal year), and from the first 22 days of the present month, everything indicates that the company will have a much more prosperous year than at any time heretofore. I feel safe in predicting that the expenses and receipts for the current year will be highly satisfactory to the stockholders of this company when the report is made to them in July, 1902."

A report from the treasurer showed that the interest charges of the company had been reduced \$23,370 per annum by refunding.

### ROOFLESS SUMMER CARS.

The experiment of operating a roofless car during summer evenings is being tried in St. Louis where a car of this description which seats 128 passengers and is called the "Moonlight" has been put in service on one of the city lines. The car is on the pattern of the ordinary open cars except that the side posts and roof are lacking. Over the rear end of the car is a small elevated platform just large enough to carry the trolley base. Light is provided by a cluster of incandescent lamps in front and a powerful reflector in the rear. The car is considered an experiment, but if it proves successful the company will use similar ones on all of its lines.

### NEW FACTORY OF MORRIS ELECTRIC CO.

The new factory of the Morris Electric Co., exterior and interior views of which are shown herewith, is located at East Orange, N. J., seven miles out from New York City on the D., L. & W.

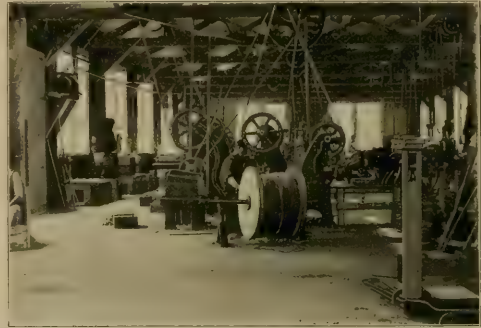


FACTORY OF MORRIS ELECTRIC CO.

R. R., and between the works of the Sprague Electric Co. and the Crocker-Wheeler Co. The main building is 220x46 ft. The engine room is located in an ell off the main shop.

The brass foundry is 46x74 ft. and is equipped with nine fur-

naces and one Tabor moulding machine, which latter will do the work of 10 moulders. Opening off the foundry is a core room 14 ft. wide by 20 ft. long, and beyond this room is the dipping room and blacksmith shop, 12x20 ft. The south end of the main shop is used for the fare register department and the balance of the shop for manufacturing the bonds and other goods made by the company. The D., L. & W. R. R. has put in a siding so that the cars run up to a platform at the door of the factory to receive



INTERIOR OF MORRIS FACTORY.

and deliver shipments. The main shop is equipped with presses and gas furnaces besides modern machinery of the usual types.

The company has several large orders for bonds on which the shop is working, and it is getting well started in the manufacture of fare registers.

Mr. E. P. Morris has devoted most of his time heretofore to the erecting and starting of the shops, but hereafter will divide his time between the shops and the New York office at 15 Cortlandt St. The company reports its business good and the export part of it far beyond expectations.

### SECOND-HAND ENGINES.

A great many of the interurban railway systems now building and projected will include the local lines in the towns connected and generally where the territory covered is considerable, there is necessary a complete redesign of the power generating plants, the three-phase system of distribution being substituted for direct current in many instances.

The number of engines thus thrown on the market, and the fact that there is also a good demand for such machines on the part of smaller independent street railway companies led the W. W. Whitehead Co., of Davenport, Ia., to make a specialty of handling second-hand engines suitable for electric railway and light stations, and in a comparatively short time it has built up a large business in this line. The plant includes a large machine shop well equipped with tools so that the largest engines can be repaired and overhauled.

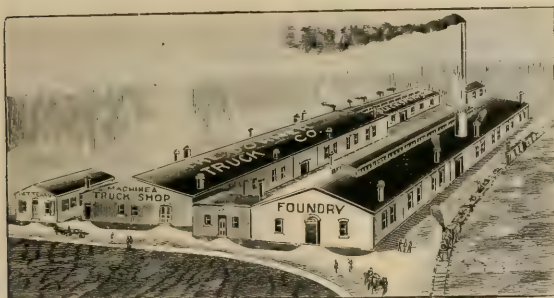
### NEW SAND BOX.

W. H. Kilbourn, of Greenfield, Mass., has recently placed on the market a new sand box, which is known as the "New Century" sand box. This is Mr. Kilbourn's latest sanding device and consists of two receptacles or hoppers, the larger one being made of galvanized iron of the ordinary shape. Below this is a small iron hopper which can be moved back and forth under the larger one by means of a foot-pin or a lever, as may be desired. There are two outlets in the small hopper, which both lead to the chute to the rail. By thus taking the sand in two directions and in small quantities, the sand is broken up if in lumps or damp, clogging is prevented and the resistance offered to working is uniform and light.

It is claimed for this device that it will work wet or dry sand and also small stone. The parts that would be liable to break if made of cast iron are all made of wrought iron.

## A NEW TRUCK COMPANY.

The Dorner Truck & Foundry Co., which has purchased a plant at Logansport, Ind., is a reorganization of the old Dorner Truck & Manufacturing Co., of Cleveland, O., Mr. H. A. Dorner of the old company being associated with local business men. The company has ample capital to run the business on a large scale and will engage in the manufacture of the well-known Dorner trucks, track cleaners, fenders, car wheels, brake shoes and other street



FACTORY OF DORNER COMPANY.

railway supplies in this line. Mr. Dorner will have charge of the sales department.

A representative of the "Review" recently inspected the plant of the company and found everything in fine shape. The machine and truck shop is 65x175 ft., the foundry 50x200 ft., blacksmith shop 35x75 ft. The machinery is all modern and the shops are well equipped to turn out work rapidly and of the best quality. The shipping facilities are excellent, a side-track running into the yards of the Wabash road and connecting with five divisions of the Pennsylvania, the Vandalia and Eel River railroads.

The officers of the company are: President, S. B. Boyer; vice-president, George Ash; secretary and treasurer, J. C. Hadley; superintendent, H. A. Dorner.

## WILLARD STORAGE BATTERIES.

At the present time, Messrs. Sipe & Sigler, of Cleveland, O., makers of the Willard storage batteries, have under way 12 large plants of Willard batteries including street railway batteries, central station batteries, large isolated lighting plants and batteries in government coast defense work. The latest contract is for a storage battery for the Cleveland Electric Railway Co., which will probably be the largest battery in street railroad service in the world. This battery will consist of 282 cells of 4,000 ampere-hours capacity and will weigh nearly 500 tons when completed. The Cleveland Electric Railway Co. owns and controls more than 200 miles of street railway. It recently installed in one of the stations two Willard batteries and to the satisfactory operation of these is largely due the present large installation.

## CORK FOR PULLEYS.

It is reported that tests now being made by Prof. F. C. Furlow of the Georgia School of Technology, and Prof. Charles M. Allen, of Worcester Polytechnic Institute, indicate that the most economical pulley has a surface of metal with cork inserts. Holes about  $\frac{3}{4}$  in. in diameter are made in the pulley face and filled with cork, the cork projecting slightly above the surrounding surface.

To one unacquainted with the results in detail it would seem that the cork would wear too rapidly.

The Buffalo, Niagara Falls & Rochester Railway Co. has authorized the issue of bonds to the amount of \$3,500,000, and rapid progress will be made on the construction of its line.

## ST. LOUIS CAR CO'S. CONVERTIBLE CAR.

A great deal of interest has been shown by railway officials in the new type of convertible car built by the St. Louis Car Co., the question of providing rolling stock that can be quickly changed from open to closed being an important one. The convertible cars which have been introduced are mainly of three types: 1. A car built with large windows which lower into pockets under the arm rail. 2. A car with large side sash which are removed from the car for summer service. 3. A car with sash arranged to raise, slanting pockets being provided in the roof to receive them.

The St. Louis Car Co. makes a convertible car of what is here called the first type. A feature of the construction is the "channel steel bottom" side sill, a sectional view of which was shown in connection with the description of the new cars for the Chicago City Ry., published in the "Review" for February, 1900, page 131. The two 8-in. channels, which constitute the side sill, are placed with the flanges out and the webs far enough apart to permit the sash to drop between them, thus making the sash pocket to extend to the bottom of the sill and permitting the arm rail to be 8 in. lower than when wood side sills are used. The channel side sill is covered by patents taken out by Mr. Robertson when he was with the Third Avenue R. R., of New York City, that company having been the first to purchase 100 of these cars embodying the convertible features.

The advantages claimed for this type of car are that it is easily and quickly convertible; that it is strong, having steel under frame; that the sash when lowered are firmly held so as to prevent all rattle and shaking that would be annoying to passengers and increase maintenance charges.

Recent orders for these cars include 120 for the Chicago City Railway Co., 20 for the Birmingham (Ala.) Railway, Light & Power Co., 40 for the St. Louis, Belleville & Suburban Ry., and the St. Louis Car Co. is confident that it will build from 800 to 1,000 cars of this type within the next year. The designs are for cars from 20 ft. to 65 ft. in length.

## 500-KW. GENERATORS DRIVEN BY GAS ENGINES.

The Sprague Electric Co. has recently closed an interesting order for three Lundell split-pole 500-kw. engine-type generators, with speed of 100 r. p. m., and wound for 250 volts, to be direct connected to gas engines. These will be installed in the new works of the Lackawanna Iron & Steel Co., at Buffalo, and are designed for a continuous overload of 25 per cent at a high efficiency. The gas engines will utilize as fuel waste gas from the coke ovens of the Lackawanna company.

These will probably be much the largest generators in this country ever operated by direct connected gas engines, and the method of utilizing waste gases for such large amounts of power has never before been attempted in the United States.

The Sprague Electric Co. has been very successful with the split-pole machines, as the ingenious design, high efficiency and endurance are much appreciated.

The carhouse of the Haverhill (N. H.), Plaiston & Newton Railway Co. is nearing completion. The structure will be 150x100 ft., and two stories high, in part.

In a report recently presented to the American Railway Master Mechanics' Association the following statement was made regarding the heating and ventilating of roundhouses: "The most modern method of heating at present seems to be by hot air and forced blast. The air can be taken from the roundhouse and warmed over and over again, thus reducing the cost of heating the air. While this air is generally carried in overhead ducts, your committee considers it should be investigated and determined in each case whether an underground duct would not be suitable. It is also suggested that air be taken from the boiler room, thus serving the double purpose of cooling this room and using the heat imparted to warm the roundhouse."



## PERSONAL.

MR. A. D. BROWN has been elected a director of the United Railways Co., of St. Louis, Mo.

MR. H. S. REYNOLDS, of Boston, has been elected general manager of the Columbus (Ga.) Railroad Co., an office which has been recently created.

MR. J. A. BENDURE on June 10th resigned as general superintendent of the Atchison (Kan.) Railway, Light & Power Co. and is engaged in the contracting business.

MR. O. D. CHASE, secretary and chief engineer of the Chase Construction Co., Detroit, was accidentally killed in a railroad wreck near Dayton, O., on July 27th.

THE LYONS (N. Y.) ELECTRIC RAILWAY CO. has elected the following officers: C. A. Lux, president; C. H. Ford, vice-president, and N. A. Mestler, secretary.

MR. F. A. ESTEP, president of the R. D. Nuttall Co., of Pittsburgh, sailed for Europe July 24th, and will visit England and the Continent in the interests of his company.

MR. S. E. FOUTS, formerly examiner in the United States Patent Office, is now engaged in the practice of patent law having offices at No. 303 New England Bldg., Cleveland.

MR. FREDERICK BROTHERHOOD has been appointed manager of the foreign sales department of the Railroad Supply Co., with headquarters at its New York store, 106 Liberty St.

MR. T. F. HUNTER, who has been engaged in the street railway supply business for the past 10 years, has taken charge of the railway department of H. M. Shaw & Co., of New York.

MR. JAMES CAMPBELL has been elected a director of the St. Louis Transit Co. and of the United Railways Co., of St. Louis, succeeding, on the board of the former, Mr. Henry T. Haarspick.

MR. WILLIAM TILOTSON has resigned as superintendent of the Berkley (Va.) Street Railway Co., a position he has held for 10 years. Mr. Tilotson will engage in other business in Berkley.

MR. C. L. B. TYLEE resigned as superintendent of the Penn Yan, Keuka Park & Branchport Electric Ry., August 1st, and has been succeeded by Mr. H. H. Dewey, formerly of New York City.

MR. CHARLES B. STORY, formerly of Bath, Me., has been appointed superintendent of construction for the Whitehall & Granville electric road building through Washington County, N. Y., and Rutland County, Vt.

MR. WILLIAM D. KEENE has resigned as superintendent of the Columbus (O.) Railroad Co., a position he has held for the past 12 years. Mr. Keene is sojourning in Georgia before resuming business duties in another field.

THE CUMBERLAND (MD.) ELECTRIC RAILWAY CO. has elected the following officers: George L. Wellington, president; James A. McHenry, vice-president; J. H. Holzshu, secretary and treasurer, and W. M. Roberts, superintendent.

MR. GEORGE W. BAUMHOFF, formerly general manager of the St. Louis Transit Co. is now engaged in the contracting business and among other work is building an electric railway connecting the towns of Iola, Lanyonville, La Harpe and Gas City, Kansas.

MR. JOSEPH S. AMBROSE has been appointed general superintendent of the Youngstown Park & Falls division of the Youngstown-Sharon Railway & Light Co., succeeding Mr. Robert T. Ivory, who recently resigned on account of ill health. Mr. Ivory will remain in Pittsburgh until sufficiently recovered to engage in business duties.

MR. O. F. DILLMAN has resigned as deputy treasurer of the city of Dayton, O., to accept a position with the Cleveland Construction Co. For the present Mr. Dillman's work will be in connection with the electric line that is to run from Cincinnati to Muncie.

MR. HENRY H. LYNCH, for many years superintendent of construction of the Market Street Railway Co., San Francisco, Cal., has been appointed superintendent of all construction and repair departments of the entire system. Mr. Lynch is the successor in this capacity to Mr. Fairchild, who recently resigned.

COL. GEORGE B. KERPER, president of the Toledo, Bowling Green & Southern Railroad Co., has resigned the position of general manager of the People's Railway Co., of Dayton, which he has held for four years, and will devote much of his time to the promotion of the former company's interests. Col. Kerper will remain a director of the People's Railway Co.

MR. EPES RANDOLPH has been appointed general manager of the Los Angeles & Pasadena Electric Ry., and as the company also operates the Pacific Electric Ry. and the Pasadena & Mt. Lowe Ry., Mr. Randolph's management will extend over these roads. His appointment was in effect August 1st. Mr. Randolph succeeds Mr. C. W. Smith who has been elected second vice-president of the company.

THE METROPOLITAN STREET RAILWAY CO., Kansas City, Mo., has re-elected Mr. Walton H. Holmes as president, and Mr. Conway F. Holmes as general manager. Mr. L. E. James has also been re-elected as vice-president of the company. No change was made in the personnel of the executive committee, which comprises: P. A. Valentine, of Chicago, W. H. Holmes and L. E. James. Mr. J. L. Looze, of Chicago, was elected a director.

MR. F. L. FULLER, who for some time has had general supervision of the properties controlled by the United Power & Transportation Co., of Philadelphia, has been given greatly increased responsibilities and will hereafter perform the duties and have the title of general manager of all the systems. This advancement is a well-deserved recognition of Mr. Fuller's labors, as the present prosperous and satisfactory condition of the lines owned by the United Power & Transportation Co. is in a very large measure due to his ability as a general superintendent.

THE LEHIGH VALLEY TRACTION CO., Allentown, Pa., has elected Robert E. Wright, of Allentown, president, to succeed the late Albert L. Johnson. Loftin E. Johnson, a nephew of the latter, and a son of Tom L. Johnson, of Cleveland, was elected vice-president. W. H. Newbold, of Philadelphia, resigned as a director, and John Hoskins, of Philadelphia, was elected to succeed him. C. M. Bates, of New York, formerly vice-president of the company, was elected secretary and treasurer. Loftin E. Johnson was also elected to fill the vacancy in the directorate caused by the death of A. L. Johnson.

MR. HARRY J. CLARK has resigned his position as chief engineer of the Syracuse Rapid Transit Co. and accepted the position of engineer for the Oneida Construction Co. He will have charge of the building of trolley road which is to connect Syracuse, Utica, Oneida and Sylvan Beach. Mr. Clark is now making an overland trip along the route of the proposed line, with representatives of the Westinghouse Electric & Manufacturing Co. Mr. Clark is a graduate of Cornell University in the mechanical engineering course and has been connected with the Syracuse street railway system as engineer since October, 1895. He has had supervision of most of the construction work done since that time, is well known in the city and popular with the men under him.

MR. F. E. HUNTRESS, of No. 8 Oliver St., Boston, has recently opened a new office at No. 716 Broad Exchange Bldg., New York, where, in addition to acting as general eastern agent of the St. Louis Car Co. and for the Neal Headlight Co., he will conduct his street railway supply business with special reference to export orders. Mr. Huntress is very widely known in New England and

has not confined his activity solely to business. He has been elected to the Massachusetts Legislature for five terms, three in the House and two in the Senate, and is one of the leaders of the republican party in the state. Mr. Huntress was graduated from Harvard in 1889 and is a young man, being only 35 years of age. He is a member of the University Club of Boston, the Harvard Club of New York, the Massachusetts Republican Club and many other social and political organizations.

MR. JAMES F. DAVIDSON, who has been for 20 years in the street railway service at St. Louis, was appointed general superintendent of the St. Louis Transit Co., August 3d. Mr. Davidson went to St. Louis from an eastern city in 1881 and was employed as a conductor on the Olive St. horse-car line, in which capacity he worked for three years under Mr. Rolla Wells, then superintendent of the company, and the present mayor of St. Louis. Mr. Davidson was made road officer and later superintendent of one division of the city's street railway system under the old regime. This position he held after the Market St. and Laclede Ave. lines had been equipped for electric traction, and continued in charge of the Olive St. division as long as it was a cable line. Since the consolidation he has retained the position of division superintendent. Pending his establishment in new headquarters which are being fitted up for him at Park and Vandeventer Aves., Mr. Davidson's office is at No. 20 South Compton Ave.

#### NOTES FROM BIRMINGHAM, ALA.

The Birmingham Railway, Light & Power Co. has fitted up two very handsome cars for pleasure riding. These are open cars with large comfortable seats and several hundred colored lights distributed over the top and sides, making a very brilliant illumination and attracting considerable attention as they pass along. They are rented to societies and clubs at a flat rate of \$10 for three hours and have proved a great success, being engaged often times every night for ten days ahead. Three different divisions of the road are traversed in this time. The cars are named "Orion" and "Royal Red."

An order has just been placed with the St. Louis Car Co. for 20 34-ft. cars with four motors each, to be delivered about October 1st. These cars are to be equipped with air brakes, arc electric headlights and all the modern appliances, and in point of beauty and finish will be the finest cars in the south. They will be used on the Bessemer, Birmingham and East Lake line.

The express business has so perceptibly increased during the past several months that the company in order to meet the demands has about ready to put into service an electric freight train in the suburban traffic. This train consists of a motor car with two trailers. The motor car is equipped with four motors and an arc headlight, and the braking of the three cars is done by air brakes controlled by the motorman on the first car. This train will make four trips per day to Ensley and Pratt City and will add greatly to the convenience of the merchants of both these places, making it possible for them to have goods delivered a few hours after ordering them. These cars are painted the standard yellow and present quite a neat appearance.

The much talked of and long coveted electric line from Birmingham to Bessemer is at last a thing of reality. Work has already commenced under the direction of Ford, Bacon & Davis, engineers, of converting the Powderly line into an electric one. When this is done a line 21 miles in length, from East Lake to Bessemer will be operated. The new cars mentioned above will be put in service on this division which will be operated in three sections.

The old system of suspension with loss of time was abandoned by the company on the 15th of July and the system of discipline now in vogue is something on the order of a demerit scheme. When an employee violates an order or causes an accident, a bulletin relating all the facts, but withholding the guilty one's name is put on all the boards and states how many days suspension he has had charged to him on the suspension book. These bulletins while not exposing the guilty party to the humiliation of having his name on the boards, yet relate the details of the incidents so as to leave no doubt as to who the erring one is. A book is kept in which a page is assigned to each employee and the circumstances occasioning the

suspension are all recorded under his name together with the number of days suspended. This has proved highly satisfactory to the employees and they strive as hard to keep their names off the book as they did when they were suspended with loss of time. The management has a plan under consideration of awarding merits to counterbalance the demerits, should an employee do a meritorious act or a deed of bravery.

The side-pole construction has been found to be more desirable than the center pole on this system and the work of changing over to the former is being pushed as rapidly as possible.

This company is doing a vast deal of advertising. Several thousand boards bearing the inscription "Follow the Crowds to East Lake" have been distributed throughout the neighboring towns and country within a radius of 60 miles and calls the attention of the people to the popular pleasure resort, East Lake Park. Then

## PERSONAL. Won't This Young Man



## Take This Young Lady



## ON A TROLLEY CAR RIDE



To Beautiful East Lake, To Lovely LAKEVIEW,  
To Picturesque North Birmingham, To Ensley,  
Tuxedo Park, North Highlands, South Highlands, Around the Loop, or to West End or Powderly.

## OF COURSE HE WILL! GO RIDING on the TROLLEY CARS for A DIME.

Special Attention Given Trolley Parties, Picnics and Excursions  
SEE—Birmingham Railway, Light & Power Co.

about 5,000 lithographed bills, very neat and attractive in appearance have been put on all the bill boards and call the attention of the public to the inducements offered to those who ride on the cars. These bills are in colors and have aided materially the pleasure travel. The reproduction herewith is reduced from a 28x42-in. poster and is one of several which is being used this summer. The lettering is printed in blue and the figures of the young man, the young lady and the trolley car in red.

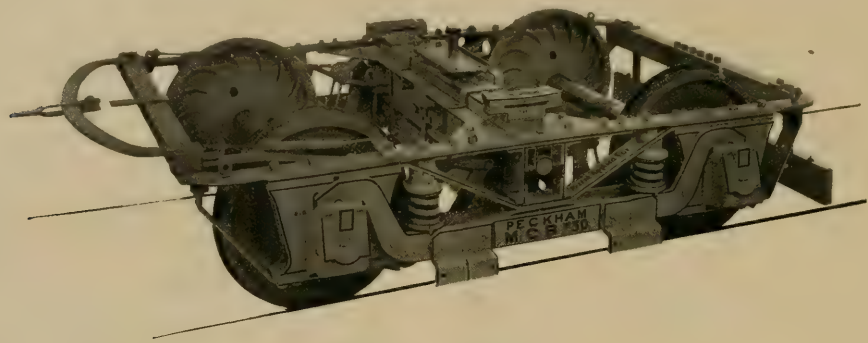
If one should take a peep into the lost article department of this company he would be impressed with the idea that Birmingham people must be the most forgetful people in the world. Nearly everything has been left on the cars and turned into this department except a baby. When an article is reported lost a regular blank for the purpose is filled out and sent to the inspector of the line on which it was lost, and if found it is promptly turned into the office where the owner may secure it by describing it. A man is retained for this department alone.

The Plymouth (Pa.) & Larksville Ry., of which Abram Nesbitt, of Kingston, is president, was opened for traffic July 18th.

NEW PECKHAM M. C. B. MOTOR TRUCK NO. 30.

The No. 30 truck, which we illustrate herewith is a new design of the Peckham Truck Co., expressly intended for high speed elevated or suburban electric railway service.

frame of the truck from tilting on the equalizing bar springs, which has been a serious defect in this form of truck when used on electric railways. A part only of the load is carried on the equalizing bar springs E and a part by the springs F, which are located inside of the pedestals D. The springs F support the frame direct

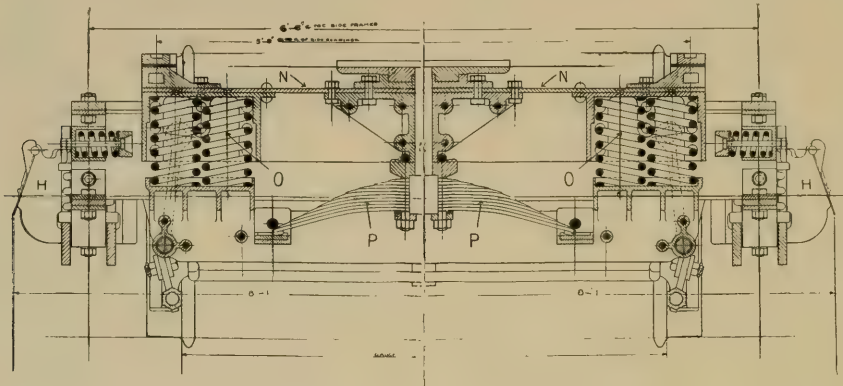


PECKHAM M. C. B. NO. 30 TRUCK.

The side frames combine the equalizing bars used in the M. C. B. freight car truck, so as to give the greatest strength; the equalizing bars and diamond frame being each sufficiently strong to carry the car independently of the other a double factor of safety is secured.

from the journal boxes, and give the extended spring base support to the frame, which prevents it from tilting.

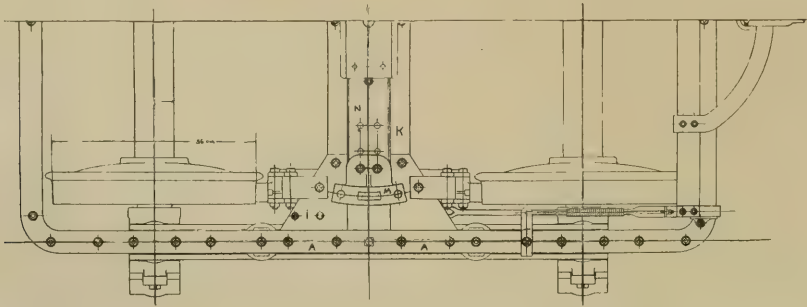
The transoms K are bulb angles 10 in. deep, which extend full size with the side truss frames to which they are very rigidly se-



SECTION THROUGH CENTER OF BOLSTER.

The side and end portion of the top frame is all one piece of forging which insures the truck always remaining square. The springs are so arranged to give an extended spring base and prevent the

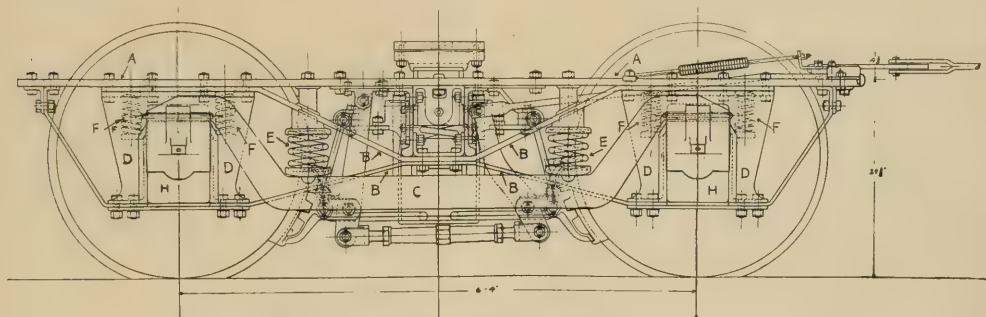
cured. Gussets of sheet steel connect the transoms to the side frames and hold the frame rigid and square. The swing bolster is constructed of plates in form of a channel 8 in. deep and is carried



HALF PLAN.



on four long coil springs and one elliptic spring, which support the bolster from the inside at its top so as to hold it securely in a vertical position and prevent its tipping partially over back and forth in direction lengthwise of the car, which action takes place with bolsters having their bottom portion resting on the top of the elliptic springs. This tipping or tilting of bolsters causes serious wear to take place on their sides and on the transoms and interferes with the operation of the brakes, as it allows the trucks to change their position slightly with reference to the car body. Such a movement of the bolsters, also gives a movement to the car body, which is objectionable to the passengers. This bolster is also fastened to the elliptic spring with heavy U bolts which gives it a very strong support and insures it against tilting. It is claimed that this



SIDE ELEVATION NO. 30 TRUCK.

bolster is the easiest riding of any form which has ever been constructed. Straps secured to the transoms and extending over the bolster prevents its being lifted out. The king pin is 2 in. in diameter and is fastened so the car body cannot be lifted off the truck. The swivel plates are large in diameter and machine fitted, and have a brass around the king pin which prevents the escape of the lubricating grease.

The journal boxes are M. C. B. pattern with journals 4x8 to 5x9 in. as desired. The axles are 5 in. to 7 in. in diameter and the wheels as specified. The pedestals D are made of cast steel and are machine fitted where they come in contact with the journal boxes and top frames. All bolts are machined to an exact size and are driven in reamed holes.

The brakes are constructed with shoes either on the inside or outside of the wheels, as may be desired, and shoes can be easily adjusted to the wheels without placing truck over a pit.

The weight of this truck as constructed for the Aurora, Elgin & Chicago Railroad Co., with 36 in. double plate wheels and 6½ in. axles, will be 10,350 lb. The Aurora, Elgin & Chicago expect to run these trucks at the rate of 75 miles an hour.

### NORTHWESTERN ELEVATED BUYS CHICAGO LOOP.

August 1st the agreement for the sale of the Chicago Union Elevated R. R. to the Northwestern Elevated was ratified by the stockholders of the latter company. The price paid for Union Elevated stock was \$125 per share.

### CONVENTION HOTEL ACCOMMODATIONS.

The delegates and other railway men who will attend the A. S. R. A. convention at Madison Square Garden in October will find the Victoria Hotel a most convenient stopping place on account of its proximity to Madison Square Garden. Situated only one block distant at Broadway and 27th St., it will be found much more convenient than any other of the first class hotels. As the New York hotels are usually crowded at the season when the convention is held, and the Victoria is one of the popular hotels of the city, it is advisable for those intending to stop there to engage rooms well in advance. The management promises special attention to A. S. R. A. visitors.

### ACCOUNTANTS' ASSOCIATION PROGRAM.

The program as arranged for the fifth annual meeting of the Street Railway Accountants' Association of America includes the following papers:

"Consumers' Account—Electric Lighting Companies," by S. E. Moore, controller Consolidated Traction Co., Pittsburg.

"Capital Accounts from the Standpoint of the Investor," by Col. T. S. Williams, Brooklyn Rapid Transit Co.

"Car Mileage and How to Obtain It Easily," by J. M. Smith, comptroller Toronto Railway Co.

"Conductors' Accounts," by Elmer M. White, cashier Hartford (Conn.) Street Railway Co.

### STREET RAILWAY STRIKES OF THE MONTH.

A strike which practically tied up all the cars of the Knoxville (Tenn.) Traction Co. was ordered on August 1st. The employees of the road recently formed a labor union which the company refused to recognize, and shortly afterwards several men were discharged. The union demanded recognition by the company and also the reinstatement of the discharged men. This was refused by the management and a strike ensued. The company's service was badly crippled and such cars as it has been able to run have been manned by non-union crews. The strike culminated in riots on August 3d in which several cars were attacked, trolley wires cut and some of the non-union men injured.

July 30 the forty motormen and conductors of the Columbus (Ga.) Railroad Co. struck for higher wages. Most of the company's cars were run for several days by employees of the lighting department, which was not included in the strike. On August 3d all of the differences between the men and the company were adjusted except the case of one man who ran a dummy car and struck out of sympathy, leaving perishable goods undelivered. As the company absolutely refused to re-employ him he resigned in order to permit a settlement.

All of the conductors and motormen of the Erie (Pa.) Electric Motor Co. struck on August 2d because five men who had been active in organizing a union were discharged. The management stated that the men were discharged for cause. The strike was called off at 11 o'clock the same night, the men agreeing to go back without the discharged men being reinstated, as they were convinced that the action of the company was justified.

### NEW MOLINE INTERURBAN.

The Moline, East Moline & Watertown Street Railway Co. was organized last month with the election of the following officers: President, C. H. Deere, Moline; vice-president, W. P. Hord, Aurora; secretary, Fred W. Rank, Moline; treasurer, Cyle D. Taylor, Chicago; directors, the foregoing officers and Frank Y. Keator. The exact route of the road has not yet been determined, but surveys are under way. Mr. Hord states that if no serious delay occurs in securing the right of way, it is hoped to have part of the road in operation by April next.

## THE PROPER TREATMENT OF JOURNAL BOXES.

BY E. PECKHAM.

A great deal has been said and many different ideas have been advanced on the subject of the journal box, which has long been a source of trouble to many railroad men, and the only object in writing this is to give better service to the trade and to overcome as much as possible the great question of hot boxes.

Different men have different ideas as to the proper way to pack boxes. We have had some experience in this line, and it is from this alone that we speak.

We do not condemn the use of all other material in the packing of a box, but we recommend the use of oil and wool waste. It is possible to run a box cool on a composition of grease, but it is not as easy, nor as safe, nor as cheap in the end as the use of oil. In many cases we have had journal bearings run hot on the grease packing, and by using the oil and waste we have overcome the trouble.

There are several points to consider, and we shall take them up in order for discussion.

1. It is very important that the brass should be fitted properly to start with. The brass should have a bearing the entire length of the brass, but only about three-fourths the width. It should bear on the center, but the sides at the lower edge should not touch the journal, as they tend to scrape the oil off instead of permitting it to follow around on the journal. The check plate should also be fitted properly. I mean it should not bind in the slot of the journal, or on the button on the end of the journal.

2. The material to be used. Use the best wool waste on the market and a good grade of black oil. We recommend the same as is used by steam railroads in their journal boxes.

3. The proper way to pack a box. Take a bucket and fill about half full of oil. Then take the waste (a small handful at a time) and put into the bucket. After mixing the oil and waste, take your packing hook and put the waste into the box. On a new bearing it is well to use a little flake graphite. In packing do not try to fill the box all at once, but take a little waste at a time and be sure that the back of the box is packed solid, not only under the journal, but on the sides as well. In case you have your packing too sloppy so you cannot pack it hard, you can add a little dry waste, enough to take up the oil. Continue in this way until the box is packed full, then put in the check plate, close the box and start your car.

4. How to prevent hot boxes. It is to be expected that the journals will warm up a little at first, but this can be prevented in a great measure by a little care on the part of the operators. First, pack in the manner described, and, second, use a little judgment in the operation of the car. It is not good policy to start a new journal at full speed. It should be run easy or at half speed for a day or so until the brass has become fitted, after which you can again oil the boxes and put the car in regular service.

5. What to do in case the journals become hot. In case the journals should get warm, one of the best things to make them run cool is to take a bar of hard soap, cut it into small slices and put into the box with the other packing. In case the journal should become so hot as to burn the brasses, take the brasses out and scrape them, then put them back and repack the box with new packing. Another good remedy is to put some white lead on the journal and then replace the brass. It will tend to help wear the brass into place. One of the best remedies is to take out the packing and put in some wood ashes and run for a time this way until the brass is fitted, then clean out the box and pack it fresh with wool and waste.

6. The proper care for the journals after they are in good shape. They should be oiled often enough to keep the waist moist. In some cases the first packing has lasted a month to six weeks. It is not necessary to repack the box each time; just add oil enough to moisten the waste. We have operated some of the largest cars and some of the highest speed roads in the country on the above lines and have not had the least trouble.

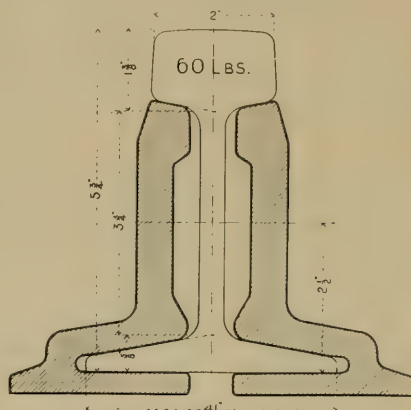
July 23d the title of the Lynn & Boston R. R. was officially changed, the system being merged into the Boston & Northern R. R., one of the two great divisions of the Massachusetts Electric Companies' system.

## PLANS FOR SALT LAKE CITY SYSTEM.

The Salt Lake City Railroad Co., since its acquisition of other local street railways, projects improvements and extensions of its combined system which will cost approximately \$250,000. Extensions to all important towns in Utah south and west of Salt Lake City, the purchase of new equipment for suburban lines, the rebuilding of the lines in Salt Lake City and the enlargement of the power house are included in the ultimate plans. February 1st the company will retire the issue of \$500,000 six per cent bonds utilized in consummating the purchase of the Salt Lake Rapid Transit Co.'s property. At that time an issue of \$1,500,000 in consolidated mortgage bonds at a lower rate of interest will be made for the purpose of retiring the recent issue, and on Feb. 1, 1903, the issue of 10 years ago will be redeemed.

## CONTINUOUS RAIL JOINTS.

The various forms of the "Continuous" rail joints, of which the accompanying cut shows the type, are described and illustrated in a handsome catalog issued by the Continuous Rail Joint Co. of America, whose main offices are in Newark, N. J. Joints of this type are made to fit all sections of T and girder rails, and also compromise



"CONTINUOUS" JOINT FOR 6 IN. T-RAIL.

joints used for connecting rails of dissimilar section. These are known as continuous compromise rail joints. Another similar type called continuous insulated rail joints is shown in which the rail is entirely insulated from the joint fastening. The catalog, which is printed on heavy paper and bound in stiff cloth covers, forms a substantial book which will be used and kept on file long after a poorer bound volume would be destroyed.

## CONDUCTORS TO HAVE POLICE POWERS.

The Duluth-Superior Traction Co. has effected an agreement with the city police department whereby conductors are authorized to arrest all persons traveling in the cars in their charge who shall conduct themselves in a manner violating the city ordinances. The responsibility for such arrests will be with the company, and not, as at first proposed, with the police officer who shall take the offender into custody.

The Pittsburg, McKeesport & Connellsville Railway Co. has placed an order with the John Stephenson Co., New York, for 25 cars to be delivered October 1st.

The Illinois Railroad & Warehouse Commission is considering petitions from a number of interurban electric railway companies for permission to cross team railroads. In most cases the commission has jurisdiction over the interurban electric lines as many of them are organized under the railroad act.

# HALF FARES.

The Portland (Me.) Railroad Co. on July 17th established a general system of transfer on all its lines within the 5-cent fare limit.

The Wisconsin Traction, Light, Heat & Power Co., of Appleton, has decided on the location of a terminus at the Kaukauna end of the line.

The publication office of Modern Mexico has been removed from St. Louis to New York City, where offices have been taken at No. 116 Nassau St.

The Toledo (O.), Fostoria & Findlay Electric Railway Co. has awarded a contract for the erection of a pavilion at its park at Arcadia. The building will cost \$6,000.

The Atlanta (Ga.) Rapid Transit Co. has been granted a franchise to operate its cars from Atlanta to the West End, over Peters, Holderness and Oak streets. The franchise provides for a viaduct over the railroad grade crossing at Peters St.

The incorporators of the Willimantic (Conn.) Traction Co. held a meeting July 1st at which Mayor William D. Grant, of Willimantic, was elected president, Walter H. Clark, of Hartford, vice-president, Thomas F. Cavanaugh, treasurer and William A. Arnold, secretary.

The United Traction Co., of Pittsburg, reports gross earnings for June, 1901, at \$184,007, as against \$171,244 for June, 1900. In May this year, the earnings of the company were \$179,400, an increase of \$8,500 as compared with the increase of \$13,363 shown for June.

The newly completed Athol-Templeton (Mass.) Ry. was put in full operation July 25, President Percival Blodgett and a large party of invited guests making the initial tour of the line, after which a banquet in celebration of the occasion was given at the Templeton Inn.

The earnings of the St. Louis Transit Co. for the first six months of the present year are reported at \$2,965,294, as against \$2,786,638 for the same period last year. The earnings for the month of June, 1901, were \$510,541, exceeding those of any other month in the history of the company.

Messrs. Lewis and Warner, receivers of the Nashville (Tenn.) Ry., have been granted authority to purchase 20 large modern cars which are to be delivered early in the fall. It is stated that the receipts of the company for June were \$47,000, of which about 40 per cent was net revenue.

The Syracuse Rapid Transit Railway Co. has purchased a new electric generator of 500 kw. capacity, which will shortly be installed in the power house. Seven new summer cars have been added to the rolling stock and Mr. Connette is considering placing an order for fourteen more for next summer's traffic.

The extreme hot weather has interfered in a peculiar manner with some of the cable lines in Kansas City. At the crossings of some of the tracks the expansion of the rails closed up the slots which crossed them. Several cars were stopped and operations were only continued after steel wedges had been driven in to open the slots.

The North Jersey Street Railway Co., of Jersey City, deposited a check for \$81,647.99 with the city treasurer of Newark, July 23d, the sum representing 5 per cent of the receipts of the various lines operated by the company in that city. The gain to the city of Newark from the increase of traffic over these lines for the year is \$1,257.85.

The Southern Ohio Traction Co. has received four new cars which will be put in service on the Hamilton & Lindenwald

Electric Transit lines. Manager F. J. J. Sloat, of the Southern Ohio company, projects placing clocks at the end of each of the local lines in order that cars may make their runs with greater punctuality.

An unsuccessful attempt to rob the Hoyne Ave. station of the Metropolitan West Side Elevated Ry., Chicago, was made by three men at 12:30 a. m. July 18th. Though covered by their revolvers the agent reached for his own weapon and opened fire. He was wounded by two pistol shots in the arm, but despite the fact succeeded in routing his assailants.

July 15th the employees of the mechanical and electrical departments of shops of the Union Traction Co., Philadelphia, presented a set of resolutions to Mr. John B. Parsons, president and general manager of the company, thanking him for reducing the working day from 10 to 9 hours without reduction in wages paid. The resolutions were signed by 500 men.

A party comprising First Assistant Postmaster-General William M. Johnson and his family recently made a trip from Hackensack, N. J., to Boston, by trolley cars, traveling 268 miles. Mr. Johnson states that there was not a mile of tiresome passage for the entire distance, and the change and variety of the scenery on the route were an unalloyed pleasure.

The Cross Country Railroad Co.'s application for authority to proceed with the construction of its line from Liberty Ave., Brooklyn, across Jamaica Bay to Rockaway Beach, has been granted by the railroad commissioners, and the construction work is under way. All injunctions have been cleared, and it is expected to have the road in operation by June 1, 1902.

The Camden (N. J.) & Suburban Railway Co. inaugurated a through service from Camden to Moorestown, July 18th. Accommodation cars are operated at half-hour intervals over the line, and a fare of 10 cents is charged. Express cars are run from the Pennsylvania R. R. terminus to Moorestown every half hour, stopping only at Broadway, Camden and Merchantville.

The Union Traction Co. of Indiana has inaugurated a new wage scale whereby conductors and motormen on lines where three men to a car are employed will receive 16 cents per hour for the first six months of service, 17 cents per hour for the second six months, and 18 cents per hour for a year and over. The highest wages paid under the old scale were 17 cents per hour after two years' service.

The United Traction Co., of Reading, Pa., is building a new line from Reading to Boyertown, a distance of 20 miles, 10 miles of which is now completed. This road is being constructed under a charter for a steam railroad. The track is laid with 90-lb. rails and well ballasted with work. Current will be transmitted at 15,000 volts alternating and transformed to 550 volts direct for the line. Stops will be made at regular stations only.

The city of Chicago is finding it difficult to make both ends meet, and the Board of Review has been making strenuous efforts to increase the assessed values of personal property. The street railways have received their full share of attention from the board, the personal property valuation of the Chicago City Ry. having been increased from \$5,000,000 to \$8,000,000, and that of the Chicago Union Traction Co. from \$8,500,000 to \$11,500,000.

The Savannah (Ga.) & Isle of Hope road has been leased by the Savannah, Thunderbolt & Isle of Hope Ry. and is being rapidly equipped with a view to having it in operation by August 15th. This line runs to the state fair grounds and will be completed as far as Thunderbolt by the time the fair opens. The operating company has decided to increase the wages of motormen and conductors, beginning August 1st. Men who have been in the service two years will receive 15 cents per hour; for one year, 13½ cents; for six months, 11½ cents per hour. The labor trouble with which this company has been threatened is due to a refusal to "recognize" the union.



# ECHOES FROM THE TRADE

THE GARTON-DANIELS CO., of Keokuk, Ia., reports that its lightning arrester business is much larger than ever before and keeps the factory hard pushed to fill orders.

THE UNITED STATES PROJECTILE CO., of Brooklyn, N. Y., is doing a large business in pressed pinions and cut gears for all electric systems, of which it makes a specialty. A number of large contracts for these goods has been closed during the last month.

THE LORAIN STEEL CO. is engaged in welding the tracks of Rochester (N. Y.) Railway Co. The company uses five special cars for this work; these were illustrated in the "Review" for December, 1898, page 818.

THE UNITED STATES STEEL CORPORATION, the largest concern in the world, has in use over 100 "Cross" oil filters in its mills. These were furnished by the Burt Manufacturing Co., of Akron, O.

THE JOHN STEPHENSON CO., of New York City, will furnish 25 cars to the Pittsburgh, McKeesport & Connellsville Railway Co. The cars will cost \$5,000 each, and will be of the same size as steam railroad coaches. They are to be delivered October 1st.

THE L. E. MEYERS CO., Monadnock Bldg., Chicago, which makes a specialty of steam and street railway construction and equipment, has recently sent to its customers and friends a handsome letter scale which cannot fail to prove a useful addition to the busy man's desk equipment.

E. P. ROBERTS & CO., of Cleveland, have been retained as chief engineers by the Muncie (Ind.), Hartford & Ft. Wayne Railway Co., of which S. M. Hexter, of Cleveland, is president. A force of engineers is in the field and contracts will be let as soon as plans and specifications are completed.

THE CHISHOLM & MOORE MANUFACTURING CO., of Cleveland, has issued a new catalog which is Appendix C to the company's 1900 catalog. This gives illustrated descriptions of the company's hand and pneumatic hoists and cranes, the "American Standard" rail joints and malleable castings.

THE J. G. BRILL CO., Philadelphia, will furnish five convertible cars, after the pattern for which the company was awarded two grand prix at the Paris Exposition, to be added to the rolling stock of the Colorado Springs & Southern Railway Co. The cars can be changed in four minutes from open to closed cars, and vice versa, and are designed for service the year round.

THE ELASTIC NUT LOCK CO., of Milwaukee, Wis., has greatly enlarged its plant and business, having installed a complete equipment of bolt cutting machinery, and will in future supply bolts as well as nuts to the trade. The demand for the company's elastic nut lock has steadily increased, and the preference of customers for buying bolts and nuts together led to the new departure.

THE SAFETY TROLLEY-WIRE PICK-UP, for which the Central Electric Co., of Chicago, is selling agent, is being used by a large number of electric street railway companies, all of whom highly recommend it. By the use of this device motormen and conductors are able to take hold of a broken wire and tie it up, thus enabling the cars to pass the point of breakdown. The time saved by having every car equipped with a pick-up would more than pay for the investment.

THE STILLWELL-BIERCE & SMITH-VAILE CO., of Dayton, O., has just closed a contract with the Wisconsin Traction, Light, Heat & Power Co., of Appleton, Wis., for a large water wheel plant. This will consist of two units of Victor turbines,

each unit containing three pairs of wheels mounted horizontally. These wheels will develop 3,200 h. p. There will also be two single 24-in. horizontal wheels, developing 150 h. p., which will be used for driving the exciters. The gate work will be of the company's patented draw rod type.

THE LANE & BODLEY CO., of Cincinnati, O., has issued the 50th anniversary edition of its catalog of 20th century engines. The present year completes a half century of this company's business, and its present products, some of which weigh hundreds of tons, appear gigantic when arrayed for comparison alongside its first style of engine made in 1851, which one man could lift. During last year all the company's old patterns were destroyed by fire so that beginning with this year all of its engines will be made from new and improved designs.

THE UNDER-FEED STOKER CO. OF AMERICA, which has its general offices in the Marquette Building, Chicago, reports the following recent sales: University of Chicago, 24 stokers under tubular boilers; Union Trust Building, Detroit, Mich., 3 stokers under vertical water tube boilers; Detroit Soap Co., 2 stokers under tubular boilers; Inland Steel Co., Indiana Harbor, Ind., 24 stokers under water tube boilers; Cerealine Manufacturing Co., Indianapolis, Ind., 4 stokers under tubular boilers; Chicago Suburban Light & Power Co., Oak Park, Ill., 9 stokers under tubular boilers.

THE SPRAGUE ELECTRIC CO. reports large sales of the Lundell fans this season. There has always been a great demand for these fans and their popularity is due to several superior features of design and construction. Light and power companies will be glad to learn that the Lundell motors and split-pole generators are now being made in sizes up to 1,000-h. p. and 1,000-kw. respectively. Both classes of apparatus are in greater demand than ever. The Sprague company is also doing a rushing business with the Greenfield interior conduits and cables, the sales being unusually large.

THE WESTERN ELECTRICAL SUPPLY CO., of St. Louis, has recently issued a pocket-size net price list and discount sheet applying to its General Catalog No. 22. This is one of the most complete price lists ever issued in the electrical business, covering, as it does, practically all the goods of standard make that pertain in any way to electricity. The book is bound in heavy linen covering, consisting of about 125 pages, and is of a size suitable for carrying in the pocket. It should prove of great use and convenience to any one wishing to always have with him prices that are right. The company is sending this book out to the trade, and will be mailed on application.

THE STOW MANUFACTURING CO., Binghamton, N. Y., inventors and manufacturers of the Stow flexible shaft, designed for application in nearly every industrial field, has issued its catalog No. 9, in which special attention is called to the combination of the Stow flexible shaft and iron-clad multi-speed electric motor for track drilling. The company has spent six years in perfecting a portable motor that would meet the exacting requirements of track work. The result is a device that works successfully on a grounded circuit; that is practically dust and water proof, and that is so simple in detail that the ordinary trackman, who, as a rule is neither an electrician nor a machinist, can operate it.

THE CENTRAL ELECTRIC CO., of Chicago, as selling agents for the Manhattan arc lamps and Pittsburgh transformers, will be pleased to send to anyone interested descriptive bulletins and price lists on this material. The Manhattan lamp ranks A-1 among the electrical trade and is so well known by electricians in general that a detailed description of the lamp is hardly necessary. The Pittsburgh type K transformer, while comparatively new, has, within the last year, been brought to the attention of central sta-

tion managers by its excellent electrical efficiency, and is now in general use throughout the country. A stock of these lamps and transformers will be carried in Chicago by the Central Electric Co. in order that customers may be supplied without delay.

THE ATLAS RAILWAY SUPPLY CO., with general offices in the Manhattan Building, Chicago, has issued its catalog for 1901 containing a thorough description of the company's manufactures, principal among which are the Atlas rail joint, the Atlas compromise or step joint, the Atlas raised joint, the Atlas rail brace and the Atlas raised brace. The Atlas rail joint is made of the highest grade of malleable iron, either as a supported or suspended joint, in eight different styles. It is adapted to fit all kinds and styles of rails, and designed for all kinds of traffic. It combines the angle bar, tie and bed plate and brace all in one and gives twice as much bearing surface as the same length angle bar. The Atlas catalog also contains tables to be used in track construction giving gross tons per mile corresponding to pounds of rail per yard, and feet of track per ton of rail. The merits of Atlas primer and Atlas surfacer for cars and locomotives, and the I. X. L. composition for wood and iron work are also discussed.

THE NEW PROCESS RAW HIDE CO., Syracuse, N. Y., is in receipt of an order from an eastern machine company for 10 pair of gear wheels, the larger to be cut cast iron and the smaller "New Process" raw hide, making a noiseless combination. The cut cast iron gears run from 20 in. to 80 in. and the raw hide pinions from 6 3/4 in. to 16 in. in diameter. The total amount of the order is above \$2,000. This company has also just received a contract from the United States Mint at Philadelphia for 6 "New Process" noiseless pinions 16 in. diameter, 6 in. face. These pinions are a part of the equipment of the new mint building, the machinery for which is just being installed. They are to be used for transmitting power from a 50-h. p. motor to a 10 x 9-in. rolling mill and will run at 175 r. p. m., meshing into a 60-in. iron gear. Six armature pinions for the same motors were shipped by the company a short time ago. They are 12-2 3/4 in. diameter, 4 in. face, and will run at a speed of 525 r. p. m. The company has just made a shipment of 24 pinions to the Sao Paulo Light & Traction Co., Sao Paulo, Brazil.

THE CHICAGO BOILER CLEANER CO., of Chicago, St. Louis and Pittsburg, reports among the many "Famous" oil refiners and purifiers sold during the past month orders for the following: United States Post Office Bldg., St. Louis; Snoqualmie Falls Power Co., Seattle, Wash.; Seth Thomas Clock Co., Thomaston, Conn.; Colorado Ice & Cold Storage Co., Denver; Mercantile Library Bldg., St. Louis; Utica Light & Power Co., Utica, N. Y. (two); Peet Brothers Manufacturing Co., Kansas City, Mo.; Arcade Bldg., East St. Louis; W. H. Duer, Fon du Lac, Wis.; Bristol Brass & Clock Co., Bristol, Conn. (two). The manufacturer claims that the "Famous" not only eliminates all gritty impurities from the waste oil, but also extracts all extraneous water, pulp and volatile elements by its safe and proper temperature treatment, making the oil a high grade lubricant, and thereby securing good, reliable and extremely economical lubrication, reducing the oil bill and also reducing the wear, friction and repair bill. The company will be glad to supply particulars describing the various sizes and styles of this device, upon request.

THE B. F. STURTEVANT CO. is the successor to B. F. Sturtevant, of Boston, who over forty years ago established the first blower factory in the United States. Within a few years the necessity of providing independent driving for large fans led to the development of the Sturtevant fan engines. A little over ten years ago the increase in the use of electricity led the company to establish an electrical department and design a full line of fan motors. At this time the company has patterns for over 100 sizes and types of engines, from 2 to 250 h. p., and has sold over 8,000 engines. In motors the sizes range from 1 1/2 to 100 kw. The company has recently issued a handsomely printed engine catalog, No. 103, and a pamphlet entitled "What Uses Mechanical Draft"; the latter is a list of over 30 pages giving the names of several hundreds of the principal users of Sturtevant fans. The plans of the company so far as perfected for its new plant at Hyde

Park, Mass., contemplate an engine and electrical shop of gallery type 120 x 400 ft., two buildings each 80 x 400 ft. and three stories high for blowers, heaters, forges, galvanized iron work, exhaust heads, etc., and a foundry 120 x 400 ft. In addition independent office, power and pattern storage buildings are planned for. Fire-proof or slow burning construction will be the rule throughout and the fire risk reduced to an absolute minimum.

## NEW MICHIGAN COMPANY.

The Grand Rapids (Mich.), Belding & Ionia Railway Co., which projects an electric interurban line from Grand Rapids to Ada, Lowell, Saranac, Belding and Ionia, filed articles of association August 8th, and all rights of way over the proposed route were transferred to it. The following officers were elected: Thomas F. Carroll, president; Wallace Franklin, treasurer, and Joseph Kerwin, secretary. Mr. Carroll is vice-president, Mr. Franklin treasurer, and Mr. Kerwin secretary of the Grand Rapids, Grand Haven & Muskegon Railway Co. The three officers named will be the sole owners of the line.

The project calls for the construction of an interurban railway, 32 miles in length, at a cost of \$1,000,000, which amount is available to the promoters for immediate use, and the erection of stations and commodious buildings for the storage of freight at Belding and Ionia. Cars are expected to be in operation between Grand Rapids and Ionia within a year.

## UNIFORM BADGES.

The badges for cap and lapel are an essential parts of the uniform and our readers will be interested in noting the badge shown in the accompanying engraving; this has been recently originated by the Pettibone Bros. Manufacturing Co., of Cincinnati, and is not only decidedly unique but also a great improvement over the



old styles. Our illustration scarcely does justice to the design because it does not show colors; the badge has a gilt rank bar with "Conductor" in raised letters; the trade-mark has white enameled letters surrounded by a gilt line on a blue enameled background, making a very handsome appearance. The letters do not scale off as is the case with common badges, which have the letters filled in with black paint.

## LAKE SHORE TO THE CONVENTION.

As in the past, the Lake Shore Railway comes forward with a new plan for the convenience and comfort of the delegates who are to attend the Street Railway Convention at New York City. Appreciating the fact that Western delegates will wish to take advantage of this opportunity of visiting the Pan-American Exposition at Buffalo, the passenger department of the Lake Shore has planned to place special cars on the Lake Shore limited, leaving Chicago at 5:30 p. m. and arriving in Buffalo for breakfast. The party will leave Buffalo Tuesday evening, via the New York Central, arriving at the Grand Central Station, New York, early Wednesday morning. Tickets will be sold upon the certificate plan. This arrangement will permit a day's stop at the Exposition going east and also obviate a day's ride on the cars. By the payment of \$1.00 return tickets good for a ten days' stop at Buffalo may be had if desired. At Buffalo the St. Louis, Cincinnati and Southwestern delegates will be met and plans will be made so that their cars may be attached to the Lake Shore train, making a solid special from Buffalo to New York over the New York Central.

## NEWS NOTES.

## NEW CORPORATIONS.

**GREENVILLE, S. C.**—The Greenville Piedmont Traction Co., proposing to build a 12-mile electric line between the cities named in the title, has been incorporated with a present capitalization of \$100,000 which will later be increased to \$250,000. Pennsylvania capitalists are interested.

**EAST JORDAN, MICH.**—The East Jordan & Southern Railroad Co., capitalized at \$250,000, has been incorporated to build a 20-mile electric railway from East Jordan, Mich., to Bellinle. A. H. Frost and W. S. Porter, of East Jordan, are interested.

**BENTON HARBOR, MICH.**—The West Michigan Traction Co., capitalized at \$1,000,000, has been incorporated to build an electric railway from Benton Harbor to Dowagiac, Cassopolis, Decatur, Paw Paw and Kalamazoo, a total distance of 90 miles. The incorporators are eastern capitalists whose names have not as yet been given for publication.

**GALESBURG, ILL.**—The People's Traction Co. has been incorporated with a present capitalization of \$10,000, and proposes to build a street railway system in Galesburg. The local stockholders are: F. W. Latimer, L. W. Sanborn and Eugene B. Hardy.

**HARRISBURG, PA.**—Charters were issued July 20th to the following companies: the Monaca, Alliquippa & Corapolis Street Railway, capital \$72,000; the Beaver & New Brighton Street Railway, capital \$30,000; the Freedom & North Rochester Electric Railway, capital \$18,000, and the Union Electric Railway, capital \$6,000. William Redwood Wright, Philadelphia, is president of all. William H. Snyder, Philadelphia, and Theodore P. Simpson, Beaver Falls, are directors.

The following companies have also been chartered: the Urochian Street Railway, to build 3-mile line, capital \$18,000, and the Meadville & Interurban Street Railway, to build a 16-mile line. F. R. Shryock, Meadville, president. The McKeesport & Suburban Street Railway, to build a 2-mile line. H. B. Rhine, Bellevue, president; the Belt Line Extension Street Railway of Altoona, C. P. Baltzel, president; the Bloomsburg & Millville Street Railway, to build a 30-mile interurban line, C. W. Miller, Bloomsburg, president; the Conneaut & Erie Traction, to build a 25-mile interurban line, capital \$150,000, J. S. Cleve, Erie, president.

**MOUNT WACHUSETT, MASS.**—The Mount Wachusett Street Railway Co. has been organized with F. S. Coolidge, of Fitchburg, president; E. F. Blodgett, of Leominster, vice-president, and James A. Stiles, of Gardner, secretary and treasurer. Work on the proposed street railway system in Mount Wachusett will be commenced in the spring.

**WINDSOR LOCKS, CONN.**—The Windsor Locks Street Railway Co., capitalized at \$100,000, has been incorporated by Henry A. Huntington, H. H. Ellsworth, Leslie C. Seymour, H. C. Douglas and T. C. Perkins, to build a seven-mile electric line in Windsor Locks, connecting with the lines of the Suffield Street Railway Co.

**LITTLE FALLS, N. Y.**—The Mohawk Valley Traction Co., capitalized at \$80,000, has been incorporated to build an electric railway system in Little Falls. Among the directors are: Timothy Dasey, J. J. Judson Gilbert and F. G. Teall, of that city, and James D. Smith, of New York City.

**CLEVELAND, O.**—The Cleveland & South Lorain Traction Co. has been incorporated with a capital stock of \$500,000 by Charles W. Wells, James H. Burke, E. H. Richards, H. A. Beckerman and Frank W. Nowak to build an electric line from Lakewood to Lorain, passing through Cuyahoga and Lorain Counties. Reuben Hall and Calvin Pease, of Dover, are principally interested. The company will open offices in Cleveland.

**BATTLE CREEK, MICH.**—The Michigan Interurban Railway Co., with a capital stock of \$100,000, all subscribed and paid in, has been incorporated and proposes building a 40-mile electric line to connect Battle Creek, Coldwater and Union City. Battle Creek capitalists are interested.

**CHICAGO, ILL.**—The Spring Valley & Northern Railroad Co., capitalized at \$100,000, has been incorporated to build an electric line through Inverness, Lee and Ogles counties, to Spring Valley. The incorporators and first board of directors comprise: F. P. Blair, R. J. Cary, Bertrand Walker and Frank Johnston, Jr., all of Chicago.

**THE  
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#### CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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The four issues of the "Daily Street Railway Review" to be published at New York, October 9, 10, 11 and 12, will have their pages numbered consecutively with the regular monthly "Review" and the attention of our readers is particularly directed to the fact that each "Daily" should be preserved to make a complete file for binding.

The American Street Railway Association will next month meet in New York for the second time, after an interval of 17 years. In 1884 when the third annual convention was held at one of the New York hotels, the association had 15 members from the territory which now forms Greater New York; ten of these companies were in New York and five in Brooklyn, and of course all of them were horse car roads, though the Third Avenue R. R. was then building a cable line and cable cars had been in operation on the Brooklyn Bridge for fifteen months. Naturally the members were most interested in horse subjects, but two short reports were presented on mechanical traction—one on electricity and one on the cable, the latter by Mr. C. B. Holmes, president of the Chicago City Ry., which company had the first cable street railway line built east of the Rocky Mountains. Notwithstanding the remarkable changes which have taken place in the street railway system of New York, it is yet the only large city in this country where the management is interested in the problems discussed 17 years ago, the Metropolitan Street Railway Co. having 122 miles of horse railways at this time, approximately one-third of the horse mileage of the country.

Today there are but four members of the Association from Greater New York, though it is scarcely necessary to say that these four are vastly more important than the 15 members of former years; in fact the Metropolitan Street Ry. includes the ten New York members of 1884 and about 20 other companies, and the Brooklyn Rapid Transit includes the five Brooklyn members and nearly 30 other companies. The other two Greater New York companies that are members of the association are the Coney Island & Brooklyn R. R. and the New York & Queens County Ry.

At the New York meeting in 1884, the subject of accounting was first considered by the association, a report on "A Uniform System of Accounts" being submitted by a committee which stated that it was of the opinion that what was wanted was a uniform system of operating expense accounts; the report included the system of operating expense accounts used by the Louisville City Railway Co. Reports on a "Standard System of Accounts" were also presented in 1892 and in 1894, but while recognizing the desirability of having accounting methods standardized the association did not take the matter up seriously. This work was left for the Street Railway Accountants' Association organized in 1897, which has accomplished most substantial and gratifying results in the last four years.

Until quite recently the supply men's exhibit was treated somewhat as a side attraction, and as no special time was set apart in the program of the association for visiting it, many of the delegates under the pressure of numerous business and social duties found their whole time taken up to the exclusion of the exhibits. Two years ago an effort was made to remedy these omissions by including a special day in the program to be devoted to the supply men, and at both the Chicago and the Kansas City meetings the last day of the convention was devoted to the examination of exhibits. The use of the last convention day for this purpose was found to be open to the objection that numbers of the delegates returned to their homes on the close of the business meetings without waiting until the close of the session.

This year the supply men's day has been fixed as the second day, the first and third being devoted to business sessions, and it will undoubtedly result in the exhibit receiving the full attention which it merits.

In the article on "The Interurban Railway as an Investment" which we publish in this issue, Mr. Guy Morrison Walker clearly states some of the principal reasons why the securities of electric interurban companies are desirable investments and deserving of more consideration than they have heretofore received at the hands of bankers and trust companies. It is shown that the capitalization of the electric lines is far less per mile than is the case with their steam competitors; that the earnings per mile are larger on the electric roads notwithstanding that the passenger fares are on the average one-third less; that the ratio of operating expenses to earnings is substantially (in cases cited from one-fifth to one-fourth) less for the electric than for the steam railways; and, above all, that this is done with a class of passenger traffic that the steam roads find unprofitable at the higher rates. Moreover the electric railways have the greater portion of their traffic for short hauls only and therefore are in less danger of a shrinkage of receipts during periods of general financial depression commonly known as hard times.

On interurban passenger traffic the superior terminal facilities of the electric lines and the more frequent service, as we have frequently pointed out, give them a great advantage over the steam roads, even were capital charges, fares, and operating expenses the same for both.

The figures on the relative costs of operation given by Mr. Walker are strikingly confirmed by the last report of one of the London urban railways. The City & South London underground during the first half of the present year operated for 52.4 per cent of its receipts including the cost of operating the elevators at its stations; not including the elevators the cost was 47.3 per cent of the earnings, as against 70 per cent for the steam railroads of the country.

The attitude of bankers towards the interurban electric railway is at present one of indifference; and the indifference is largely due to the want of information as to the merits of enterprises. Most of the conservative bankers will not accept as collateral any securities not listed, and those interested in electric interurban companies (with a few notable exceptions have heretofore been unwilling to make public the information that is necessary in order to have their securities listed. Sometimes the reasons which cause managers to withhold information as to receipts and operating expenses are widely different; we recall two instances where the officials believed that the showing was not good enough to publish, because the reader would not appreciate various mitigating circumstances that existed, and in two other cases the managers were certain that the statement was too good, and feared that it might

invite competition in adjacent territory that they wished to occupy themselves. We cannot presume to say that in these particular instances the railway officials did not know their own business best, but if this class of securities is to take the position it deserves, the bankers and the investing public must be informed as to what the properties are actually doing. It is a most promising sign that many of the bankers who are not handling interurban securities at the present time are anxious to secure information on what this class of roads is doing, and express the belief that the time is not far distant when even the most conservative will have to take up the consideration of the subject.

The grade crossing accident at Chicago last month in which six persons were killed or fatally injured is a lamentable incident which strongly emphasizes the necessity of abolishing grade crossings of steam and electric roads where it is practicable to do so, and providing adequate protection in other cases. In this instance the crossing was safeguarded by gates operated from a switch tower and a flagman who signalled the approach of the train. On the part of the street railway the motorman was under orders to come to a full stop before crossing the steam tracks, and the conductor was instructed to go ahead of the car on foot and see for himself that the track was clear before signalling the car to cross, but in spite of all these precautions, which appear to be as complete as could be devised outside of interlocking apparatus and derailling switches, the accident occurred.

Absolute security against such catastrophes may be had by separating the grades at crossings. If it is not practicable to do this, collisions can be prevented by installing interlocked signals and derailling switches. The use of a derailling switch has been condemned as being merely the prevention of one accident by causing another. But the derails are used not to cause accidents, but to secure obedience to signals, and in practice they have been proved to work well. With a street car, derailment would not ordinarily be particularly dangerous to passengers, and in any case would be far preferable to a collision with a railroad train.

The abolition of grade crossings is not only to be recommended from a humanitarian standpoint, but, especially in the heart of a great city, it is advisable from the standpoint of economy. Where cars and trains are passing with great frequency a collision is almost inevitable sooner or later and the damages arising out of such accidents will in the course of time amount to far more than the expenses of construction in separating the grades. The safest way is unquestionably the best, and making such accidents impossible will ultimately prove an economy.

The difficulty of deciding upon a common system of electric traction for the Metropolitan and the Metropolitan District railways in London, which was mentioned in the issue of the "Review" for August, has led to a great deal of discussion of the question on the part of both the daily and the technical press in England, which has not, however, advanced in any degree the solution of the problem in which these two underground systems are involved. From the present indications it seems inevitable that the eventual decision of this question will rest with the board of trade, as the Metropolitan District company, controlled by Mr. Yerkes and his associates, is committed to the ordinary 500-volt direct-current system, while the Metropolitan company is firmly advocating the use of the Ganz three-phase system.

What would appear to be the most rational method of settling the question, namely, bringing both companies under one management, was attempted on the part of the Metropolitan District, but up to the present has failed. The Yerkes syndicate offered to lease and operate the Metropolitan system, furnish the entire electrical equipment for the road and guarantee a net yearly revenue sufficient to pay all of its fixed charges and a dividend of  $3\frac{1}{2}$  per cent on the common stock. This as well as another offer from the District company having been rejected by the Metropolitan company the two roads are enjoying a respite of one month, presumably to be devoted to meditation, which the parliamentary committee allowed before the question will be decided by the board of trade. This delay appears as a peculiar phase of business management to the average American mind. The two companies together are said to be losing \$50,000 a week, and while the Yerkes syndicate is chafing

under a month's enforced idleness and a weekly loss of \$40,000, the Metropolitan directors, under whose administration the company is losing \$50,000 a week, are aggrieved that the delay was not fixed at four months instead of one. Since negotiations to bring the two companies under one management have closed, it is not clear what useful end can be gained from this long period of reflection. The reason for desiring such a delay is not clearly stated, but it is probably in line with the English policy of not plunging rashly into electric traction. It might be suggested that a delay of four years would be still more satisfactory, as this would perhaps enable the companies to obtain some data on the operation of the Ganz system in other places.

We do not by any means intend to disparage the Ganz system, but on the other hand believe that the time is about ripe for the application of the high tension alternating current to railway operation. At the same time it must be remembered that the Ganz system has not yet passed the experimental stage, and whatever merits it may eventually be found to possess are as yet an unknown quantity. The 500-volt direct-current system which it is proposed on the one hand to use in use on thousands of miles of electric railways and its capabilities are well known, while on the other hand for one of the most important systems in one of the most important cities in the world, where trains are operated under the closest headway, to install a system which has not been proved on any considerable scale or for any considerable time seems a species of business recklessness quite at variance with the well-known spirit of British conservatism.

There is also an interesting feature connected with the method of arbitration which was laid down by the parliamentary committee. The special tribunal to take evidence and report to the board of trade on the system to be adopted is to consist of three members, one electrical engineer representing each of the companies, and an arbitrator who is not an electrical engineer, the latter qualification being imposed for the reason that all engineers were supposed to have made up their minds on the subject in advance.

The selection of a man who knows nothing whatever about the subject to act as an arbitrator between the companies it would seem must certainly lead to an entirely impartial decision on the subject, but we think an equally intelligent decision might be reached by allowing the representatives of the two companies to settle the matter between themselves by the throw of a die.

One of the leading English technical journals which, by the way, has expressed the hope that "some day, perhaps, our grandchildren may celebrate the inauguration of electric traction on the Inner Circle," has been so much disturbed by the possibilities of similar disagreements on a far larger scale, in the future, throughout the railway world, that it sees only lamentable clashing between systems and general chaos among the railways unless Parliament at once draws up a set of standard electrical specifications to which all railways must rigidly adhere. Other journals have published leaders decrying a parliamentary standard for electric railways on the ground that such an action would necessarily check all future development in this field.

We trust that the differences between these two companies may be settled in time to check the forebodings of the technical press, from which we judge the cause of electric traction in that country may be set back still another generation behind the times.

For several years the street railway companies of various cities have had in service special observation cars which make regular trips over routes which were carefully laid out so that a passenger is taken through the most interesting portions of the city. Wherever these cars are operated they have been well patronized and greatly appreciated by residents as well as visitors in the city. Among the cities having observation cars is Quebec, and we regret to note that opposition of hackmen and liverymen has been so strong that the company has decided to discontinue its special service. Doubtless similar opposition was made in the American cities by the horse-owning interests affected but for some reason it has had less effect this side of the border. Funeral cars on street railways have been placed under the ban by undertakers and liverymen, but they have come to stay, and it may be safely predicted that no improved service which street railways can furnish at a lower cost to patrons will ever be successfully opposed for any length of time by special interests that may be adversely affected.



## Traffic and Traffic Conditions on Manhattan Island.

### A Historical Review of Street Railways in New York City—The Phenomenal Increase in Traffic and Growth of the Transportation Systems from the Time of the First Stage Line.

Although Broadway was among the last of the great thoroughfares in New York City to have a line of tramways, the Madison Ave. horse car line having been laid in 1830-32, and the Third, Sixth and Eighth Ave. lines in the early '50's, Broadway was and still is the back bone of the Metropolitan system. An investigation into the present street railway transportation conditions of Manhattan Island may very properly therefore begin with an examination into the conditions as they have existed and as they now exist on Broadway. In truth the story of this division is the chief chapter in the history of street railway development in New York.

To go back a hundred years, Broadway in 1800 was a quiet residential street up to what is now Eighth St., and above that point it was a lane through a prosperous farming country. At the corner of Houston St., a stone set in the curb conveyed the interesting information "2 miles to New York," and this stone, so the

sion of Broadway, and whose drivers in their reckless efforts to capture a possible passenger converted the street into a wild jungle of 'buses and vehicles, through which the pedestrian made his way at the risk of his life.

In 1850 Jacob Sharp commenced his efforts for securing a street railway franchise on Broadway. It took him 35 years to overcome the obstacles that were placed in his way, but he finally obtained his franchise and the story of how he did it is an important chapter in the political history of New York. The franchise was granted late in August, 1884, by 19 of the city aldermen, who met at 9 o'clock in the morning in response to a quiet word which was passed along the line the night before. A committee appointed by the Legislature to investigate all the incidents connected with this action, aided by the late Roscoe Conkling, reported that Sharp had allowed his enthusiasm to get the upper hand and had brought him-



A GLIMPSE OF NEW YORK'S SHIPPING—SOUTH ST. AND EAST RIVER.

story goes, was in evidence as late as 1890. There were a few shops on the west side of Broadway at Canal St. in the '30's, but in the main the avenue was given over to two and three story brick residences occupied by the elite of the city. In a modest frame house in Greenwich Village (now Varick and Charlton Sts.) the first Italian opera in America was given and was enthusiastically patronized by the fashionable set of lower Broadway.

Broadway's first transportation company was organized to run a single cart drawn by four large oxen from the Battery to the outskirts of the city somewhere below Houston St. This was in 1746.

Shortly thereafter, several regular lines of omnibuses were established and so rapidly did the city's trade and population increase that by 1850 Broadway had become overcrowded with vehicles, and at certain hours of the day was a place of excessive confusion and danger attended by detention of travel and injury to person and property. It is a matter of record that in that year a bridge was erected over Broadway at Fulton St. to furnish pedestrians with a safer method of crossing. This condition of affairs was brought about in a large measure by the intense competition of the dozen or more 'bus lines which had taken posses-

self under the ban of the state statutes by giving each of the aldermen two or three times his regular salary for attending the early morning meeting and passing the Broadway franchise. The franchise was declared valid a short time before Sharp's death.

Jacob Sharp, before he got all he wanted, committed a crime that placed him in the penitentiary, but the fact still remains that he was one of the shrewdest men the city has ever produced, and it was only through his persistence that the opposition of the influential stage companies and the wealthy residents of Broadway, including the Astors and A. T. Stewart was ever overcome. As early as 1852 Sharp in a memorandum to the New York Senate the Assembly pointing out the benefits that would ensue from the building of the road used these words:

"The unimproved lands now unoccupied for the want of proper means of communication with the business section of the city will be at once made available for residences, and the exhausting emigration to Brooklyn and other contiguous places will be thereby checked; the value of real estate thus situated will be increased, wealth created to sustain its part of the burdens of administering our city government, and taxation relatively diminished over the whole city. The real estate of the city pledged for the public debt,





THE SKY LINE OF LOWER NEW YORK SEEN FROM THE HUDSON.

This is the first view of New York obtained by visitors arriving over one of the many steam trunk lines having their termini on the Jersey side of the river. The sky line of this end of Manhattan Island has changed within the past eight years from a low and comparatively straight horizon line to its present rugged and irregular contour. The effect is imposing and impressive rather than pleasing from an aesthetic standpoint.

lying principally in that locality, will be vastly increased in value, and the means afforded of rapidly diminishing the debt of the city and finally, the laboring classes of the city will be enabled to acquire cheap and healthful residences within convenient access to business. The present system of public conveyance cannot be extended to keep pace with the constantly increasing demand for traveling facilities in this section, without greatly aggravating the evil of overcrowded streets; while a railroad affords a more complete economy of time and space than any other known method of travel, and is consequently, adapted to attain the required end."

This is sound logic even at this day and Sharp lived to hear the stoutest opponents of the railway confess that in spite of the way it was procured the road was of great advantage to the city.

When first applying for a franchise on Broadway, Mr. Sharp caused to be collected a mass of statistics which in the light of later day figures are exceedingly interesting. We reprint one of his tables showing the average number of omnibuses passing up and down Broadway per hour. The figures are averages of counts made on the 6th, 7th, 9th and 10th of August, 1852.

Mr. Sharp, referring to his statistics, pointed out that the number of horse cars, each seating 80 passengers (it was intended to run doubled-deck cars seating 40 inside and 40 on top) which would be required to carry this same traffic, would be, for the down traffic, 26, and for the up traffic 35. He also proceeded to show that if a number of horse cars, namely 90, were employed, equalling only one-third of the number of omnibuses then required, the number of passengers that could be carried per hour would be, instead of 2,016 or 2,808, practically 5,400, with cars of 60-passenger capacity, or 7,200 with cars of 80-passenger capacity. These figures are interesting as showing how Sharp proved that any street railway, even a horse line, was better than the old system of transit. Strange as it may seem that any argument on this point was necessary, it is none the less curious to remember that it took practically the same amount of argument later on to prove the superiority of mechanical traction over the horse-drawn cars. But so is human nature.

From 1850 until the present time there has been going on a uniform and steady but tremendous increase in the city's urban

OMNIBUS STATISTICS OF BROADWAY.

Observed and recorded Aug. 6, 7, 9 and 10, 1852.

During the Hour Beginning at	Omnibuses Passing Chambers St.		Average No. of Passengers per Omnibus.				Total Number of Passengers Carried.				Total Number of all Other Vehicles Passing Chambers St.	
			Up.		Down.		Up.		Down.			
			At Chambers St.	At Canal St.	At Chambers St.	At Canal St.	At Chambers St.	At Canal St.	At Chambers St.	At Canal St.		
	Up.	Down.									Up.	Down.
	7 a. m. ....	189	251	1.78	2.94	5.66	8.87	335	407	1422	1465	161
8 " .....	220	270	2.36	2.75	7.46	11.50	526	418	2016	1914	256	618
9 " .....	263	265	2.72	4.60	6.52	9.50	717	796	1728	1616	375	460
10 " .....	233	249	3.38	5.63	5.62	8.14	789	941	1400	1314	418	468
11 " .....	228	239	4.72	7.13	5.10	6.72	1078	1215	1219	1144	396	478
12 m. ....	281	225	4.44	7.36	5.15	6.49	1245	1259	1160	1077	345	322
1 p. m. ....	201	226	5.31	7.00	4.95	8.38	1069	1134	1119	1223	354	326
2 " .....	196	244	5.88	7.12	6.02	7.90	1153	1175	1469	1225	414	454
3 " .....	240	234	6.04	7.85	5.01	8.08	1450	1246	1194	1273	431	485
4 " .....	237	220	6.53	11.13	4.62	6.42	1550	1837	1018	1143	490	401
5 " .....	254	233	7.29	10.51	4.30	5.58	1844	1724	1026	1006	638	274
6 " .....	271	256	10.36	10.83	3.25	4.26	2808	1788	833	720	370	88
7 " .....	240	250	10.31	11.71	3.36	3.73	2475	2050	840	665	71	23
Total for 13 hours ....	3053	3162	5.58		5.20		17039	15990	16444	15785	4719	4723

The complement of an omnibus was usually 12 passengers. The total licensed number of omnibuses for the lines entering Broadway was at this time 509. The total population of the city by the census of 1850 was 515,547.

From the table it will be seen that in 1852 the maximum number of down passengers conveyed per hour by all the omnibus lines was about 2,016, and the maximum number of up passengers 2,808, for which were used in the former case 270 omnibuses and in the latter case 271 omnibuses per hour. The total number of passengers carried per day of 12 hours was about 33,400, the number of 'buses passing a given point during the day being 6,200.

It therefore appears that 50 years ago 'buses were run in both directions on Broadway at 13 seconds intervals, almost as frequently as the Broadway electric cars are now operated. But the 270 omnibuses per hour, taking practically the same space and making infinitely more confusion could carry when crowded, a little over 3,200 passengers. The cars now passing up lower Broadway per hour frequently carry 25,000 persons.

and suburban population on the one hand, and on the other an honest and energetic endeavor on the part of the existing transportation companies to meet with improved facilities, the demands placed upon them by this tremendous and unparalleled volume of traffic, a volume be it said that now surpasses that of any city in the world in size and in the adverse conditions under which it must be handled.

In 1855 with four street railroads in operation on Manhattan Island there were carried 18,500,000 passengers; in 1860 the number of street railroads had increased to six and the passengers carried to 36,500,000; in 1865 there were 12 roads and the passengers carried numbered 82,000,000.

By 1870 the conditions had become well-nigh intolerable. The long and narrow form of Manhattan Island left but one direction in which the increasing population could spread, namely to the north, and so fast did the tide set in that direction, that by 1870 the surplus population had then begun to overflow onto the mainland above the Harlem. By common consent and the law of nat-

nal selection the lower end of the island was given over entirely to the business and office life of the city; just to the north of this section and merging into it was the shopping district, and all to the north of this from the East River to the Hudson became the residential territory. These then were, and for that matter to a great degree, still are the conditions.

During the greater part of the day the transportation lines were fully able to handle all the travel presented, but when the two great surges of traffic, the one from the residential section down to the business section in the morning and the other in the opposite direction in the evening, struck the narrow channels of travel the results were disastrous and the transportation lines were overwhelmed.

In 1875 the Legislature created a Rapid Transit Commission, whose mission it was to work out a scheme for increased facilities in the metropolis, and it is to this board that New York owes the present system of elevated railroads. The first section of the elevated had been built in 1871-2, and after due examination the commission endorsed the system and recommended its adoption.

In 1871 the number of passengers carried on all the surface and

Soon after the year 1800 the surface companies, viewing with increasing alarm the rapidly enlarging volume of passengers that was being attracted by the higher speeds and better service of the elevated roads, began to cast about for some means by which they could improve their own properties and so check in a measure the tide of travel that was turning toward the "road on stilts." In 1892 the old "Huckleberry Road," now the Union Ry., received permission to put up the trolley in the district of the Bronx, but to the overhead wires Manhattan Island was forbidden ground. All the king's horses and all the king's men couldn't secure a franchise for a trolley road below the Harlem, and many were the financial kings that tried it.

Finally in 1893 the cable as a solution for the problem came to the front and the Broadway and Third Avenue lines were soon converted for cable traction. But the cable was not deemed suitable for all the other lines. Thorough and expensive experiments were carried out with stored steam motors, with the Hardy and Hoadly compressed air motors, and with various systems of storage battery cars, in the effort to find a suitable substitute for the mules and horses. But they were all found wanting in some one essential



WEST WASHINGTON MARKET.

elevated railroads in New York was 1,388,070,000. In 1882, by which year the elevated service had been pretty thoroughly established, the total passengers carried had risen to 252,800,000, or an increase of over 80 per cent for the decade.

But the labor of the Rapid Transit Commission was but working round the links of an endless chain as far as results were concerned, for no sooner were the increased facilities in running order than the suburbs of the city at once became the Mecca for thousands of new home-seekers, increasing in greater proportion the number of people to be carried to and from their business and soon the conditions were worse than they had been previously. By 1892 the annual number of passengers carried had increased to 453,200,000.

In the meantime most of the main north and south avenues had been laid with street railway tracks, all of course operated by animal traction. Sharp had secured his Broadway franchise in 1884 and the Broadway line quickly became the chief factor in the transportation situation because it entered directly into the heart of the business section. There had also been built a number of cross-town lines which acted as feeders to the main lines and served the

particular. Thus it came about that by reason of the opposition to the trolley the close of the last decade found New York, the metropolis of the Western Hemisphere, and Washington the nation's capital, the only two cities in the country dependent upon equestrian power for the operation of their street cars.

In 1896 came the experiments with the conduit electric system on Lenox Ave. The system, proving itself practically a success, in spite of its several disadvantages, at once became an important aid in the solving of the Rapid Transit puzzle. The electric conduit was extended to other lines of the Metropolitan company, which in the meantime had been acquiring by purchase and lease, the other street railway properties of the city, and so the surface lines found themselves not only able to secure the lion's share of the increasing travel, but also to attract so large a part of the former elevated railway patrons as to force the elevated company to face a very serious situation, in short, nothing less than bankruptcy.

As a measure of self-defense and a bold counter stroke we find the elevated company at the beginning of the present decade, equipping its entire 110 miles of system with the third rail electric mode of operation, and as a cross-counter move the cable on Broadway

and Third Avenue surface lines is abandoned and the electric conduit substituted.

And so we come to the present rapid transit problem.

By the census of 1900 the population of Greater New York is 3,437,202, of which 1,850,093 people live on Manhattan Island; 200,507 are in the Borough of the Bronx; 152,999 are in the Borough of Queens; 1,166,582 are in the Borough of Brooklyn and 67,021 live on Staten Island or the Borough of Richmond. The average increase in population of Manhattan Island for the past decade has been 3.5 per cent per annum, or 35 per cent for the 10 years. The average number of inhabitants per square mile in the Borough of Manhattan is 84,000; in the Borough of Brooklyn 15,000, and in the Borough of Queens 1,270.

In 1894 the Legislature appointed a new Rapid Transit Commission with vastly increased powers and laid upon it the burden of attacking the new situation. This board found the conditions very nearly identical with the situation that its predecessor of 1875 had been called upon to face, but with all the difficulties vastly aggravated. During the middle hours of the days the transportation lines were able to give a fairly satisfactory service, but just so soon as the morning and evening rush came on, the combined facilities of the elevated and surface roads could not begin to move the traffic with the speed and comfort that the public demanded and had the right to expect in a city with the rating of New York.

The commission struggled long and hard, being beset with a mass of legal technicalities as well as engineering difficulties, but the beginning of the 20th century finds New York's underground rapid transit road one-third completed and within two years of actual operation.

What are going to be the effects upon the existing transit lines? Will the new underground road pay, and has the rapid transit problem in New York been solved? To these queries there can be but one answer, "time must tell." For even the experts who are most directly interested can not agree as to what the results are to be. There are those who hold that the surface lines by virtue of their cross-town feeders, their greater "accessibility" with reference to the sidewalks and their smaller and therefore more frequent units, will secure all of the large and more remunerative short haul traffic, as well as retaining a goodly portion of the long haul travel. These critics hold that the underground road will not pay interest charges on the \$35,000,000 of bonds, for the satisfaction of which the city of New York has pledged its credit.

On the other hand the optimists stoutly maintain that the tunnel road will have all the business, by reason of its larger, more comfortable and faster units. In refutation of the charge of inaccessibility they point to the plans for the underground stations, the platforms of which will, with one or two exceptions, never be in excess of 14 ft. below the street surface and reached from convenient points in the sidewalks by easy stairways. They go on to say that when the people realize that they secure a railway well lighted, well ventilated, with a temperature cool in summer and warm in winter, whose operations at all times will be constant and free from interference by fires, congestion of street traffic, fogs, snows, or the other causes that so frequently interfere with the surface and elevated lines, a new era in urban transportation will have been begun.

To the disinterested observer, a condition midway between these two predictions seems to be the probable outcome. Both the underground and the surface lines will unquestionably attract certain classes of patrons which will use one or the other means of travel exclusively. But there should be enough for both. And above all other arguments remains the likelihood which is almost a certainty that by the time the underground road has been completed and the improvements on the surface lines finished, the normal growth of the city will furnish a lucrative business that will tax to the utmost the facilities of both routes. In three years' time the city will be brought face to face with the same old conditions. No less an authority than William Barclay Parsons, chief engineer to the Rapid Transit Commission, has made public declaration of his belief that for New York there is no such thing as a solution of the rapid transit problem. In his own words, "the city is very much like the victim of the opium habit, who needs more of the drug the more he gets."

Just what part the elevated roads will play under the new conditions, not even the experts care to forecast. The owners of these roads while not making any public declarations have evidently not lost faith in their properties, for the work of electrical equipment,

including the erection of a mammoth new power station is going uninterruptedly forward.

Another scheme now attracting general attention is one for bettering the transportation facilities of that class of travelers to and from New York known as the daily "commuters" whose numbers have increased enormously during the past decade. This suburban passenger traffic is nearly all drawn from two states, New York and New Jersey. In New York it comes from Westchester and Rockland counties to the North, Queens and Nassau counties on Long Island to the east, Richmond County (Staten Island) to the south, and from Bergen, Essex and Union counties, in New Jersey, on the west. The number of commuters living in this "Metropolitan District," (an area having a radius of 50 miles from the New York City Hall), who come to Manhattan Island every working day of the year, is now estimated to be upwards of 200,000. By far the greater part of this traffic is handled by steam roads, one on Long Island, one on Staten Island, four entering Manhattan from the North, and eleven New Jersey roads having their terminus on the western bank of the Hudson River. With the exception of the four roads from the north, all of these routes are compelled to transfer their passengers to the city over some one of twelve or fifteen different ferry lines plying across the Hudson and East Rivers, and across New York Bay from Staten Island.

The Rapid Transit scheme includes at least three tunnels under, and three new bridges over the East River to Brooklyn, and two new bridges and one or two tunnels connecting Manhattan with New Jersey.

Of the East River tunnels, one will be under the jurisdiction of the Rapid Transit Commission. This undertaking has been approved by the Mayor and the franchise awarded. Its general route will be from the Rapid Transit loop at the City Hall on Manhattan; under Broadway to the Battery; thence under the East River to Brooklyn; and thence underground to Borough Hall and Fulton St., and on to the Long Island R. R. station at Atlantic and Flatbush Aves.

A second tunnel is projected by the Long Island Extension Railroad Co., which is understood to be controlled by Pennsylvania R. R. interests, which interests also control by recent acquisition the Long Island R. R. The route of tunnel is from the Long Island tracks at Thompson Ave., Borough of Brooklyn, under the East River to a point near 34th St., on Manhattan Island, and thence underground to Seventh Ave., where it will open into the main Rapid Transit tunnel, giving the Long Island R. R. a through connection into the heart of the metropolis.

A third tunnel is proposed, beginning at Beckman St. and crossing under the river to some point in Brooklyn. The enterprise is projected by a company incorporated as the New York & Brooklyn Railroad Co., but the plans are still in an unsettled and indefinite state.

Of the new bridges the "New East River Bridge" has taken very tangible shape and is about half completed. It is nearly a mile above the present Brooklyn bridge and when opened will immediately afford great relief to that nearly overloaded structure. The plans provide for two carriageways, four electric railway tracks, two elevated railway tracks and two foot walks. The bridge is erected on the "suspension" plan with an extreme length between terminals of 7,200 ft. and a total length of main span, between the two towers, of 1,600 ft. The minimum height of bridge above mean high water for 200 ft. on each side of the center of the main span is 135 ft.

Foundations for a third bridge still further up the East River have been located and construction work is in progress. The central pier for this structure will rest on Blackwell's Island.

On the Hudson River tunnels and bridges little has been done beyond the preliminary surveys for one of the bridges, but it is affirmed that the next few years will see most of these projects under way.

In line with these improvements should be mentioned the changes to be made in the New York Central tunnel which enables the Vanderbilt roads to reach the heart of Manhattan Island at 42d St. The poor ventilation in this four-track subway has always been a source of annoyance to the public and to the New York Central management. Lately the question of a motive power which will leave no products of combustion in the tunnel has been brought forward, and official statements intimate that electricity or possibly some form of compressed air motor will soon displace the steam locomotives at present used in the tunnel.



## The Metropolitan Street Railway System.

Development of the Company through Consolidations—History of Cable Traction and the Underground Electric Conduit—Some of the Operating Conditions—Statistics on Traffic—Mileage and Equipment—The New Power House—Officers and Operating Staff.

The Metropolitan Street Railway Co., which was organized in 1893, has gradually, by successive consolidations of companies, leases of properties, and purchases of securities, secured control of all the surface street railways in the Boroughs of Manhattan and the Bronx. Some idea of the manner in which this immense system has been evolved is had from the accompanying table which gives the names of the underlying companies, the dates of their organization and the dates on which they passed under control of the Metropolitan.

In 1893 the Metropolitan system comprised about 113 miles of track all of which was operated by horses. At this date the other surface railways on Manhattan Island aggregated about 156 miles of track all operated by animal traction except the 125th St. line of the Third Avenue R. R., which had been converted for cable traction in 1885 and 1886; the main line of the Third Avenue road was then being converted for cable and was put in operation in 1894, making at that time 23.38 miles of track. In 1893 the Union Railway Co. operating in territory north of Harlem River, and the companies since acquired by it, had 23.5 miles of overhead trolley road.

Construction work on the Broadway cable line had been in progress for some time when the consolidation was effected and on July 8, 1893, the first cable, from Houston St. to Bowling Green was started in service; eleven other cables were added at short intervals on the Broadway, Columbus Ave., and Lexington Ave. lines, the last one being started in service June 19, 1896.

By the time the New York cable roads were in operation it had been demonstrated elsewhere that electricity was far superior as a motive power for street railways and the New York companies were desirous of finding a reliable conduit system, the overhead trolley being prohibited on Manhattan Island. In April, 1894, contracts were made with the General Electric Co. for the installation of an open slot electric conduit on the Lenox Ave. line, and by the middle of the next year this line was in operation from 116th St. to 146th St. and giving satisfaction. This conduit (which was illustrated in the "Review" for 1894, page 787, and 1895, page 401), was designed for a cable road so that the electrical conductors could be removed and a cable installed in event that electric operation should prove a failure.

A trial of over a year and a half having convinced the management that the electric conduit was entirely satisfactory, in the later work the design of yokes was changed, being made shallower, so as to avoid the excessive amount of excavation necessary in the first construction. The new design of yoke was illustrated in the "Review" for 1897, page 248. By the end of 1897 the Metropolitan system (including the Central Crosstown and Second Avenue roads, controlled by the Metropolitan) comprised 231 miles of track of which nearly 200 miles was operated by horses. The mechanical traction lines at that date were:

	Miles.
Broadway, cable .....	10.20
Columbus Ave., cable .....	6.52
Lexington Ave., cable and electric.....	8.62
116th St. and Manhattan Ave., electric.....	3.76
Lenox Ave., electric .....	3.02

The Third Ave. R. R. in 1895 contracted with the Love Co. for a section of underground conduit nearly half a mile long, and this was completed in 1896. In July, 1898, The Third Avenue company decided to change all of its system on Manhattan Island to conduit and this work on the main line was completed in 1900, after the Metropolitan has secured control of the system. The 125th St. Crosstown line was the first section to be opened, the first through conduit car being run Sept. 28, 1900. Oct. 22, 1900, the Third Ave. line from 116th St. to 65th St. was opened, and on Nov. 24, 1900, through conduit cars were operated from the Harlem River to the Post Office.

In the meantime the Metropolitan company had continued the

work of installing electric conduits on the principal lines and in May of the present year the Broadway, Columbia Ave. and Lexington Ave. cables were taken out, the last section being changed May 26th. The first through conduit car was run on the evening of May 26th, and regular operation commenced May 27th.

The system now comprises 457.6 miles of track divided as follows: conduit electric, 156; horse, 122; storage battery, 4.6; overhead trolley, 175. The chief features of the track construction are pointed out in the article by Mr. W. B. Reed, engineer maintenance of way, published on another page.

A feature of street railway operation on the Island of Manhattan, and one believed to be exceptional in this country, is the persistence with which certain well defined principles have been operating to bring about the present traffic conditions. In other words, the



H. H. VREELAND,  
President Metropolitan Street Railway Co.

present Metropolitan rail section, the four standard types of cars, the transfer arrangements, the running times and schedules, and in truth, the mammoth new power station, are all the outcome of several positive conditions that have practically left no other alternative of method, shape or design. For instance, cars are built of a certain length and a certain width because if they were longer or broader by the fraction of an inch they would not pass trucks on the narrow down-town streets, nor would they take certain curves without striking each other or the elevated railway posts. The number of cars on many of the lines, and therefore, the running headways are determined by the rapidity with which cars can be run in and out of the terminals or across certain important intersecting streets, the question of filling cars with passengers not entering into the situation at all, because it is known that during the rush hours every car that can possibly be put on the streets will be crowded to its utmost capacity. In the case of the new power house, the scarcity and high cost of the available real estate left practically required the installation of one main high tension station as has been done. It would almost seem that the very immensity of the Metropolitan's traffic has saved it from many of the petty and vexing problems that the manager of more limited sphere is called upon to meet. This, be it understood is not minimizing the great problems that have been so perfectly solved in New York.

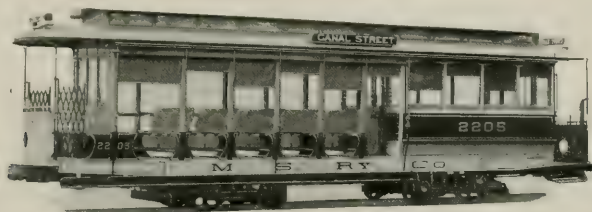


water-pipe would be limited by the diameter of the smallest valve in the pipe.

One of the most serious congestions of this kind, occurs at 23d St. and Broadway, where Lexington Ave. cars running at 20-second intervals have to be thrown in between the Broadway main line and Columbus Ave. cars, passing, often at intervals of 15 seconds, and this must be done without interrupting the 23d St. crosstown line, which intersects at this point with cars on 20 to 25 seconds headways. In this particular case advantage was taken of a widening of Broadway at 23d St. to lay a set of secondary or auxiliary.

The electrical equipment includes motors of various makes, but these are now being reduced to two standards, G. E. 1,000 for single truck cars, and G. E. No. 57 and Westinghouse No. 56 for double truck cars. About 100 of the Third Avenue cars are equipped with four motors to the car. The auxiliary car equipment includes "Providence" fenders made by the Consolidated Car Fender Co., "Sterling" brakes and "Sterling" fare registers made by the Sterling-Meaker Co., and "Consolidated" electric heaters made by the Consolidated Car Heating Co.

At the present time, there are four standard types of cars used



STANDARD COMBINATION CAR.



STANDARD DOUBLE TRUCK OPEN CAR.

curves which permit cars to switch from 23d St. line to the Broadway line with minimum delay.

Under headways as short as this it can be understood that one second must never be disregarded and it is interesting to notice some of the expedients resorted to, to gain even the least bit of time. For instance, all of the electric cars carry a "Providence" fender attached to each end of the car, in order to save the time that would be required if the fenders were changed at the various terminals. In the same direction switchbacks and cross overs are placed at stated intervals on all the lines, and a large percentage of the cars perform a "shuttle" service, caring for certain classes of short distance riders without running over the portions of the line where they are not required.

A general inventory of the rolling stock owned by the Metro-

politan system. These are a single-truck closed car, a double-truck closed car, a double-truck open car and a double-truck "combination car." There are also a few single-truck open cars. Views of these cars as built by the J. G. Brill Co. are shown herewith.

The single truck closed cars are 22 ft.  $\frac{1}{4}$  in. long, over end panels 5 ft. 11 $\frac{3}{4}$  in. wide at the sills, and 7 ft. 6 in. wide at the belt rails. The inside finish of the cars is of silvered white ash and the seats are veneered and covered with Wilton carpet. The cars are mounted on Brill No. 21-C trucks and have Sterling brakes, registers and sand boxes.

The double truck closed cars are 28 ft. over the end panels, 6 ft. 6 in. wide at the sills and 7 ft. 6 in. wide at the posts. The inside finish and trimmings are practically the same as the other cars.



STANDARD SINGLE TRUCK CLOSED CAR.



STANDARD DOUBLE TRUCK CLOSED CAR.

politan Street Railway Co. shows the following: long box cars, 744; short box cars, 719; combination cars, 200; long open cars, 435; short open cars, 331; sweepers, 43; snow plows, 12; sand cars, 18; storage battery cars, 50.

The larger portion of these cars are of the Brill type, the remainder having been supplied by the Stephenson Co. All the double trucks are the Brill "Eureka" maximum traction. The trucks for single cars were supplied by the J. G. Brill Co. and the Peckham Manufacturing Co.

The double truck combination open and closed cars are 36 ft. 1 $\frac{1}{2}$  in. long, over crown pieces 6 ft. 5 in. wide over the sills, and 7 ft. 2 $\frac{1}{2}$  in. wide at the posts. The open compartment has ash slat seats and backs, and the closed compartment has seats covered with carpet. This type of equipment in New York has proved extremely satisfactory to both the company and its patrons, as it is suitable for every day in the year. There are always certain classes of passengers who desire a closed car even in the warmest weather, and on the other hand, there are those who prefer an open car,



even with the temperature down to the freezing point. This car meets the wants of the smokers at all times of the year. It also enables the company to meet the requirements of a city ordinance requiring at least one closed car in four be run during both the summer and winter seasons.

The double-truck open car is of the standard 12-bench type, 35 ft. 11 in. over crown pieces, 6 ft. 9 in. wide at sills and 7 ft. 6½ in. at the posts. The car is finished in ash with ash slat seats and backs, bronze metal trimmings, pantasote curtains, entrance guards, push buttons and Sterling brakes, sand boxes and registers. These last three types of cars are mounted on Brill "Eureka" maximum traction trucks.

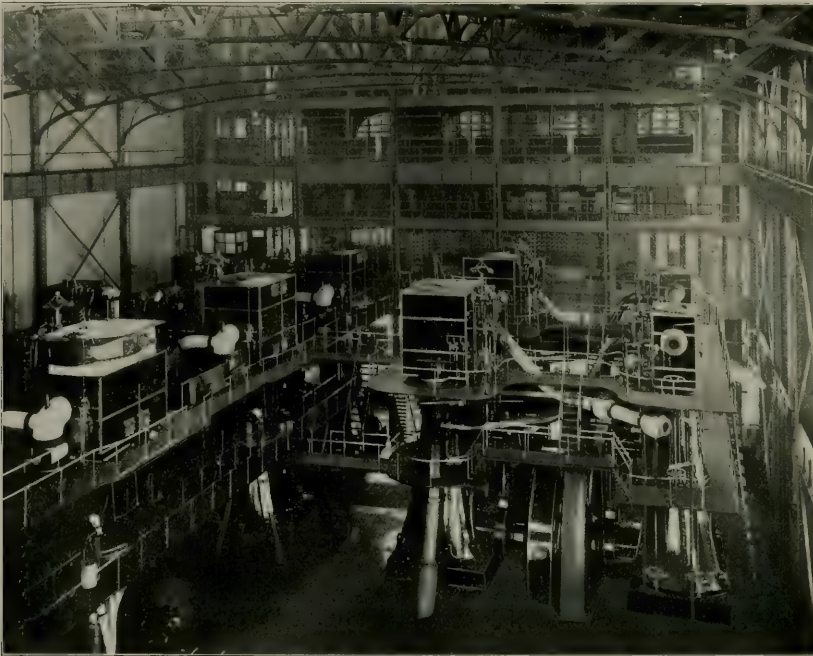
For compressed air operation on the 28th and 29th St. cross town line, the company used single truck closed cars built similar to the standard single truck closed cars described.

The Metropolitan Street Railway Co. does not handle United States mail, although the Third Avenue company up to a short

figures. The time limit is an hour, a. m. and p. m. figures being separate in order to lessen the probability of the conductor punching the wrong hour.

Some idea of the magnitude of this transfer business in New York will be had when it is known that the company is now issuing 500,000 tickets a day of which only about 8 per cent are missing when the returns are made up. On some of the lines one conductor will issue as many as 1,500 tickets for a day's run. There are about 450 different points where transfers are given out, a few of these still being retained as central transfer stations with an agent in charge to distribute the tickets. At other points the conductors issue the transfers when the fare is paid.

An innovation which the company believes will prove to be one of the great advantages to the public has just been instituted for handling some of the ferry and shopping district travel. This is the building of a new line to run as follows: From Fourth St. and Sixth Ave. north to 23d St.; across 23d St. to Seventh Ave.; north



INTERIOR METROPOLITAN POWER HOUSE AT 96TH ST.

time ago operated regular mail cars from the Post Office to Harlem. Since the Third Avenue system has been combined with the Metropolitan, however, this service has been discontinued and the cars previously used for the mail have been converted into express cars. The electric railway express service as now organized on the Metropolitan system was fully outlined in the "Review" for last month. The service has become exceedingly popular and is being rapidly extended.

Until quite recently the transfer privileges on the Metropolitan system were so liberal that passengers could ride all over the city for a 5-cent fare. With no intention of curtailing the legitimate transfer riding, but with the idea of doing away with some of the transfer abuses, the company has recently adopted a new form of transfer that was originated by the operating officials.

To obviate "circuit" riding the plan has been followed of printing the tickets in three colors, green for the north bound cars, red for the south bound cars and white for the crosstown lines. These colors are never changed. The tickets are dated for each day and bear the month and day of the week in conspicuous letters and

on Seventh Ave. to 42d St.; thence on Broadway to 65th St. and north on Columbus Ave. to 125th St. This new route will pass directly through the shopping district and it is believed will not only relieve the Sixth Ave. and other near by surface lines, but will also attract considerable travel now going to the elevated road.

#### POWER HOUSE.

The Metropolitan Railway Co. has the second largest power station in New York, which is located on the East River at 96th St. and was designed to have sufficient capacity to operate all the surface cars on Manhattan Island. The building is of steel skeleton construction with walls of yellow brick, and is situated on the river front in a location similar to that of the Manhattan station. The approximate dimensions are 201 ft. wide by 200 ft. long on 96th St. and 279 ft. long on 95th St. This area is divided into a boiler room and an engine room section by means of a longitudinal brick wall running through the building. Near the center of this wall the chimney, which is stated to be the largest one ever built, is located. It is 353 ft. high and 55 ft. square at the base, the

upper section being cylindrical tapering to 35 ft. in diameter at the top. Its entire weight is 8,540 tons. The whole of the building foundations are carried on 40-ft. piles spaced  $2\frac{1}{2}$  ft. between centers over the whole area, and upon these is a layer of concrete 5 ft. thick under the engine room and 7 ft. thick under the boiler house.

The boiler section of the building which lies on 95th St., contains three tiers of boilers on separate floors. There are 87 Babcock & Wilcox boilers in all, 29 being on each of the three floors. They are arranged in two rows facing a central aisle and the rows are broken at the center where the chimney passes up. These boilers like those of the Manhattan station are supported from the steel frame of the building and are independent of the floor. There are four smoke flues on each floor each having a damper where it enters the chimney, controlled by a Locke regulator. The boilers are designed to carry 200 lb. pressure, but are run at 160 lb. at present. Some of the boilers are hand fired, but the most of them are fitted with automatic stokers. The nominal horse power of the boilers is 250, but their ultimate capacity reaches 400 h. p.

Above the boilers are the coal bunkers which extend over the length of the building, and have a storage capacity of 9,000 tons. Coal is delivered by barges at the docks at 95th and 96th Sts. and between these docks is a coal and ash tower 135 ft. high connected to the boiler room by a bridge 52 ft. above high tide. There is a jib crane mounted on the tower which carries a bucket of  $1\frac{1}{2}$  tons capacity. This is operated by a small engine from the top of the tower which is supplied with steam from the boiler room. By means of this the coal is raised into a receiving hopper at the top of the tower from which it passes to a coal crusher, then to a weighing hopper and thence to a Mead conveyor which delivers it to the coal bunkers over the boilers. There are two parallel lines of conveyors which are operated by a steam engine, as is also the coal crusher. The coal bunkers have a W section and are of steel covered with concrete so that they are water tight and can be flooded in case of fire.

The ashes from the boilers fall through chutes into the basement. From here they are carried by another Mead conveyor to the second story of the building and dumped into the returning buckets of the coal conveyor which carries them to the tower on the river bank. From this they are discharged onto barges through a chute.

A separate surface condenser with independent combined air and circulating pump is installed in the basement for each engine. The condensing water is taken from the East River and the condensed steam after passing from the condenser through the air pumps is



HERALD SQUARE.

led to hot wells in the basement of the boiler room. There is a hot well for each engine and these are piped to two equalizing tanks from which the feed water is drawn for the boilers. In addition to the condenser connections four free exhaust pipes are provided, one at each corner of the engine room.

The engines which are eleven in number are of the vertical cross compound type and were built by the Allis-Chalmers Co., of Milwaukee. Their cylinder dimensions are 46 and 86 in. by 60 in. and they run at 75 r. p. m. giving a piston speed of 750 ft. per minute. They are normally of 1,000 h. p. each but can work for a short time up to 1,200 h. p. The field of the generators are mounted on the engine shaft between the generators. The receivers between the cylinders contain re-heating tubes, into which low pressure steam is admitted. A table comparing the steam apparatus of



WASHINGTON MEMORIAL ARCH.

This arch, located in Washington Square, at the beginning of Fifth Avenue, was completed in 1893, replacing a temporary arch of similar design erected for the centennial celebration of the inauguration of Washington as the first president of the United States, which took place at New York, April 19, 1789. The arch is exquisitely executed in marble and cost \$250,000, which was raised by popular subscription.

this station with that of the Manhattan station will be found on another page.

The generators which are of 3,500 kw. nominal capacity, are capable of standing an overload of 1-3 for several hours without overheating. This makes their ultimate capacity nearly 5,000 kw. They are of the General Electric revolving field type with stationary armatures, running at 750 r. p. m. and generating a current of 6,600 volts at 25 cycles per second. They contain 40 poles of laminated iron, which are bolted to a steel yoke ring. The current is distributed to six rotary converter sub-stations, one of which is in the main station and five distributed in different parts of the city. Each substation plant contains a transformer, rotary converter and storage battery plant and they are all uniform in design and capacity. The plans of the station were prepared under the direction of Mr. M. G. Starrett, chief engineer, and Mr. F. S. Pearson, consulting engineer. The work of installation was done under the supervision of Mr. Walter Pearson, electrical engineer, Mr. A. S. Mann, mechanical engineer, and Mr. William Low, civil engineer.

At this writing nine of the eleven units are running and the station is supplying, during the rush hours, electric power for about 1,650 cars, these comprising the entire surface street railway service of Manhattan Island.

In 1898 the Third Avenue R. R. awarded to the Westinghouse companies the contract for a power station to be erected at 216th St. and Ninth Ave. and contain 16 generating units of 4,500 h. p. each, a total rated capacity of 72,000 h. p., which would have made the largest traction station ever built. The lease of the Third Avenue road by the Metropolitan caused the project to be abandoned, and a sub-station will probably be located at this point.

#### OFFICERS.

The officers and operating staff of the Metropolitan Street Railway Co. are: President and general manager, H. H. Vreeland; vice-president, D. B. Hasbrouck; secretary and treasurer, Charles E. Warren; attorney, H. A. Robinson; auditor, D. C. Moorehead; assistant general manager, Oren Root, jr.; consulting engineer, F. S. Pearson; chief engineer, M. G. Starrett; engineer maintenance of way, W. B. Reed; electrical engineer, W. A. Pearson; principal assistant engineer, C. H. Jewett; mechanical engineer, J. D. Andrew; general master mechanic, Thomas Milten; architect, A. V. Porter; chief draftsman, C. E. Colby; track master, F. Greenwald; assistant attorneys, John T. Little, jr., Ambrose McCabe, D. W. Patterson, Sharon Graham, D. R. Almy, Marvin Wynn, Theo. H. Lord; stock transfer agent, R. L. Anderton, jr.; assistant treasurer, R. McKean Barry; appointment department, J. J. Swan; transfer ticket department, F. J. McGarey; superintendent of transportation, T. A. Delaney; chief inspector, James Parker; general car house foreman, George Robinson; general stable inspector, E. A. Flint; chief motorman, Frank Kane; division superintendents, John Sittler, H. A. Newell, J. J. Shea, J. J. Cahill; general foremen, H. Heppenheimer, Preston Enderly, A. Snyderup, S. J. Hill, C. H. J. Schwartz.



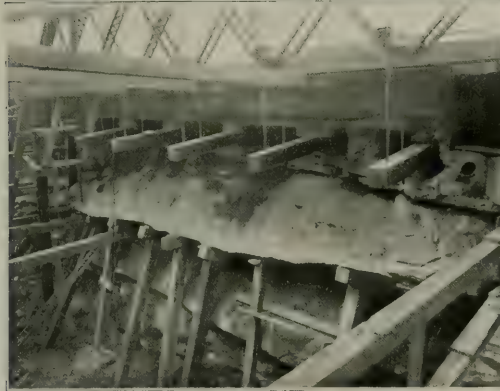
## The Rapid Transit Tunnel and Railway.

It is the purpose of this article to give a brief review of the work actually accomplished by the Rapid Transit Commission and a description of the tunnel so far as the plans have been perfected.

The present Rapid Transit Commission was created in 1874 by special act of the Legislature, which empowered the Board to make plans for a rapid transit railway for Manhattan Island and the Bronx, and to either sell a franchise to a private corporation, or else engage the city of New York in a scheme of municipal ownership and construction, the option to be determined by popular vote at a general election. The voters decided by a majority of more than three to one in favor of municipal control.

at sufficient depth below the street to avoid all pipes, sewers, conduits, building foundations and other of the sub-surface obstructions.

The second plan, and the one adopted, provides for a subway that is more nearly a covered trench than a tunnel, in the sense that the word tunnel is popularly received. The roof of the trench lies immediately below the surface of the street, or as near the surface as the grade and topography will permit. In some cases this roof forms the foundation for the street paving. The method is to open a trench of the proper width and depth and remove or rearrange all interfering gas and water pipes, sewers, etc.; the roof, of concrete



CONSTRUCTION VIEWS ON THE RAPID TRANSIT ROAD.

Under Columbus Monument.  
A Difficult Piece of Shoring.

At Madison Square.  
Conduit, Showing Roof Girders.

The Commission consists of the Mayor and the Comptroller of the City of New York, and the President of the Chamber of Commerce, ex-officio, and of five citizens named in the bill. The board is self-perpetuating, any vacancy occurring from any cause is filled by the vote of the other members.

The popular vote being in favor of a municipally-owned road, the Commission's engineers, under the direction of Mr. William Barclay Parsons, began the task of deciding upon construction details.

Two feasible but broadly differing plans of construction presented themselves and much preliminary work was done before the choice of method was made. One of the alternatives was to make the Rapid Transit road, in reality as well as name, a "tunnel" railway. In other words, to follow the London idea of underground railroading and place the tracks in metal-lined tunnels or tubes, built by boring or driving, without disturbing the surface of the ground, and

and water proof material, supported on girders is then put in place and the surface of the street restored. A deep level tunnel, according to the estimates, could have been built at a lower first cost and without the necessity of disturbing the sub-surface structures, but, on the other hand, the greater depth would have called for passenger elevators at all stations, a feature that would have made a very serious increase in the operating expenses. (In the case of the City & South London road the cost of operating elevators is 11 per cent of the gross earnings.)

The plan adopted, although involving the stupendous task of removing the various obstructions and perhaps being of more inconvenience to the people of the city during the period of construction, gives, when completed, a subway lighted in many places by daylight, through heavy glass in the sidewalks, and easily and in most cases automatically ventilated. But of supreme importance it gives a



level reached by a stairway corresponding in length and ease of use to a single flight of stairs in an ordinary dwelling house.

The practicability of the shallow construction has been substantially demonstrated in the work already accomplished. In pushing the digging it has been the plan to disturb but one-half of a street at a time, leaving the other half open to vehicles, so that the total inconvenience to users of the street has been very small.

Having settled upon the method of construction the Commission turned its attention to the route. As at first adopted the route followed Broadway from the Post Office, eventually branching to reach the extreme northern limits of the city on both the east and west sides. Unlooked for opposition was encountered on the part of the Broadway property owners, who finally defeated this plan by appeal to the courts.

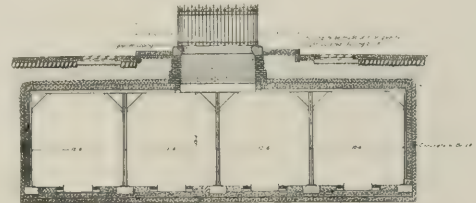
A new route, avoiding Broadway, was therefore projected. The system resembles a gigantic capital Y, with its main stem and each of its two branches of equal length, each seven miles long, making the entire road practically 21 miles.

The Y has its base resting at City Hall, on Broadway. Thence it continues with four tracks under Elm St. and Fourth Ave., north to the Grand Central Depot; thence west on 42d St. to Broadway, and north on that thoroughfare to 104th St. At this point the prongs separate, two of the tracks going east under a corner of Central Park to Lenox Ave. and thence north under the Harlem River, and northeast to Bronx Park, along Westchester Ave. and the Southern Boulevard. The western branch, also with but two tracks, continues north from 104th St. up the Boulevard by tunnel and overhead viaduct to Spuyten Duyvil Creek.

The engineers made a series of test borings, which constituted no insignificant undertaking. Borings were made every 20 ft. along the proposed route to 25 ft. below the surface. From data collected in this way and by close examination of thousands of maps and

in the area to be excavated. With this chart the Commission was ready to intelligently call for bids for actual work.

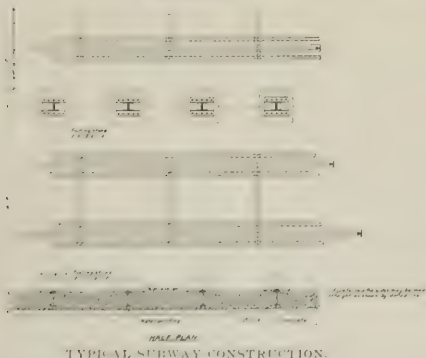
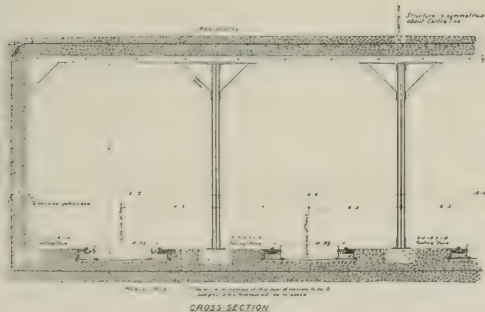
After some delay an applicant for the task of carrying out the plans of the Commission appeared in the person of Mr. John B. McDonald, a contractor of international reputation, who has probably carried to successful completion more large engineering enterprises than any other man of this age. His achievements include the building of 400 miles of the Canadian Pacific R. R., one of the



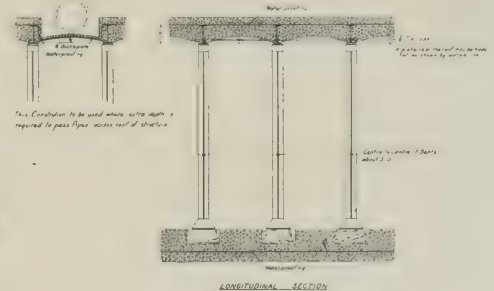
CONSTRUCTION ON BOULEVARD.

elevated roads in Chicago, nine miles of tunnel through which Chicago gets her water, the Baltimore & Ohio R. R. tunnel in Baltimore and the Jerome Park reservoir in New York.

Nov. 14, 1899, the Commission advertised for bids and on Jan. 16, 1900, awarded the contract to Mr. McDonald, subject to his providing acceptable sureties. Feb. 24, 1900, the contract for building and operating the road was signed. Mr. McDonald's bid for the entire subway was \$35,000,000, which the city raised on long term bonds.



records on file at the City Hall, a profile and plan were drawn showing the construction and condition of soil and rock for every section passed through, and the location of every gas and water pipe, main, sewer, compressed air pipe, wire conduit, street railway track and conduit and elevated pillar and building foundation lying with-



By the agreement Mr. McDonald has the privilege, after the road is completed, of operating the system for a period of fifty years, with the option of renewing the contract for a further term of twenty-five years at an annual rental to be adjusted by arbitration.

As soon as the road is completed the contractor shall pay annually into the city treasury a sum equivalent to the yearly interest on all the bonds issued for the construction of the road, and an additional sum equal to one per cent on the entire cost of construction. This one per cent is for a sinking fund, for the payment of the bonds.

When work on the subway has been two-thirds completed the contractor is to arrange for the complete equipment of the road, including power stations and rolling stock, so that when the subway is finished the road will be in entire readiness to operate.

The contractor is to buy and pay for this equipment, comprising everything, with the exception of the actual subway and roadbed, out of his private funds. At the termination of the fifty-year lease the city is then to purchase this equipment at a valuation to be fixed by arbitration.

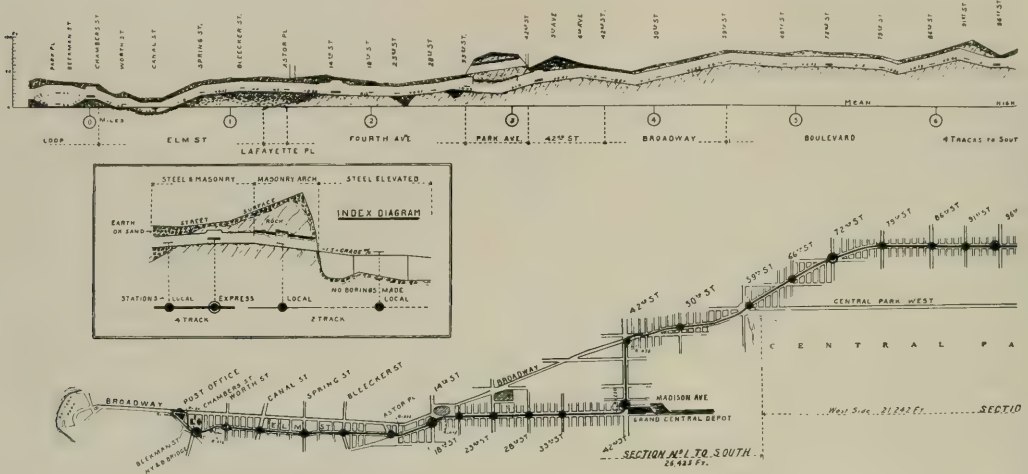
To guarantee the faithful fulfillment of his obligations, Mr. McDonald has given a bond of \$5,000,000, \$4,000,000 of which is furnished by the Rapid Transit Subway Construction Co., organized Feb. 19, 1900, of which Mr. August Belmont is president. The remaining \$1,000,000 is secured by bonds of four leading surety com-

panies of Philadelphia and New York. He has also deposited with the comptroller of the city \$1,000,000 in cash as a further and tangible evidence of his good faith. Moreover, Mr. McDonald provides another bond of \$1,000,000, which is given by Mr. Perry Belmont, as guarantee for the payment of the rental during the fifty years of operation. It is believed that never before has a great public work been so thoroughly protected against failure or possible mistake on the part of the contractor.

Mr. McDonald announces that he probably will not operate the

As soon as the contract was let the route was divided into fifteen sections, each of which was sub-let to a contractor, who agrees to complete his section in accordance with the main contract. Under this arrangement work was commenced simultaneously at many points along the route and has been pushed so rapidly and yet so smoothly that few persons in the city have realized that the subway is now nearly half completed.

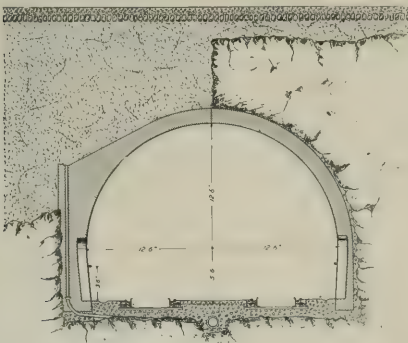
Although the road is called the "Tunnel Route," as before stated there are but two or three portions of the work that may properly



road himself, but will turn it over to the Rapid Transit Subway Construction Co., or to a new operating corporation to be financed later.

Actual work on the Rapid Transit tunnel was commenced on Mar. 24, 1900, when Mayor Van Wyck in the presence of members of the Rapid Transit Commission, public officials and a crowd of citizens numbering several hundred thousand, turned out the first shovelful of soil in front of the City Hall. The Municipal Assembly had appropriated \$5,000 for the occasion and the event was fittingly

be called tunnels. One of these is through the hill of Gneiss, on upper Broadway and 17th Ave., from 158th St. to a point near Fort George. This tunnel is two miles long, it being, next to the Hoosac tunnel at North Adams, Mass., the longest in the United States. Borings are in progress from headings at either end, and from two intermediate shafts, sunk 100 ft. to the floor level of the tunnel. Cuttings are made by compressed air drills and hoists taking air through pipes from a compressor plant erected on the Hudson River. This is one of the most difficult sections on the line.



DEEP TUNNEL NORTH OF 104TH ST.



PARK AVE. BETWEEN 33D AND 41ST STS.

celebrated. The spot in City Hall Park from which the mayor took the earth was marked by a commemorative tablet bearing the date, the contractor's name, and the names of the commissioners, as follows:

Alexander E. Orr, president; John H. Starin; Woodbury Langdon; George L. Rives; Charles Stewart Smith; Morris K. Jesup; Robert A. Van Wyck, mayor; Bird S. Coler, comptroller; William Barclay Parsons, chief engineer.

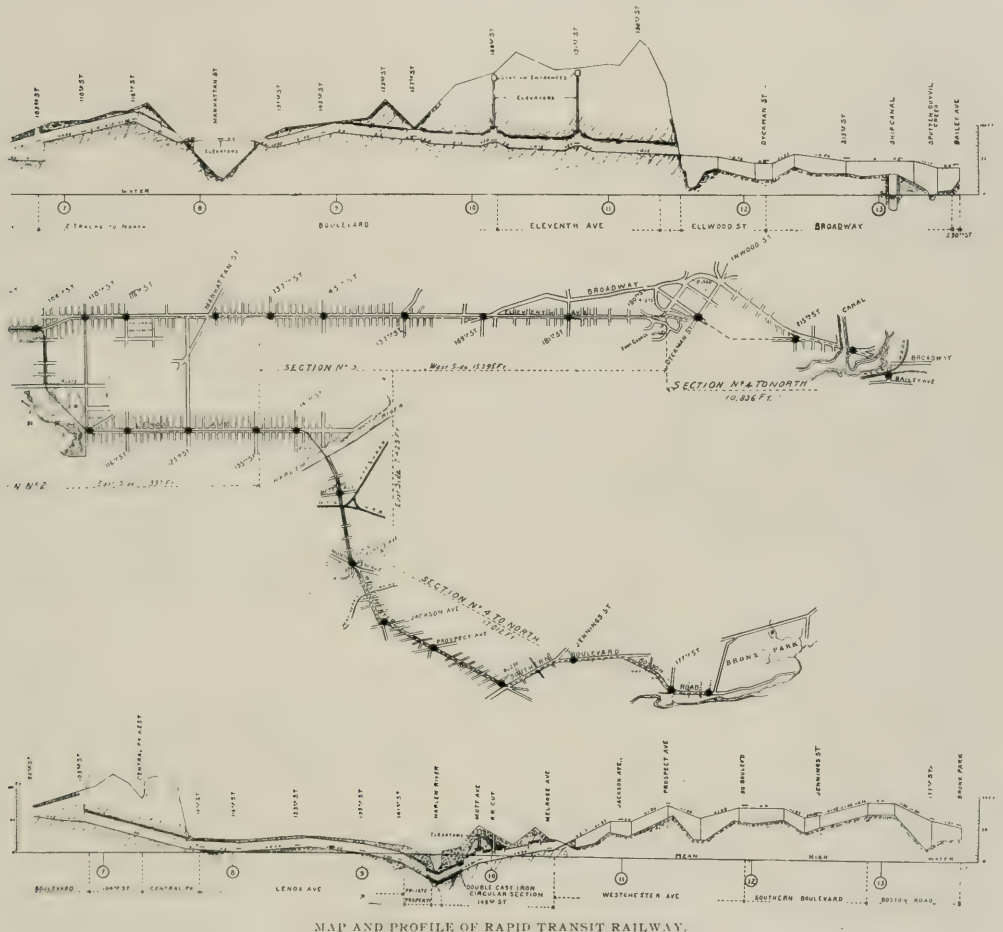
Another difficult piece of cutting was under Park Ave., from 33d to 41st St. Here the Rapid Transit tunnel drops below the present tunnel through which the conduit tracks of the Metropolitan Street Ry. are laid. It was necessary to shore up the existing tracks as well as the old tunnel foundations, a task, while not involving new principles of engineering, called for considerable care and delicacy to avoid interruption to the street railway service, cars being run here on 30-seconds headway.

Mr. McDonald, when asked regarding the prodigious difficulties involved in the tunnel work, replies that there are really no difficulties that cannot be overcome by intelligent and diligent labor.

Next to the tunnel work the most trying operations are removing, rebuilding and shifting the tangle of sub-surface pipes and

the relaying of three miles of water pipe, from 12 in. to 48 in. in diameter. There are 650,000 cu. yd. of materials to be excavated, of which one-half is rock.

The excavation is being carried on in 26 different openings, the openings being full width 54 ft. 4 in. and to subgrade.



MAP AND PROFILE OF RAPID TRANSIT RAILWAY.

similar underground obstructions. These must all be changed without interrupting the varied services. New levels for sewers and water pipes must be determined and new locations for the telegraph, telephone and high and low tension conduits found. At one point a sewer 9 ft. wide and 6 ft. high, which drained an area of 120 acres, was found directly in the path and had to be replaced by other channels.

Another "interesting" piece of work developed at Columbus Circle, Eighth Ave. and 59th St. The subway here passes under the Columbus Monument and three intersecting lines of electric conduit railway tracks. The entire surface of the circle, including the monument and the tracks, had to be carried on girders during the progress of the digging.

A representative section is the one known as No. 6, on Broadway from 60th to 104th Sts. The subcontractor in this case is William Bradley, of New York. The length of the section is 12,270 ft., the depth ranging from 20 to 45 ft., the width being 54 ft. 4 in. The contract for the section calls for the moving and rebuilding of one mile of sewers, varying in size from 15 in. pipe to 6 ft. brick, and

For hoisting material, four Lambert cableways of 350-ft. span are used as many openings, and at the others, derricks both guy and stiff leg are used, small cars and track being employed on the bottom of the cut to bring the buckets filled with excavated material to the derrick.

The tracks of the Metropolitan Street Ry., all pipes, subways, etc. are suspended by means of trusses while the material under them is being removed, so that the excavation is taken clear to subgrade without further support being necessary. When subgrade is reached for the length of the truss, posts are put in to carry the tracks, etc., and the truss is moved ahead a distance equal to its own length, and the operation repeated.

These trusses vary in length of span from 50 to 85 ft., 24 pairs being wooden "A" trusses, and 10 pairs being old iron railroad bridges. These trusses are particularly useful in rock excavation as they give a clear space for blasting without the danger of knocking out supporting posts.

A compressed air plant comprising three 24 x 30 in. Rand compressors is being installed on the dock at 76th St. and North



River. This will supply power to all drills and hoists between 60th and 82nd Sts., where the heaviest rock work is encountered. The rest of the section between 90th and 104th St. is worked by steam drills, taking steam from large stationary boilers placed at convenient points.

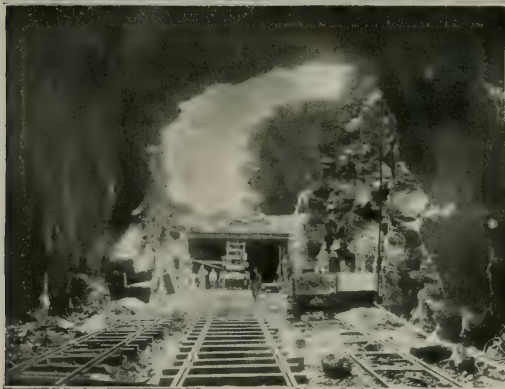
The most difficult features of the section are at 65th St., where the structure of the Manhattan Elevated Ry. has to be supported, and at 71st St. and Amsterdam Ave. where the rapid transit tunnel crosses under the street railway tracks. From 97th St. to 104th St. the tunnel is double-deck, the center tracks being depressed to avoid grade crossings with the outer tracks at 104th St., where the eastern branch of the tunnel leaves the main line. The lower tracks are 45 ft. below the street.

Most of the rock from the excavations is sent to the crusher at 86th St. and Broadway, and crushed to make concrete for use on

At present one relieving cut is used. After several months' trial with a top heading in the west tunnel and a bottom heading in the east one, the top heading has been abandoned and both the twin tunnels are now driven with bottom headings. The advantages are the reduced injury to the roof by blowing it down by horizontal holes, greater facility in working and reduced cost per cubic yard.

The upper ends of the two branches of the Rapid Transit road will be carried on elevated structures, aggregating 5 miles in length, and there will be a high steel viaduct half a mile long to carry the western branch over the Manhattan Valley on the upper west side. All the remainder of the road will be underground.

For the present the main line stops at City Hall, where is the terminal loop, but plans have recently been approved for continuing the subway down Broadway, and by tunnel under the East



CONSTRUCTION VIEWS ON RAPID TRANSIT ROAD.

Air Compressing Plant, Union Sq.  
Central Park Heading.

Broadway and 101st St.  
Broadway and 157th St.

other parts of the construction work. All riveting on the iron work is done with pneumatic tools.

In constructing the tunnels under Park Ave. the particular feature is the difficulty in blasting tunnels of such large section immediately under an old existing tunnel and adjacent to so much very valuable property. Concerning this Mr. Ira A. Shaler, the contracting engineer for this section, says: "The work has required most unusual and extraordinary care in the system of drilling holes to attack the face, and more especially in the system of blasting. Low grade explosives only are used and the charges so limited that no dangerous vibration is caused. The effect of the blasting is continually tested, so that there may be no doubt as to the amount of vibration caused. For a long time the main cut holes were relieved by two sets of shorter cut holes, one in front of the other.

River to a connection with the Long Island R. R. in Brooklyn Borough.

The general scheme for the seven miles of main line calls for four tracks, laid on the same level, the two inner tracks to be reserved for express trains, and the two outer ones for local trains. A striking feature of the design is the absence of all grade crossings. At the City Hall terminal where connection will be made with the proposed extension down Broadway, and at 104th St., where the branches divide, crossings at grade are avoided by depressing two of the tracks and carrying them under the other two. This layout with the scheme of terminal loops will make the continuous and uninterrupted running of trains as near a certainty as the present art of railroad will permit.

On the express tracks, subway stations will be placed at average

intervals of  $1\frac{1}{2}$  miles. On the outer or local tracks the stops will be more frequent, probably about four to the mile. The stations as designed are light and airy structures, illuminated by direct sunlight from heavy glass transoms in the sidewalks above.

The stairways will be seldom over 14 ft. in perpendicular descent and will be built with easy inclination. At stations designed for both express and local stops, island platforms will be laid in the center for the fast trains, and connection with the local platforms will be had by elevated bridges. A neat metal canopy on the sidewalk will cover the entrances to the stairways.

Care will be taken to insure perfect ventilation at the stations and in the subway, although it is believed that artificial ventilation will be necessary in but few sections. The stations are so close together, are so near the surface, and have such ample openings into the free air, that there can be but little chance for obnoxious

vapors or cellar air to accumulate. Moreover, the concrete base, walls and roof are amply provided with water-proof layers of felt and asphalt sufficient to insure perfect freedom from dampness. Where possible, as on the Boulevard, open space surrounded by grass plots will be left in the center of the street.

Early in September the Rapid Transit Subway Construction Co. began letting contracts for the equipment of the power station which will furnish current for the operation of the subway. The Allis-Chalmers Co. will supply eight engines which will be direct connected to alternators of approximately 4,500 kw. capacity; these engines are to be of the same type as those furnished for the Manhattan elevated power house. The Babcock & Wilcox Co. was given the contract for 48 boilers. At this writing contracts for the electrical apparatus, alternators, transformers and rotary converters, have not been let.

## Manhattan Railway Co., of New York.

The Manhattan elevated system, which comprises all the elevated roads on Manhattan Island and the Suburban Railroad north of the Harlem River, includes a total length of track of 109.57 miles. This is divided into four main north and south lines situated on Third, Fourth, Sixth and Ninth avenues. The company was incorporated Nov. 24, 1875, previously to which the Metropolitan Elevated Railway (Sixth Ave.) had been organized June 17, 1872, and the New York Elevated Railroad (Ninth Ave.) Jan. 2, 1872, the latter being the successor to the West Side Elevated Railroad, which was sold under foreclosure. The Metropolitan and the New York elevated roads were both opened for operation in 1878, and on May 20, 1879, they were both leased to the Manhattan company for a term of 999 years.

Under the first lease executed the Manhattan company agreed to pay interest on the \$10,818,000 6 per cent bonds of the Metropolitan Elevated and on \$8,500,000 7 per cent bonds of the New York Elevated. Besides this it was to pay an annual dividend rental at the

At the southern end the lines have all been extended to the South Ferry, where they terminate at one station. Here the traffic is so congested that it is impossible to operate the trains fast enough to accommodate the traveling public.

That feature of the Manhattan in which delegates attending the conventions will probably be most interested is the new power station, the largest yet designed. This station is located at 75th St. and East River, which is an ideal site for procuring condensing water, easy coal transportation, etc., and is but a short distance north of the center of distribution, which, however, is rapidly moving northward. The nominal capacity of the station at present being installed is 64,000 i. h. p. for continuous service, but this will readily permit of overloading to 100,000 h. p. for an indefinite period. This power will supplant that of about 225 locomotives, which burn over 225,000 tons of coal per year. The plot of ground upon which this building stands is 204 ft. wide, 588 ft. long on the north side and 531 ft. long on the south side, this difference being due to the angle at which Exterior St. crosses 74th and 75th Sts. Exterior St. follows the water front on which the station faces. The side walls of the building rise 66 ft. above the sidewalk and are surmounted by a parapet. The walls are of granite to a height of 26 ft. and above this are of brown Pompeian brick with string courses of ornamental moulded brick. The windows are 14 ft. wide, 45 ft. high and are spaced 35 ft. apart. The site of the building is underlain with a bed of rock and no piling was required. The building is of steel construction and self supporting, independently of the walls, the steel columns resting on cast iron bed plates which are buried in the concrete below the level of the basement floor. In this way no room is lost for column foundations in the basement, which is slightly below the level of Exterior St. A longitudinal brick wall divides the building into engine room and boiler room sections, the former containing a basement and main floor and the latter of a basement, two floors of boilers and above this a coal storage compartment. The basement of the boiler house is divided by two walls into three longitudinal sections, the middle one being used for the pumps, etc., and the outside ones for the ash handling machinery. A space 30 ft. wide on the west end is partitioned off the full height and width of the building for offices, store rooms, shops, etc. A 50-ton crane spans the room over the main engines and two smaller cranes are over the exciter engines. The boiler plant consists of 64 boilers made by the Babcock & Wilcox Co., each of 500 h. p. nominal capacity. They are designed to carry a pressure of 200 lb. and have forged steel headers. The two boiler room floors each contain two rows of sixteen boilers which face on a central passageway and they are all supported entirely from the columns of the building and are independent of the floors. They are fitted with automatic stokers, which the engineers estimate will save the services of 180 men.

A tower for coal and ashes is built directly in front of the boiler house on the masonry bulkhead which follows the bank of the river. This tower is 65 ft. long and 25 ft. wide and is connected to the station building by a covered bridge 60 ft. above the street. At one end of this tower is a mechanical shovel for unloading coal from the barges in which it is delivered. The water at this point is from 20 to 25 ft. deep, according to the tide. This shovel passes the coal into a hopper; thence it passes into a coal crusher, then to the weighing scales, then to a cross line conveyor, then to a main line con-

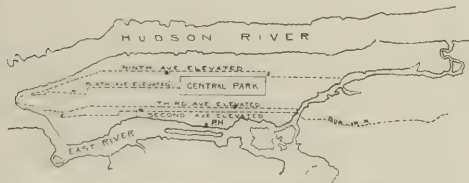


DIAGRAM OF MANHATTAN ELEVATED LINES.

rate of 10 per cent on \$13,000,000, equally divided between the two companies.

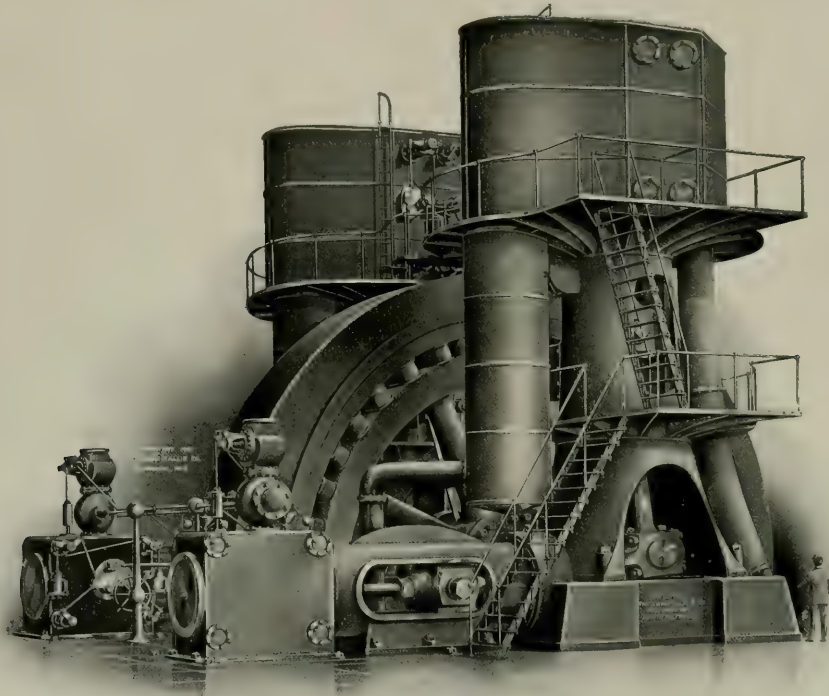
The Manhattan company failed to comply with this lease and on July 14, 1881, it was put into the hands of receivers. A second agreement was drawn up between these companies which, however, was declared illegal by the court, and finally by a third arrangement the Manhattan company issued consolidated stock to the amount of \$26,000,000 which was exchanged for outstanding stock, as follows:

For \$6,500,000 New York Elevated Railroad Co. stock, \$7,800,000 consolidated stock; for \$6,500,000 Metropolitan Elevated Railway Co. stock, \$7,150,000 consolidated stock; the balance, \$11,050,000 consolidated stock, to the holders of \$13,000,000 Manhattan Railway Co. old stock. The Suburban Rapid Transit Co. was leased June 4, 1891.

In 1879, when the companies were consolidated, the east side lines extended from the Battery to 129th St. and Third Ave., and from Chambers St. to 129th St. and Second Ave. The west side lines were from Morris St. to 59th St. and Sixth Ave., Battery to 83d St. and Ninth Ave., and 53d St. and Sixth Ave., to 155th St. and Eighth Ave. The northern termini of these lines were almost in the wilderness at the time they were built, so that comparatively little extension to the north has been found necessary, but most of that portion of the city which was then vacant farm lands and woods is now almost solidly built up and the high real estate value now obtaining there are due largely to the building of these lines.

veyor, then to the coal bunkers over the boilers. This coal and ash handling mechanism is all electrically driven by direct connected motors with speed regulating theostats and was provided by John A. Mead & Co., New York. Separate Green economizers are provided for each four of the boilers making 16 economizers in all; these were built by the Green Fuel Economizer Co., of Matteawan, N. Y. Four stacks are used to provide against a shut down from a possible accident to a single large one. These stacks have octagonal bases 75 ft. high above the foundation and above these are circular shells built of perforated radial brick made by the Alphons Custodis Chimney Construction Co., of New York. There are 16 Sturtevant blowers installed as a precautionary measure to be used for forcing the draft in emergencies only.

	Manhattan.	Metro-politan
Boiler heating surface, sq. ft.....	335,570	205,291
Rated boiler capacity, h. p.....	32,000	21,750
Heating surface, per h. p., sq. ft.....	10.486	9.44
Grate surface, sq. ft.....	5,632	3,901
Ratio heating to grate surface.....	59.5	51.4
Working pressure, lb.....	150	150
Economizer surface (outside) sq. ft.....	98,304	None
Economizer surface per b. h. p., sq. ft.....	3.072	
Ratio heating to economizer surface.....	3.41	
Chimney height, ft.....	278	353
Aggregate area, sq. ft.....	997.92	380.13



8,000-H.P. REYNOLDS-CORLISS ENGINE FOR MANHATTAN RY.

The engines are arranged in a single line in the engine room and consist of eight 8,000-h. p. units built by the Allis-Chalmers Co., of Milwaukee. These are of the combined horizontal and vertical type, the two high pressure cylinders, 44 in. in diameter, being horizontal and the two low pressure cylinders, 88 in. in diameter, being vertical. The stroke is 60 in. and the speed 75 r. p. m. The cranks are 135 degrees apart which gives such a uniform turning effect that no fly-wheel is required in addition to the revolving field of the generator which is 32 ft. in diameter and weighs 370,000 lb. The exciter engines are direct connected tandem compounds of 300 h. p. each, with cylinders 15 and 25x18 in. and run at 200 r. p. m. A separate jet condenser is provided for each engine, and provision has been made to easily change to surface condensing if found desirable.

The generators are of the Westinghouse type and they will distribute current at 11,000 volts to six sub-stations where it will be transformed to 625 volts continuous current for use on the cars, by means step-down transformers and rotary converters.

The following table from Power comparing this station with the new Metropolitan station is of interest:

Area per boiler h. p., sq. in.....	4.09	2.51
Coal storage per rated boiler h. p., lb.....	937	827
Engines, aggregate rated h. p.....	64,000	44,000
Aggregate maximum h. p.....	100,000	72,600
Displacement of low pressure piston per minute, per h. p., cu. ft.....	7.92	7.56
M. e. p. per rated h. p., lb.....	28.94	30.31
Condenser .....	Jet	Surface

The location of the power house and sub-stations are indicated on the outline map of the Metropolitan system.

Mr. W. E. Baker, formerly general superintendent of the Metropolitan Elevated, Chicago, is general superintendent of this work, Mr. L. B. Stillwell is consulting electrical engineer and Mr. E. D. Leavitt consulting mechanical engineer. Mr. George H. Pegram is chief engineer of the company in charge of the general engineering work.

At the present time delegates will find but one of the large units in the Manhattan station nearing completion. It is expected a portion of the total station equipment will go into service early in the winter.



The company's rolling stock consists of 334 locomotives, 1,122 passenger cars and 29 service cars, and in view of the impending change to electric traction it was feared that the locomotives would be almost a dead loss, but recently orders have been received from all parts of the world for the old locomotives, in greater numbers than the company possessed, and at a fair price. The old passenger cars will be largely used but in addition there will be a number of motor cars. An order for fifty of these has been placed with the American Car & Foundry Co. and another order of fifty with the Wason Manufacturing Co. of Cleveland. The contracts for equipping these cars with Van Dorn couplers and "Consolidated" electric heaters have already been let. The contract for the equipment of 800 motor cars and 400 trailers with 1,600 motors and multiple-unit control has been given to the General Electric Co. The trains will be made up of six cars, of which the first, third, fourth and sixth will be motor cars.

The company has adopted as its standard the protected rail bonds of the Protected Rail Bond Co., of which nearly 100,000 were used in the construction of the Second and Third Aves. lines. The "Keystone" cable hangers furnished by Mayer & Englund Co. have also been adopted as standard for suspending underground cable in manholes and cable vaults.

The officers of the company are: President, G. J. Gould; vice-president, Alfred Skitt; secretary and treasurer, D. W. McWilliams; general superintendent, William E. Baker; auditor, E. F. J. Gaynor; electrical engineer, L. B. Stillwell; chief engineer, George H. Pegram; master mechanic, H. A. Webster.

## OTHER ROADS IN AND NEAR NEW YORK.

In addition to the two great companies—the Metropolitan Street Railway Co., including the companies controlled by it in the Boroughs of Manhattan and the Bronx, and the Brooklyn Rapid Transit Co. in the Borough of Brooklyn—there are several other operating companies in Greater New York.

The Coney Island & Brooklyn Railroad Co., chartered in 1860, and the lessee of the Brooklyn City & Newtown Railroad Co.,



HIGH BRIDGE ACROSS THE HARLEM.

This unique structure was built to carry the Croton aqueduct which conveys practically the entire water supply for Manhattan and for a portion of the Bronx. The bridge is 1,400 ft. long and is supported by 13 arches resting on solid granite piers, the crown of the highest arch being 116 ft. above the river surface. The water is carried over the bridge in large cast-iron pipes protected by brick masonry. A wide footpath enables visitors to walk across it and view the fine prospect from its top.

in 1896 as a consolidation of the Steinway Ry., the Newtown Ry., the Riker Avenue Ry., the Long Island City & Newton Ry., and the Flushing & College Point Ry., and controls the entire street railway system of Long Island City (Borough of Queens) with a line to Flushing. The company has about 65 miles of track, including the property of the New York & North Shore R. R., of Brooklyn, which is controlled by the same interests. The officers are: President, W. H. Shelmerdine; vice-president and general manager, J. R. Beitem; secretary and treasurer, I. M. Tritt. The New York & North Shore R. R. is the result of a consolidation in 1899, of the Long Island Electric Ry. and the New York & North Shore Ry.

The Pelham Park Railroad Co., of which H. D. Carey is president, operates a narrow gage horse railway, 1.5 miles, on City Island, in the East River. The City Island Railroad Co., of which Edwin B. Strout is president, has a 2-mile narrow gage horse railway on the same island.

The Staten Island Electric Railroad Co. operates 31 miles of track on Staten Island. This company was organized in 1894 and is the successor to the Staten Island Belt Line Railroad Co. The officers are: President, J. H. Swinarton; vice-president, H. W. Poor; secretary and treasurer, Wm. E. Findley; superintendent, R. O. Carnahan.

The Staten Island Midland Railroad Co. has 29 miles of electric track, including the lines of the Staten Island Traction Co. The officers are: President and general manager, Robert Witherrill, Chester, Pa.; secretary, H. T. Walter; treasurer, Richard Wetherill, Chester, Pa.; superintendent transportation, W. J. Smith.

The metropolitan area includes also Jersey City, Hoboken and a number of smaller towns along the west shore of the Hudson River and around Newark Bay, and in this section of New Jersey there are some very extensive street railway systems. The North Jersey Street Railway Co., of which E. F. C. Young is president, David Young, vice-president, and G. F. Chapman, general superintendent, owns and operates the Newark & South Orange Ry. and leases the lines of the Consolidated Traction Co. The system comprises some 235 miles of track in Jersey City, Newark, Passaic and Hoboken and adjacent territory and the same interests control the Jersey City, Hoboken & Paterson Railway Co., of Hoboken, a consolidation operating 155 miles of track, and the Elizabeth, Plainfield & Central Jersey Railway Co.

Another very interesting railway is that of the New Jersey & Hudson Railway & Ferry Co., of Hackensack, N. J., which was described in our issue for December, 1900, page 700. The officers of this company are: President, A. Merritt Taylor; vice-president, W. H. Clark; second vice-president and general manager, Frank R. Ford; secretary and treasurer, W. N. Barrows; superintendents, F. W. Bacon and E. W. Lawson. This company operates the Riverside and Fort Lee Ferry and an amusement park on the Palisades.



EXTERIOR MANHATTAN POWER HOUSE.

operates 20.48 miles, leases 20.86 miles and has trackage rights over 2.25 miles, giving it a total of 49.5 miles of track in the Borough of Brooklyn. The officers of this company are: President, John L. Heins; secretary and treasurer, Duncan B. Cannon; superintendent, D. W. Sullivan. The offices are No. 120 Broadway, New York, and De Kalb and Central Aves., Brooklyn.

The Van Brunt Street & Erie Basin Railroad Co., chartered in 1860 and began operating as an electric railway in 1898. The company has 2.5 miles of track. The officers are: President, Thomas Murphy; secretary and treasurer, Wally Ferry; superintendent, T. J. Conner.

The New York & Queens County Railway Co. was organized

## System of the Brooklyn Rapid Transit Co.

Some of the Operating Conditions—Traffic Across the Brooklyn Bridge—The Consolidations That Have Resulted in Present System—Excursion Traffic—Mileage and Equipment—Power Houses—Overhead Line Construction—Repair Shops—Track Construction.

The total track mileage operated as the Brooklyn Rapid Transit system has increased from 476 miles in 1899 to 523 miles in 1900, and to 525 miles at the present time. A glance at the accompanying map of Brooklyn will make clear the general distribution of this trackage. The territory covered can best be described as fan-shaped, with practically all the surface and elevated lines converging at the Brooklyn Bridge, although there is a lesser point of concentration at Fulton St. and the East River toward which part of the business travel to New York gravitates.

Although the equipment of the Brooklyn lines for electricity and the uniting of virtually all the surface railways and elevated lines under one management have been important factors in bringing about the present peculiar traffic conditions in Brooklyn, the event which had the most influence in developing the present situation was the opening of the Brooklyn Bridge in 1898 to the cars of the Brooklyn Rapid Transit Co. This located the terminals of virtually all the main Brooklyn lines at Park Row, Island of Manhattan, instead of at Fulton St. on the Brooklyn side of the river. Although

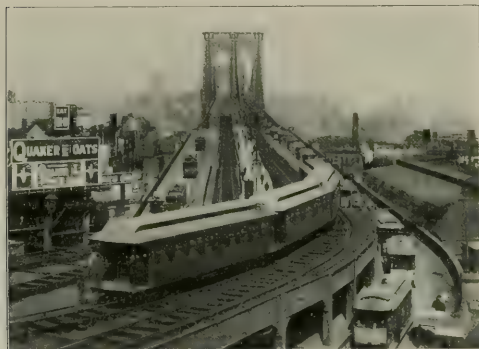
Ralph-Myrtle lines turn off Fulton St. at Myrtle Ave., the Court St. cars at Court St., and the other lines at points further east.

Practically the entire shopping district in this section of the city is on lower Fulton St. and owing to the vast amount of business done on this thoroughfare together with the large number of wagons, trucks and electric cars using it, it is without exception the most congested street in Brooklyn. During heavy traffic hours cars are spaced less than 10 ft. apart. Fulton St. from curb line to curb line is but 42 ft. wide.

A count shows that during an average day of 24 hours 168,800 passengers are carried across the bridge in surface cars, and 114,400 in the elevated trains. The number of trips operated will be seen from the accompanying table.

NUMBER OF TRIPS ACROSS THE BROOKLYN BRIDGE.

Time, Hour Beginning.	Wednesday, Aug. 17, 1898.	Wednesday, Aug. 14, 1901.	Increase	Decrease
Midnight.....	113	93	..	20
1 a. m. ....	75	87	12	..
2 " .....	47	57	10	..
3 " .....	34	34	..	..
4 " .....	35	34	..	1
5 " .....	71	55	..	16
6 " .....	161	163	2	..
7 " .....	229	253	24	..
8 " .....	276	253	..	23
9 " .....	212	237	25	..
10 " .....	190	208	18	..
11 " .....	188	204	16	..
Noon.....	177	220	43	..
1 p. m. ....	191	193	2	..
2 " .....	193	221	28	..
3 " .....	210	251	41	..
4 " .....	242	234	..	8
5 " .....	271	269	2	..
6 " .....	250	231	..	19
7 " .....	177	192	15	..
8 " .....	174	190	16	..
9 " .....	144	172	28	..
10 " .....	162	174	12	..
11 " .....	151	164	13	..
Totals.....	3973	4189	305	89
Increase.....			216	



BRIDGE TERMINAL IN BROOKLYN.

this change added but three or four miles of track to the company's system, this little track has during the past three years carried over five million cars and has exerted a most important influence upon the gross receipts of the company.

Within the fan-shaped territory served by the Rapid Transit Co. there are two distinct and well defined classes of travel. One class comprises an enormous excursion traffic flowing from the bridge, the ferries, and the residential districts to the dozen or more beaches and excursion resorts along the southern and eastern shore of Long Island. The other division constitutes what is termed the business travel that surges every working day from the whole Brooklyn section to New York over the Brooklyn Bridge and even overflows to the various ferry lines.

It may be in place to describe the situation on Fulton Street at the Brooklyn end of the Bridge. There are eight distinct lines that turn into Fulton St. somewhere between East New York and the river. These are the Fulton St., Putnam Ave., Gates Ave., Flatbush Ave., Third Ave., DeKalb Ave., and two Court St. lines. The New York cars of these lines and the ferry cars of the DeKalb Ave. line run down Fulton to Washington Sts., and thence through Washington St. to the bridge. At Washington St. and Myrtle Ave. the cars of the Myrtle Ave., and Ralph-Myrtle lines turn into Washington St., and run to the bridge. The ferry cars of all these lines (except DeKalb Ave.) run down Fulton St. to Fulton Ferry. The New York cars of these lines (except DeKalb Ave.) in returning from New York, come off the bridge at Sands St., run through Sands to Fulton St., and then up Fulton. The Myrtle, and

The excursion travel on Sundays and holidays is proportionately great. During the summer season about five million people are carried to Coney Island alone, the company operating eleven different routes to this resort from Manhattan, Hamilton Ferry, Broadway Ferry, 39th St. and other points. Over 2,500,000 of these passengers are carried on the Sundays of the season.

Following is a statement of the passengers carried, and car miles run on the surface lines of the Rapid Transit Co., for three years ending June 30:

	1899.	1900.	1901.
Passengers carried .....	264,319,820	275,607,367	288,094,337
Car-miles run .....	54,727,712	54,329,630	50,155,625

It will be noticed that although the number of passengers carried has steadily increased during the past three years, the number of car-miles run has been considerably reduced, due to the judicious rearrangement of certain routes.

At the heaviest hour of an average day at the present time the maximum number of cars on all the surface lines of the Brooklyn Rapid Transit is 1,365; and on the elevated lines 341.

For the twelve months ending June 30, 1900 and 1901, the Brooklyn Rapid Transit Co. made the following report, which includes the entire system, surface and elevated.

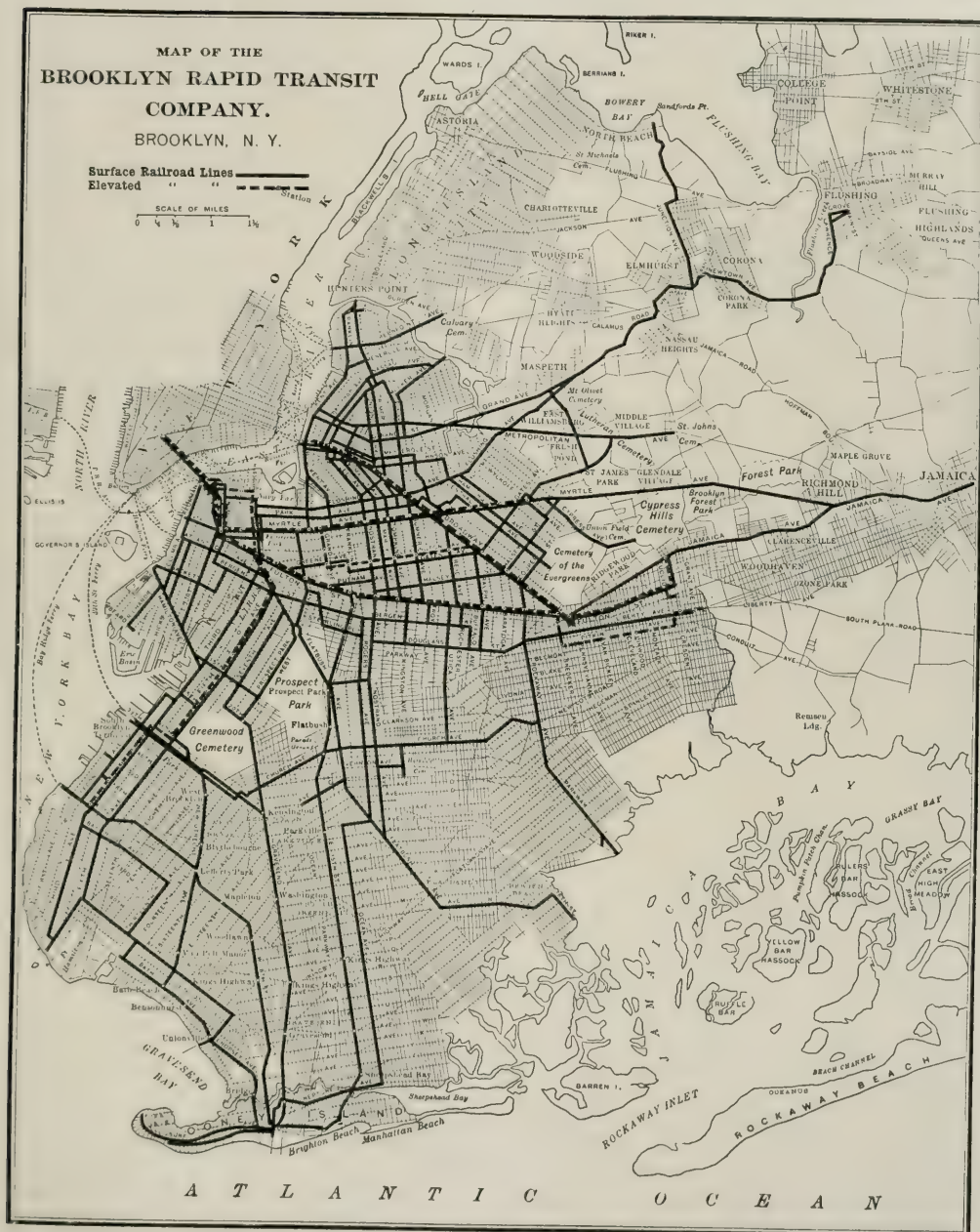
	1901.	1900.	Increase.
Gross receipts .....	\$12,101,197.63	\$11,751,595.31	\$349,602.32
Expenses including taxes..	7,970,634.50	7,993,226.32	

Net receipts .....

\$4,130,563.13      \$3,758,368.99      \$372,194.14

The company carries on its pay rolls during the warm months, 8,653 employees. Of this number about 12 per cent are dropped after the heavy summer business is over and most of the excursion lines are abandoned for the winter. This condition of affairs entails a very serious obstacle to the efficient handling of employees,





as it is necessary at the beginning of each season to engage and break in a large number of new men. To aggravate the difficulty, it is practically impossible to assign these new men to any one division, as the emergencies of traffic constantly arising require that they shall be transferred from division to division as each day's business shall dictate.

The officers of the Brooklyn Rapid Transit Co. are: President, J. L. Greatsinger; vice-presidents, T. S. Williams and H. C. Duval;

*From Power's Manual of Five Years.*

general manager, J. C. Brackenridge; secretary and treasurer, C. D. Menely; auditor, W. B. Longyear; engineer equipment of line, H. H. Williams; electrical engineer of power stations, C. E. Roehl; engineer maintenance of way, E. H. Packe; purchasing agent, Lincoln Van Cott; general superintendent surface lines, W. W. Wheatley; superintendent of elevated lines, B. W. Folger; superintendent of equipment, Eugene Chamberlain; general storekeeper, W. J. O'Connor.



## CONSOLIDATIONS IN BROOKLYN.

The Brooklyn Rapid Transit Co., organized in 1890 as the successor of the Long Island Traction Co. (organized 1893) controls by ownership of stock the following companies. (The date immediately following the company name is date of organization.)

I. Brooklyn Heights R. R., 1867 (purchased by Long Island Traction Co. in 1893), which in 1893 leased the Brooklyn City R. R. for 999 years. The Brooklyn City, 1853, comprises the following six roads which were merged with it in 1890:

1. Bushwick, 1867.
2. Brooklyn Crosstown, 1872. Successor to Nassau R. R., Greenpoint & Williamsburgh R. R., Brooklyn City, Hunter's Point & Prospect Park R. R.
3. Calvary Cemetery, Greenpoint & Brooklyn, 1884.
4. New Williamsburgh & Flatbush, 1873. Successor to Williamsburgh & Flatbush, 1866.
5. Green Point & Lorimer, 1884.
6. Grand Street & Newtown, 1860, and
7. South Brooklyn Street Ry., merged in 1892.

II. Brooklyn, Queens County & Suburban R. R., 1893 (purchased by Long Island Traction Co. in 1894), which comprises the following roads merged with it in 1894:

1. Broadway R. R., 1858, with which was merged in 1883; Yates & Flatbush, 1881.
2. Broadway Ferry & Metropolitan Avenue, which included Brooklyn, Bushwick & Queens, 1885. Successor to North Second Street & Middle Village, 1870, which succeeded Grand Street Ferry & Middle Village, 1869, which succeeded Metropolitan, 1863.
3. Jamaica & Brooklyn Road Co., 1880, which included the following roads merged at that time:
  - A. Jamaica, Woodhaven & Brooklyn R. R., 1872.
  - B. Jamaica & Brooklyn Plank Road Co., 1850, which comprised:
    - a. Brooklyn & Jamaica R. R., 1832, which bought Brooklyn, Jamaica & Flatbush Turnpike Co., 1809, in 1833, and was sold to Plank Road company in 1851.
    - b. East New York & Jamaica R. R., 1863.

III. Nassau Electric R. R., 1893, most of the stock of which was acquired by the Brooklyn Rapid Transit Co., in 1893, and which included:

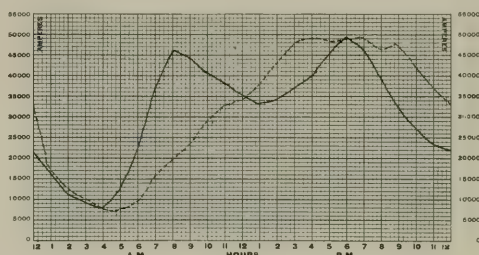
1. Atlantic Avenue R. R., 1872, which comprised:
  - A. Brooklyn Center & Jamaica Ry., 1860, successor to Brooklyn Central & Jamaica R. R., a consolidation of
    - a. Brooklyn & Jamaica R. R.
    - b. Brooklyn Central R. R.
  - B. South Brooklyn Central, 1877, successor to South Brooklyn & Park R. R., 1870, which was successor to Brooklyn & Canarsie R. R., a consolidation of Brooklyn & Canarsie R. R. and South Brooklyn & Bergen Street R. R.
  - C. Prospect Park & Coney Island, 1874, a consolidation of
    - a. Park Avenue R. R., 1870.
    - b. Greenwood & Coney Island R. R., 1872.
  - D. Brooklyn, Bath & West End R. R., 1879.
2. Kings County Electric Ry., 1892.
3. Coney Island, Fort Hamilton & Brooklyn, 1894.
4. Coney Island & Gravesend Ry., 1893.
5. Sea Beach Ry., 1896. Successor to New York & Sea Beach Ry., 1883, which succeeded New York & Sea Beach R. R.

IV. Brooklyn Union Elevated R. R., 1899, most of the stock of which was acquired by Brooklyn Rapid Transit in 1899, and which includes:

1. Brooklyn Elevated R. R., 1874, a consolidation of
  - A. Union Elevated R. R., 1886.
  - B. Seaside & Brooklyn Bridge Elevated, 1890.
2. Kings County Elevated R. R., 1899, merged with Brooklyn Union Elevated in 1900, and comprising:
  - A. Kings County Elevated Ry., 1879, successor to Fulton Elevated Ry.
  - B. Sea View R. R., 1886, formerly Coney Island Elevated R. R. Stock purchased by Brooklyn Rapid Transit Co. in 1897 and merged with Kings County Elevated in 1900.
  - C. Brooklyn & Brighton Beach R. R., purchased by Brooklyn Rapid Transit Co. in 1899 and merged with Sea View R. R. in 1900.

## POWER HOUSES IN BROOKLYN.

The problem of economical power generation and distribution in Brooklyn has been difficult to solve, for a number of reasons. These include the concentration and congestion of traffic on the Brooklyn Bridge lines but much of the difficulty is brought about by the peculiar excursion traffic which the company has been called upon to handle. Under ordinary conditions the operation of excursion lines where single surface motor cars alone are to be considered is comparatively an easy undertaking, the use of properly wound boosters, or in some cases a storage battery plant, being a satisfactory solution. But in Brooklyn the dozen or more beaches and excursion resorts lying along the outer edge of



TOTAL LOAD BROOKLYN RAPID TRANSIT CO.  
Full line, winter day; dotted line, summer day.

Long Island from eight to ten miles from the center of the city, and all served by one or more surface and elevated lines of the Brooklyn Rapid Transit Co., combine to make a situation which we believe is not duplicated anywhere in the world. As a single example, attention may be called to the Brighton Beach line. This was formerly a steam road, 7 miles long, but it has been equipped with electricity and is now used both by the ordinary surface motor cars and the heavy electric elevated trains which pass from the elevated structure to the surface by means of an incline. These trains will take from 700 to 800 amperes in starting, and an average load of 400 amperes per four-car train when making an average schedule of 28 miles per hour. It will be seen that the stoppage, for any reason, of one elevated train will make a very considerable difference in the load carried on one section, and consequently will have a serious effect on the local voltage,

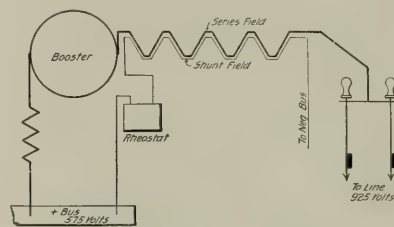


DIAGRAM OF BOOSTER CONNECTIONS.

leaving the surface cars on the same section at the mercy of the heavier trains. When it is understood that this line carries as high as 150,000 passengers in a single day, the situation will be appreciated. But to cap the climax this travel lasts comparatively few days in the year, and the line is practically idle during the winter months. On the Sea Beach road almost similar conditions were encountered, with the exception that the service on this line is performed entirely by the surface motor cars. In meeting these particular conditions resource was had to the use of special boosters. In some cases these boosters are merely generators provided with sufficient resistance in the shunt field to permit a range in voltage from 125 volts to 600 volts. When the load on the station approaches the rated capacity of the station units, this generator-booster is thrown in series with the feeders and the

station bus, thus raising the station pressure to take up the increased line loss. There are three wires on the line, two of which are fed through this temporary booster, while the third remains connected with the main station feeder bus.

In other instances, as on the Sea Beach line, specially wound boosters driven by comparatively inexpensive engines were employed. These boosters are so designed that it is possible to obtain at the positive terminal of the booster any desired increase of pressure from 25 to 400 volts above that of the power station. The boosters are so wound that they will be in a measure self-regulating, but contain also shunt field coils, which can be easily adjusted to take up the fixed current of the system, and divide proportionately the load between the machines and the feeders, which are direct-connected on the station bus. The beginning of the Sea Beach line was a little over three-quarters of a mile from the station, and so a certain portion of the road could be easily operated without raising the voltage. Each of the two boosters were cut in at two points, and these four wires and the direct-feed wire were connected by an equalizing wire. That is, the feed for this section of 12 miles of trolley wire was supplied from the station bus at 575 volts, and from two independent boosters of different voltage. This line, running in multiple, operates with entire satisfaction, the average voltage of the line during its heaviest hours running from 486 to 510 volts.

As stated elsewhere, the Brooklyn Rapid Transit Co. is building a new combined direct and alternating current station, and it is probable that these boosters in time will be supplanted by rotary-converter sub-stations. In fact for a part of the past summer one or two of the Coney Island lines have been operated from a rotary sub-station taking alternating current from the mains of the Brooklyn Edison Illuminating Company.

At the present time power for the Brooklyn Rapid Transit system, including part of the elevated and all of the surface lines, is taken from four main power houses. For the immediate present, the elevated lines are operated jointly by steam locomotives and by electric trains, as the loss by fire of one of its main stations last year has greatly hampered the company and will prevent the operation of the entire elevated system until the new station can be completed.

In addition to these four main stations there is a small independent combined cable and electric station for operating both surface cars and elevated trains on the Brooklyn Bridge, and a small cable station for running the one-mile cable line on Montague St. The equipment of the five stations is as follows:

#### Southern or 52d St. Station.

This plant, which is at 52d St. and the East River, was the first permanent street railway power station in Brooklyn. It was placed in operation Jan. 14, 1893, and at that time was considered fully up to date and rather in advance of other similar stations then running. The original equipment is still in use, but there have been added two engine driven boosters. The equipment is now as follows:

Six Allis 1,000-h. p. cross-compound condensing engines, 26 and 48 x 48 in., running 74 r. p. m. at 160 lb. steam pressure; and two Westinghouse compound automatic condensing engines of 500 h. p. each, which drive two boosters. Each engine is connected to a Wheeler surface condenser.

Twelve General Electric multipolar 400-kw. generators, belted in pairs to the Allis engines. The boosters are each of 1,000 amperes capacity, one being belt driven and one direct connected.

Sixteen Babcock & Wilcox 250-h. p. water tube boilers, each equipped with Wilkinson automatic stokers. There are four Green fuel economizers.

#### Eastern or Kent Ave. Station.

Owing to the favorable location of the Kent Ave. plant with respect to load centers, and also to its general design with regard to the size and arrangements of its units, this station has had a most advantageous load factor practically from the start and is now running at a remarkable economy. It had the distinction of containing the first direct-connected generator of large size that was ever built, and in fact one of its units came from the World's Fair in Chicago, where it supplied power to the Intramural Railway, and was exhibited as the first 1,500-kw. railway generator in



STATUE OF LIBERTY.

Bartholdi's Statue of Liberty stands upon Bedloe's Island about a mile off Battery Park. This colossal figure representing "Liberty Enlightening the World," is made of hammered plates of copper, is 151 ft. in height and stands upon a pedestal 155 ft. high. It was presented to the people of the United States by the citizens of France.

the world. The Kent station was erected in 1893. The equipment comprises:

Six Allis 2,000-h. p. cross-compound condensing engines, 32 and 62x60 in., running at 72 r. p. m. with 160 lb. steam pressure.

Four General Electric direct-connected 1,500-kw. and two Walker direct-connected 1,600-kw. machine generators. The General Electric generators were installed in 1893 and are rated at 2,500 amperes at 600 volts. The Walker machines were added in 1898, and are rated at 2,666 amperes at 600 volts.

Thirty-four Cahall boilers of 250 h. p. each, arranged in two decks. There are six Green fuel economizers and Wheeler surface condensers.

#### Third Ave. Station.

Originally this plant belonged to the Nassau system and was acquired when the Nassau lines were taken over. It was built in 1892, but in 1898 was considerably enlarged and now contains the following apparatus:

Four C. & G. Cooper Co. 750-h. p. tandem compound Corliss engines, 22 and 40x48 in., running at 76 r. p. m.; three Cooper 550-h. p. tandem compound Corliss engines, 20 and 36x48 in., running at 78 r. p. m.; one Cooper 375-h. p. tandem compound Corliss engine, 16 and 30x48 in., running at 75 r. p. m.; one Westinghouse 250-h. p. compound automatic engine, 16 and 27x16 in., running at 250 r. p. m.; two Allis 1,000-h. p. cross-compound condensing engines, 24 and 48x48 in., running at 82 r. p. m. These are all connected to jet condensers.

Four No. 6 Westinghouse, 400-kw. belted generators; three General Electric multipolar 400-kw. belted generators; one Westinghouse 230-kw. belted booster; one General Electric 200 kw. belted booster; two Walker 800-kw. direct-connected generators.

Twenty Babcock & Wilcox 250-h. p. water tube boilers, all equipped with Wilkinson automatic stokers.

#### Thirty-ninth St. Station.

This is also a plant acquired with the Nassau system. It was built in 1895 and contains:

Three 750-h. p. cross-compound Corliss engines, 22 and 40x48 in., running at 83 r. p. m., and two 1,500-h. p. cross-compound Corliss engines, 28 and 52x48 in., running at 75 r. p. m., all built by the C. & G. Cooper Co. The engines are connected to Worthington surface condensers.

Two Westinghouse multi-polar 660-kw. direct-connected generators; one Westinghouse 560-kw. direct-connected booster; two Westinghouse multipolar 1,120-kw. direct-connected boosters.

Boilers. Ten Babcock & Wilcox 250-h. p. water tube boilers.

#### Bridge Station.

Beside the cable driving machinery the Bridge station contains two 400-kw. Walker generators, direct connected to two 600 h. p. Southwark Foundry & Machine Co.'s simple engines.



"CLEOPATRA'S NEEDLE."

The Obelisk stands in Central Park near the 82nd street entrance. The full length of the obelisk is 69 ft. 2 in. It was presented to the city of New York by the late Khedive of Egypt, Ismail Pasha, and was brought with great difficulty from its ancient site in Nubia on the Nile.

The accompanying table is a summary of the equipment and capacity of the five Brooklyn Rapid Transit electric power houses:

SUMMARY OF ELECTRIC POWER STATIONS OPERATED BY BROOKLYN RAPID TRANSIT SYSTEM.

	Southern or 52d St. Station.	Eastern or Kent Ave. Sta.	Third Ave. Station	39th St. Bridge Station	Total.	
Engine capacity, not including booster engines, in h.p.	6,000	12,000	6,650	4,500	1,200	30,350
Engine capacity, including booster engines, in h. p.	7,000	12,000	7,275	5,250	1,200	32,725
Generator capacity in kw.	4,800	9,200	4,400	3,560	800	22,760
Rated generator capacity in amperes	8,400	15,300	7,700	6,000	1,400	38,800
Boiler capacity in h. p.	4,000	8,500	5,000	2,500	1,200	21,400

The average current output of the power stations of the Brooklyn Rapid Transit Co. has risen from less than 200 amperes in 1892, to 8,000 amperes in 1895, to 15,000 in 1898 to nearly 45,000 at the present time. Roughly speaking the average daily load is about one-half the maximum; the winter loads, both the average and the maximum, are heavier than the summer loads by about 25 per cent. In winter, however, the heaviest loads shift from the excursion lines to certain of the business traffic lines. When the new power house is completed the company will have available about 82,000 electrical horse power from its several stations.

The new station for which the foundations are now being laid is adjacent to the old Third Ave. station. In its design it differs somewhat from other modern plants of the same class, as it will supply both direct and alternating current, thus serving the district immediately adjacent as well as sections 10 miles away. The building is 183 ft. 3 in. wide by 186 ft. 9 in. long divided into two sections by a longitudinal wall. That portion devoted to the boilers is about 71 ft. wide inside and 115 ft. high. There are two floors on which are set two rows of boilers, leaving a passageway down the center of the building. Flues to serve the lower tiers of boilers are carried along the side walls in a basement under the lower boiler floor where the economizers are located; the flues for the upper tier of boilers are just under the roof. Coal storage pockets are provided above the upper boiler floor. There are stacks located midway of the length of the building. The engine room is 102 ft. wide inside with a flat roof having a monitor in the center; the floor level is the same as that of the lower boiler room, and the generating units are arranged in two rows, with the engines next to the side walls of the building. A traveling crane of 88 ft. span is provided in the engine room.

The new installation as laid out comprises four Westinghouse 2,700-kw. direct-connected alternating current generators, and two Westinghouse 2,700-kw. direct-connected, direct-current generators, each driven by a 4,000-h. p. vertical engine, with cylinders 42 and 86x60 in. The six engines are to be built at the Scranton shops of the Allis-Chalmers Co. All of these units follow conventional lines for apparatus of this class, which has been furnished for other large modern power stations at New York, Boston and elsewhere.

The direct-current machines will generate at the usual 550 volts.

The alternating current machines will generate at 6,600 volts. This high voltage current will be transmitted to sub-stations, stepped down to 350 volts, and converted into direct current at the usual line pressure. Seven of the sub-stations have been decided upon, but others will be added in the years to come as the conditions demand. The main station itself is designed for future extension. The standard units for the sub-stations will be 1,000-kw. Westinghouse rotaries, with three 400-kw. Westinghouse, air-blast, static transformers to each converter. The number of units in each sub-station will vary from two to seven, depending upon the section to be served.

A feature of these sub-stations will be the arrangement of the switchboard. It has been the common practice in former work of this nature to have the direct and the alternating current panels entirely separate. In the Brooklyn installations the d. c. and a. c. instruments are to be mounted on the same panel, and the heavy alternating leads from the rotaries to the transformers will run direct to electrically operated switches located in vaults under the transformers. These switches will be operated by local circuits through small pilot switches on the switchboard panels, thus in effect controlling the d. c. and a. c. current from one panel.

At the present time the company has a 2,000-ampere hour storage battery at the Bridge station, and one of the same capacity at East New York, for regulating the fluctuations on the line. These batteries were supplied by the Electric Storage Battery Co.

#### ROLLING STOCK IN BROOKLYN.

The total car equipment of the Brooklyn Rapid Transit system consists of 3557 cars, which have been supplied by various companies. Among the number will be found cars from practically every builder in the country.

On the surface division, the equipment is as follows: 1289 closed electric cars, 8 closed cable cars, 1327 open electric cars, 6 open cable cars, 55 combination cars, 7 parlor and special cars, 10 express cars, 8 freight cars, 6 mail cars, 43 electric snow plows, 35 electric snow sweepers, and 69 miscellaneous cars.

Of these cars, 530 are of the Brooklyn Heights standard 13-bench open type. These cars seat 65 passengers, and are 36 ft. 11 in. long over all, being equipped with Brill maximum traction trucks, and Westinghouse No. 68 motors.

The closed cars include 554 of the Brooklyn Heights standard type. These cars seat 30 passengers, and are 34 ft. in length over all, the car body being 25 ft. long, and the equipment being the same as that on the standard open cars.

The combination cars, which are of an entirely new type, and are claimed to possess many advantages over other cars of this class, are 37 ft. over all, with a 28-ft. body, the car seating 36 passengers. This car was designed and constructed under the direction of Mr. Eugene Chamberlin, superintendent of equipment. It has low window sills and the sash are easily removable when it is desired to convert the car into an open one. The chief feature of novelty is the seats which are practically revolving chairs. The seats are made by Heywood Brothers & Wakefield Co., and are described elsewhere in this issue. Fifty additional cars of this type have just been contracted for with the Laclede Car Co.

For the equipment of surface cars, there is a total of over 4200 motors and about 1900 controllers. The trucks include 886 pairs of Brill maximum traction, and 1521 single trucks of Peckham, Bemis and other makes.

In the motor equipment are included 1700 Westinghouse No. 68 motors; 200 G. E. 1000; 502 G. E. 800; 738 W. P. 50, and Walker, Curtiss and S. R. G. motors. The controller equipment consists of K, K-2, K-10, K-11, K-12, and the G. E. B-23 controllers.

In addition to the motor equipments mentioned, the company is now under contract with the Westinghouse Electric & Manufacturing Co. for a supply of 1700 of the new Westinghouse No. 81 motors, and with the General Electric Co. for 200 of the new G. E. 64 motors, it being the design to maintain a larger number of cars equipped throughout the year, instead of transferring equipment from open to closed cars in the fall and spring, as has been the practice in the past.

The company has a number of power brakes in use supplied by all the leading makers of street car brakes. The great variety of equipment is being tried with the object of determining the character of brake best suited to the requirements of service under the existing conditions in Brooklyn.



The power brakes in use on the company's lines include, air brakes with separate motor driven compressor; air brakes with axle driven compressor; air brakes with storage tanks; friction brakes; electric brakes; track brakes in which wheel and track shoes are set by the motorman using ordinary hand brake staff; track brakes in which power is taken from the momentum of the car by means of a friction disc or from other sources of power; and fluid pressure brakes, using an oil that will not freeze, to transmit pressure to the brake cylinder.

The desirability of a satisfactory power brake is well understood by the officers of the company, but as yet no brake has been made a standard. Brakes submitted for trial on the company's lines are subjected to thorough investigation as to their performance in making ordinary service stops, and, if satisfactory in this respect, the various brakes are passed through careful tests to determine their capacity in making emergency stops, as it is for this class of work that efficient brakes are most urgently required.

Special apparatus has been constructed for making these tests and for each brake the time from signal given the motorman to the stopping of the car is very accurately measured as well as is the distance run by the car in this interval of time, and the speed of the car the instant of stop signal.

These measurements of speed, time, and distance, are made with an accuracy which admits of no dispute. Stops are made at many different speeds, and from such data curves are plotted showing the relation between the distance from signal to stop and the speed of car at signal.

Tests of this sort are made under uniform weather, track and grade conditions, so that results obtained with different equipments may properly be compared with each other.

#### ELEVATED DIVISION.

On the elevated lines there are in service 486 passenger cars, 79 of which are equipped electrically, 37 open passenger cars, and 128 locomotives.

The electrical conversion of the elevated lines, which is now taking place, is probably one of the most interesting features to be found on the system. At the present time, the equipment consists of 79 motor cars, each one of which is operated by means of one

the elevated division, all of these being replaced by No. 50-E Westinghouse motors of 150 h. p. capacity.

During last winter and spring, the whole of the 79 motor cars were in regular operation on the lines of the system, together with 70 coaches equipped as trailers. During the summer months, however, owing to the scarcity of power, the electric service was abandoned, but will be begun again very shortly. At the same time, the electric service will be supplemented by the addition of 50 new motor cars, now in course of construction at the works of the Jewett Car Co., and 50 trailers, which have just been remodeled at the East New York shops of the elevated division. These 50 trial cars have been equipped with the third rail contact shoe and electric lights, as well as with both vacuum and air brakes, so that they can be utilized in electric as well as in steam service.

All elevated cars in electric service are equipped with the New York Air Brake Co.'s automatic, quick action brake, the motor cars being provided with small motor-driven compressors and automatic governors made by the Christensen Engineering Co., for the purpose of supplying air for the brake system, and for the operation of the control of the Westinghouse system.

The truck equipment of motor cars consists of 40 standard Baldwin motor trucks; 36 McGuire motor trucks, and 6 Brill No. 27-E motor trucks. This last type truck has also been purchased for 50 new motor cars now in course of construction, it being of the Brill company's latest type, with forged steel side frames, instead of the cast steel formerly used.

#### BRIDGE DIVISION.

On the Brooklyn Bridge Division, there is a total of 92 passenger cars, 20 of which are equipped with motors. These 20 motor cars are equipped with McGuire motor trucks, and four G. E. 50 motors, and each are operated by G. E. E-14 controllers.

With the exception of the few light hours of the day and night, the motor cars are used only for the purpose of switching at the terminals of the Bridge railway. The trains, as a rule, are operated by means of a cable system.

#### COMPRESSED AIR LOCOMOTIVE.

Within a very short time there will be put in service on the elevated lines a compressed air locomotive, built by the Compressed Air Co. of New York. This locomotive is designed to handle trains of from one to five cars in the regular service of the system, and it will be put in such service on the Ridgewood track after being thoroughly tested in "shuttle" train service.

#### REPAIR SHOPS.

The most efficient and expeditious methods of effecting street railway repairs is exemplified in the main shops of the Brooklyn Rapid Transit Co., at Fifty-second St. and Second Ave., South Brooklyn. From the main shops, as from a central office, is managed a system of auxiliary repair stations, which includes 11 depot and four elevated railway shops. The repairing system is perfectly organized and is managed with the precision that characterizes a military institution. The reorganization of the shops, and their present management, are greatly to the credit of Mr. Eugene Chamberlain, superintendent of equipment, whose skill as an electrician and thorough knowledge of the small economies are evidenced in the arrangement of every detail.

Cars are run into the shops on five receiving tracks at the Second Ave. entrance. The tracks accommodate from six to nine cars each, and, in another portion of the building there are eight more tracks of equal capacity. Pneumatic hoists lift the car body from the trucks, which are then transported by means of electric transfer tables to a point between the machine shop and forge room, where there are 14 repair pits.

The armatures and fields having been removed from the motors they are conveyed to the winding room above by electric hoists, where they are carefully inspected before a report of the necessary repairs is made. The winders are furnished with two pairs of armature stands and this has been found to be a great economy of time and labor. Besides armatures and field coils, resistance boxes and controllers are also repaired in this room. At one end



THE NEW EAST RIVER BRIDGE.

of the well-known multiple-unit control systems. Trains are thus made up, containing from one to five, or, as is more usual, two or three motor cars, together with two or three trailers, as the case may require. Each car is equipped with two motors on one truck, and with the necessary primary and secondary control apparatus for operating the car singly or in trains with other motor cars and trailers, as desired. There are in operation, on these motor cars, 49 equipments of the latest type of Sprague multiple unit control apparatus, 24 sets of the Westinghouse electro-pneumatic control apparatus, and 6 sets of the "Contractor" system of the General Electric Co.

The motor equipments consist of 40 Westinghouse 50-B equipments; 6 G. E. 55 equipments; 24 Walker 15-L equipments, all consisting of two motors each, and ten 4-motor equipments of Westinghouse No. 68 motor. This equipment, however, is now in process of standardization; Westinghouse No. 68 motors will be retired from the elevated service and used on the surface cars of the system, and the Walker 15-L motors will be made up into 4-motor equipments for use on the freight and wrecker cars of

of the apartment is a baking oven which is always kept at a temperature of 200° F., by steam heating coils. A portion of the winding room is also used as an auxiliary stock room, and here the foreman has his office.

The forge room is located directly under the winding room, and is equipped with 12 down-draft forges and a full complement of power and hand tools.

The machine shop, with its complement of lathes, shapers, slotters etc., adjoins the forge room, and here, in addition to repairs of rolling stock, many repairs of power station equipment are effected. Some of the heaviest work of the shops is done in this department. In the machine shop, multiple drills, which will drill four holes at one operation, and turret and monitor lathes, are used.

An interesting feature of the shops is the mill room, where the car bodies are repaired. The power for the machines is furnished by a 100-kw. motor. The floor is concrete, and a rotary blower furnishes an exhaust for blowing out sawdust and shavings. The machines are staggered in order to prevent interference with the long pieces of lumber handled in the mill room.

Other important departments are the paint shop, the "harness" shop where straps and window curtains are repaired, the glass shop, the pattern and drafting rooms, and the main stock room. The latter is under the supervision of Mr. W. J. O'Connor, who has charge of the stock of materials for supplying all the lines of the Rapid Transit system.

#### OVERHEAD CONSTRUCTION IN BROOKLYN.

The overhead line of the Brooklyn Rapid Transit system presents such varied conditions that it has given use to many original and interesting forms of construction, and the extent of the system requires that a large force of men be continually employed that it may be properly maintained. The line department is in charge of a superintendent of line, who is assisted by two general foremen, one in charge of the trolley lines and emergency crews, and the other in charge of the feeder system. Under the foreman of trolley lines are the trolley maintenance and construction crews and the emergency crews, while the foreman of feeders looks after the maintenance of overhead feeders, subways, poles, etc. Some idea of the extent of the work covered by this department may be gathered from the statement that there are 440 miles of single track, overhead trolley; 87 miles of third rail, 700 miles of over-

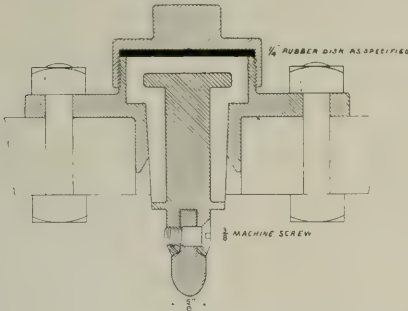


FIG. 1—HANGER FOR STEEL BAR.

head feeder (500,000 c. m., and 1,000,000 c. m.), 700,000 duct feet of subway rapidly being filled with cable, 19,000 trolley poles, 5,000 lamps on various parts of the system outside of buildings, and 18,000 lamps in car houses and offices; also an extensive telegraph system in use on the elevated lines and connecting various offices and shops, a considerable private telephone system and numerous call bells, signals, illuminated signs, etc. At the present time there are employed at the department 160 men; 60 horses are required to carry on its work, and its rolling stock includes two electric tower cars, 10 tower wagons, 8 emergency wagons, 2 trolley wagons, 2 feed wire trucks, and 16 other trucks, wagons and carts.

#### EMERGENCY CREWS.

The line department emergency crews form one of the most important factors in the successful operation of the various lines comprising the system. These crews are on duty day and night

and are provided with quarters similar to those in use by the city fire departments. In addition to the regular trolley maintenance supplies carried in the emergency wagons they are also equipped with tools and jacks for the purpose of removing obstructions from the tracks, replacing derailed cars and repairing disabled cars. This service has recently been supplemented by an additional crew, making a total of six emergency crews. The efficiency of this service will soon be increased by the provision of electric automobile and steam mobile emergency wagons. The personal comfort of the crews will be much improved by the erection of three new model buildings for their exclusive use, equipped with sitting rooms, dormitories, baths, etc., and a comfortable and roomy flat for the use of the foreman and his family.

#### STANDARD OVERHEAD CONSTRUCTION.

The best example of the standard overhead construction adopted for the Rapid Transit System is found in the line running to

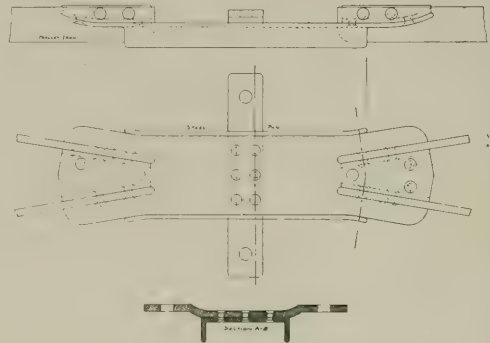


FIG. 2—STEEL SWITCH PAN.

Brighton Beach, this being one of the latest lines constructed by the company. Throughout this line standard steel trolley poles are used, installed at distances of 90 ft. apart. For spans,  $\frac{3}{8}$ -in., 7-strand galvanized iron cable is used with No. 00 hard drawn copper wire for trolley. This trolley wire is supplied with a feeder connection at every 400 ft. There are several long curves in the line which are constructed to conform very closely to the curve of the tracks. The terminal at Brighton Beach consists of four loops, the overhead work for which is very substantially constructed.

#### SPECIAL CONSTRUCTIVE FEATURES.

The elevated roads of Brooklyn under which, in nearly every case, is operated a trolley line, has given rise to a form of construction known as trough construction, that is, an inverted wooden trough 12 in. wide with sides 4 in. high is fastened to the iron work of the elevated structure, the trolley wire being supported in the middle of this trough by means of car barn or other similar types of hangers. Before the adoption of this construction there were continual delays owing to the burning off of trolley wire due to the grinding of trolley poles on the iron work of the elevated structure. The rigidity of the trolley wire suspension in this case very greatly reduced its life. On some parts of the system the elevated structure is so low that there remains but a foot or two clearance between the top of the surface car and the trolley wire under the structure. In such cases the wear in the wire is excessive and its life is reduced to little more than six or eight months, switches and frogs being equally short-lived. In order to lessen the labor of renewing the line at such points, a construction using steel bars for the trolley wire and sheet steel at frogs and switches was designed. Fig. 1 shows the hanger in section, and Fig. 2 the steel switch pan. The first of the steel trolley bar construction was installed at Flatbush and Atlantic Aves., about two years ago, and has required no expense for maintenance.

At the New York terminal of the Brooklyn Bridge is another novel overhead construction. At this point a sheet steel pan with angle iron flanges  $\frac{3}{4}$  in. high has been erected over the four loops, which comprise the terminal. This pan varies in width from

1 to 4 ft. according to its height above the rail and the curvature of the track which it covers. It was made necessary by reason of the difficulty experienced in maintaining trolley wires over these loops, owing to the very small clearance between the cars and the gallery overhead, and to the necessity for overcoming the slightest delays in operating the cars under the conditions there existing. Other interesting features of the bridge trolley constructions are the expansion joints where provision is made for an expansion of 14 in. and the double trolley wire in the up grades of either roadway installed for the purpose of overcoming possible delays caused by the breakage of the main trolley wire.

There are three expansion joints for the trolley wire over each roadway, one at either end and one in the middle. The two arms between which the motion takes are about  $2\frac{1}{2}$  ft. apart. Each side of this opening two arms about 6 ft. apart are connected by oak plank from which are suspended the two elements of the expansion joint. On one side there is an iron bar 5-16 in. by 1 in. rounded on the lower edge to diameter equal to the thickness of the bar; this bar projects beyond the opening and on the other side is received in a U-tube bent up out of  $\frac{1}{8}$ -in. iron which forms the other element of the joint.

Many of the steam railroad grade crossings, of which there are a large number on the system, are protected by gates about 3 ft. high, which are lifted by wire cables and a drum driven by a hand crank. An angle iron arch is placed in the trolley circuit so that



FIG. 3—HALF ELEVATION TROLLEY LINE OVER CROSSING.

the gate can be raised till its lower edge is at the level of the trolley wire. On the lower edge of the gate is a 4-in. channel iron runway, which, when the gate is up, makes alignment with similar flaring pans or runways at the ends of the trolley wire. Fig. 3 shows a side elevation of the structure over the steam railroad with side view of the arch in the trolley circuit and end view of the gate.

Both the steel pan and steel bar constructions mentioned above, are to be used in a modified form in a large car barn soon to be erected. The construction of the new power house sub-stations now in progress has made necessary the installation of a high tension transmission line from the central station to the various sub-stations. With the exception of the line to the Coney Island sub-station, the transmission feeders will be installed in subways. The line to the Coney Island sub-station will be carried on 45-ft. poles by way of the Sea Beach line. These poles are provided with two cross arms each, and arranged to carry two circuits. In order to secure the benefit of transformers installed in the Halsey St. sub-station last spring it became necessary to install a temporary transmission line to that point. This line consisted of a three-conductor lead covered cable, weighing approximately 7 lb. to the foot. About three miles of the line was run on the elevated structure on Lexington Ave. between Nostrand Ave. and the sub-station, the feeder cable being suspended from a  $\frac{3}{4}$ -in. galvanized iron cable by means of the Metropolitan cable clips installed at intervals of one foot throughout the entire length of the line, while at intervals of 50 or 100 ft. the feeder cable was lashed securely to the links supporting the messenger cable. This method of installation is giving excellent service and has several advantages over ordinary underground installation.

This company several years ago adopted the "Protected" rail bond as standard and it has installed about 150,000 of these joints. The "International" register is extensively used, over 1,000 of these having been furnished the company by the Mayer & England Co.

## TRACK CONSTRUCTION ON THE BROOKLYN RAPID TRANSIT SYSTEM.

By R. L. Russell, Assistant Engineer, Brooklyn Rapid Transit Co.

Speaking broadly a street railroad man from any part of the country can find in Brooklyn, on some part of the Brooklyn Rapid Transit Co.'s system, a line whose construction and operation problems are those of his own road, generally with a few extra complications on account of the connection with the rest of the system, unless the visitor comes from one of the few roads operated by the underground trolley. And in addition to the problems incidental to all trolley roads, there are special ones peculiar to the traffic conditions of Brooklyn.

As in the old world all roads led to Rome, so in Brooklyn to-day all lines lead to the Brooklyn Bridge. When the new bridges are built, the conditions will be greatly improved.

At the New York end of the bridge will be found the busiest trolley terminal in the world. Over five million cars have passed around these four surface loops from Jan. 23, 1898, when the first service was started, to Aug. 1, 1901. The loops are heavy 9-in. girder guard rails, and the special work of the best hardened steel center construction; but the entire loops had to be renewed after only two years.

Leaving the New York terminal loops on a car for Brooklyn, we pass up the approaches on as rigid a roadbed as there is in the world. The 9-in. grooved rail is laid on the concrete foundation of the roadway, with Weber joints, and tie-rods every 3 ft. This rail was designed by Mr. J. C. Brackenridge especially for this service at the time the work was projected, and how well he conceived is shown by the illustrations in Mr. E. H. Packe's article on another page of this issue. This wear during three and one-half years, under the passage of over five million cars, is there compared with the wear of the flat rail on the suspended span which is reached a couple of minutes after leaving the loops. Here the rail is bolted to stringers of creosoted timbers, and the roadbed is ideally elastic. Comparison shows that the wear of the metal on the elastic foundation is only half that on the unyielding concrete, as might be expected.

On reaching the Brooklyn end of the bridge, the lines diverge, radiating like the sticks of a fan. Keeping to the right, up Fulton St., if it be rush hours, we run into one of the problems of the Brooklyn traffic, the one main thoroughfare up-town which must handle all the cars and the traffic for the big department stores for a number of blocks until the main business section is passed. On this street the service is only a little less severe than that on the bridge. The rail, of the same section as that on the bridge approaches, is laid on 6 x 8 in. x 8 ft. yellow pine ties, while between the ties and around the ends is rammed concrete 6 in. in depth. Brace tie plates are placed at every third tie; Weber joints are used, and hemlock rail fillers to hold the granite block paving, with pitch and gravel joints. Tie-rods are also spaced every 3 ft. on Fulton St., but on other less heavy lines, tie-rods are not used with tie construction.

The travel is so heavy on Fulton St. that switchmen are a necessity at each switch to avoid delay. As the lines branch off from Fulton St., however, and the headway between cars becomes longer, switchmen are not necessary. At various points in this zone, next to that of heaviest traffic, electric switches have been in use for several years. These are operated by electromagnets, energized by cars passing over an insulated rail, with the current on, before reaching the switch. If the switch is set against the car, the motorman goes over the rail with power on; if not, he coasts over. Experience shows, however, that the time saved by use of an electric, or other semi-automatic switch, is so slight that the installation is not profitable. The motormen are at every junction obliged to stop anyhow, before taking the switch, and except at important points the motorman can easily turn the switch with a long-handled switch iron.

After leaving Fulton St., where, during rush hours, the cars are necessarily spaced so closely that high speed is impossible, the various lines diverge rapidly, and the construction varies. Several branch off to the south, and by different routes reach terminals, not widely separated, only a few hundred yards apart, at Coney Island. Another runs to Brighton Beach.



The Brighton Beach and Coney Island lines are most interesting. Their heavy travel is entirely during the summer months; and then it is so enormously heavy that on Saturdays, Sundays and holidays it is almost impossible to handle it. These lines are mainly old steam railroads, on private right of way (Brighton Beach R. R., Prospect Park & Coney Island R. R., Sea Beach R. R., and Brooklyn, Bath & West End R. R.), and upon their lease by the Brooklyn Heights Railroad Co., were converted to trolley use. In doing this, one of the distinctive features of the Brooklyn Heights construction should be mentioned, the use of inclines of two per cent grade and steeper, connecting lines of different grades, both running parallel and at right angles to each other. In no other system are there to be found so many of these, of varied construction, connecting elevated with surface lines, and street railways to those in cuts.

The Brighton Beach R. R. was formerly an independent steam road running from Brighton Beach to Atlantic Ave., a distance of about 7 miles. Before its lease to the Brooklyn Heights company, the Kings County Elevated R. R., operating by steam from Fulton Ferry and the bridge east to the city line, had built an elevated structure turning off at the Franklin Ave. station, and running south over the Long Island R. R. two blocks away at Atlantic Ave., and then descending to the surface at Park Place and connecting with the Brighton Beach R. R., thus connecting New York and Brighton Beach by means of the bridge and the Kings County Elevated and incline.

The Brighton Beach permanent way and equipment, however, had been allowed to run completely down, and on its lease by the Brooklyn Heights R. R., in the spring of 1899, its entire reconstruction became necessary, and in order to operate trolley cars to the beach, two inclines were designed at Flatbush Ave. and Malbone St., under which the Brighton road passed through a tunnel about 400 ft. long. A connection was also designed to connect the Brighton Beach and the Manhattan Beach railroads just south of Sheephead Bay, at a point where the two lines begin to diverge after having run south for a long distance parallel and but a few hundred feet apart. By prolonging the divergent tangent of the Manhattan Beach line back to meet the Brighton line, an ideal connection was made.

In the relaying of this line, 70-lb. T-rail was determined upon to replace the old 60-lb. rail, and loops for the terminal at Brighton Beach. All trains were taken off the line except a work train to handle material, and the road was divided up into three sections; each section put in charge of a track foreman, with not more than four assistant foremen, and a bonus offered to the foreman and gang laying the best track and roadbed under the following conditions:

#### INSTRUCTIONS TO FOREMEN LAYING THE BRIGHTON BEACH R. R.

1. Track must be perfect in alignment, surface and gage.
2. Great care must be taken to obtain an even and perfect bearing for fish plates; bolts to be evenly tightened up. Particular care must be taken to obtain an even bearing of sole plate on the base of rail.
3. Care must be taken in spacing of ties, which are to be 2 ft. center to center. All ties on tangents must be at right angles to the rail, and radial on curves. All ties must be tamped evenly and hard from one foot inside the rail to the end of tie; centers not to be tamped as hard as the ends. Ties should be cross-spiked to keep them at right angles to the rails.
4. Back filling should be level with the top of ties, and carried to a distance of 8 in. beyond the ends of ties to form a shoulder, then down on a 1 to 1 slope, as shown on drawing, to the bottom of the ditch 1 ft. below top of ties, and 2 ft. across on a level.

Banks should be grubbed off and a regular slope formed from the bottom of ditch to the top of cut.

All tunnels must be white-washed with two coats, and all rubbish, of every description, removed from the line of work.

As a premium to the gang that builds the cheapest and best track in the shortest time, in accordance with the above instructions, the foreman in charge of the gang will be paid \$100; each assistant foreman (not exceeding four) \$50; and to each laborer \$5.

The men building the second best section of track will be paid a premium in each case one-half the above figures.

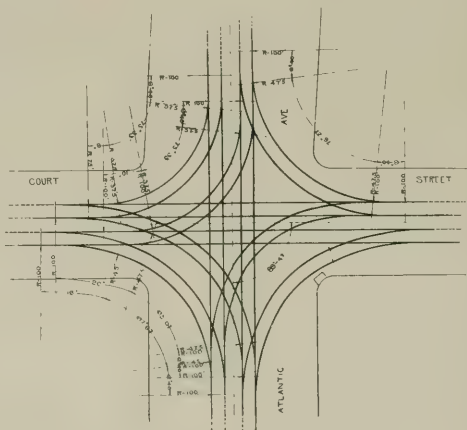
The president of the company, together with the chief engineer, engineer of maintenance of way, with the roadmaster in charge of the work, will pass upon the work done by each gang and award the premiums as above.

This is done in order to show that the railroad company takes an interest in the welfare of the men, and in return expects the men to take an equal interest in the welfare of the company.

The result of this stimulus to the best efforts on the part of everyone can be seen and felt today, after three seasons of exceptionally heavy traffic, in the fine roadbed.

The incline from the east-bound Flatbush Ave. track connects with the south-bound Brighton Beach track, and coming back from the beach, the incline track turns out on the opposite side and leads up to the New York bound trolley track on Flatbush Ave., thus avoiding any grade crossing on the former steam road, which would be bad on account of the proximity of the tunnel. These inclines are built of coursed rubble retaining walls, laid in portland cement mortar, surmounted by "cosmo-concrete" coping back of which the fill forms a solid roadbed upon which the regular tie construction can be used.

As steam or electric trains are operated over this line via the Kings County Elevated and incline at the same time with trolley



COMPLICATED SPECIAL WORK PENNSYLVANIA STEEL CO. AND LORAIN STEEL CO.

cars of the Nostrand and Flatbush Ave. lines, via the Flatbush Ave. and Malbone St. incline, the special work must all be designed to carry both steam and trolley service.

Spring rail frogs are used, so placed that in the single spring rail type the open flange-way is parallel with the trolley run, making a practically unbroken main line for the narrow treads of the surface car wheels. If both runs on a branch-off curve are used by trolley cars, double spring rail frogs are put in. In crossings of acute angles, the side frogs are of the movable point type, operated simultaneously with the throwing of the switches either from a tower or by ground throws, depending on the importance of the junction. Cosmoconcrete platforms add to the appearance of this line.

This year the reconstruction of the West End R. R., another Coney Island line, has been necessitated by the decision to run electric trains instead of trolleys. This was formerly a steam road, and the right of way for a great portion of the line forms half of the roadway, first of New Utrecht Ave., and then of Bath Ave. This line is being laid with 70-lb. T-rail without interfering with the operation of trains on a 15-minute headway, and the same course could not be pursued as in the case of the Brighton Beach line, where traffic was suspended at the time of reconstruction.

In the present case also, the work is being done almost on a public street as the other half of the roadway of New Utrecht

Ave. and Bath Ave. is not fenced off, and the driving upon it is frequent. This work is now in progress, as well as the construction of the New Utrecht Ave. sewer, and make a ride over this road full of interest.

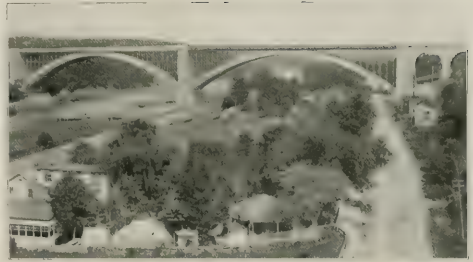
The trains leave the New York end of the Brooklyn Bridge, pulled by motor cars taking the current from a third rail, and go over the Fifth Ave. line of the Brooklyn Union Elevated to 36th St. Union Depot, where they run down an incline into the tracks of the West End line; trolley poles, formerly tied down on the trail cars, are raised to the overhead trolley wire and the current is conveyed to the motor cars through cables coupled where the air hose is and the trains pull out again. Cosmocrete platforms are being constructed along this line and also to some extent at the terminals at Unionville. A new steel draw bridge is to be built over Coney Island Creek, a feature not necessary on the Brighton Beach line, which is nearer the head of the stream where it is not navigable. At this writing (September 1st) it is undecided whether this bridge will be of the swing type, with center pier, as is the present bridge, a lift bridge similar to the Harway Ave. highway bridge a few hundred yards down stream (west), which would give a chance for the solution of a very pretty problem as to the design and disposal of the overhead work when the bridge is opened, or a knife bridge similar to that on the Sea Beach line of the Brooklyn Rapid Transit system a few hundred yards up stream, only with plate girders, and galloways frame of iron or steel instead of wooden construction.

The peculiar features of a bridge of this last named type are that instead of a floor system upon which the rails are laid, each rail is laid directly upon a longitudinal girder. Each girder is independently hinged or pivoted at the galloways frame end and each swings in a horizontal plane about its pivot as a center when the bridge is opened, and the longitudinal girders fold practically against one another. There can, therefore, be no rigid lateral members, but all tie-rods connecting the girders laterally must be pivoted at each end. The bridge may be said to open and close like a fan. Outside of each outer girder may be constructed a foot walk if desired. The galloways frame is anchored securely, and over the top of the frame, cables pass to the far end of the girders and are led down to a hand lever on each side. Before opening the bridge the tender pulls down these levers and secures them by a pin through a hole in the lever arm, thus raising the far end of the girders sufficiently to unlock the rails by lifting them from the socket joints into which they fall when in line. A circular arc on which is bolted a casting with teeth leads from the far end to engage the gear wheel on a motor placed on a platform on the anchorage side. This motor is wired through an ordinary car controller connected to the trolley wire and kept under lock. Upon the current being turned on, the revolution of the motor draws the toothed arc towards it and with it the bridge.

The advantages of this construction are the ease of providing for the overhead work and the simplicity of the mechanism required for opening, and the few bearings to look after. The Sea Beach bridge was framed and erected by the Brooklyn Heights Railroad Co's. carpenters, the motor and rack put in place by the company's machinists, and the track laid with no more difficulty than would be experienced in building a stairway.

The Sea Beach R. R. is also reached by two inclines, one a single track incline from the Third Ave. line at 65th St. down to the Sea Beach, and two inclines at Fifth Ave., under which the Sea Beach road also passes; the northerly incline at Fifth Ave. being an embankment filled in behind a coursed rubble retaining wall laid in cement mortar, and the southerly incline being a wrought iron structure from the upper end to a point from which to the foot of the incline a retaining wall with fill behind it became a cheaper and better construction. By the use of elevated girders from a portion of the old Brooklyn Union Elevated R. R., which was taken down some years ago, a considerable saving was effected in the cost of this incline.

These Coney Island lines should be of interest to the engineers of high speed interurban electric railways having private rights of way as this is practically what these lines are. The motor equipment used on the system has to bear an unusually severe service because of the high speed maintained on these lines and the same cars having to maintain a speed so greatly reduced as that on Fulton St. and the Brooklyn Bridge during rush hours.



WASHINGTON BRIDGE.

This is a short distance up stream from High Bridge and is another remarkable structure. It is 2,400 ft. long and 80 ft. wide, built of steel, iron and stone. The two central arches are each of 510 ft. span and 133 ft. above high water mark. The total cost of the bridge was nearly \$2,700,000.

The interurban railway on public highways can be seen on the Brooklyn Rapid Transit system on the lines to Jamaica, Newtown, Corona, Flushing and Bowers Bay; and also the lines to Bergen Beach and the Ocean Ave. line to Coney Island. On these lines may be seen 9-in. girder rail with all forms of pavement—granite block, Belgian, cobble brick asphalt—and T-rails with macadam and brick.

In Mr. E. H. Packe's paper, before mentioned, will be found illustrations of the different forms of construction mentioned. The two forms of construction which promise to give the most work to the engineers of the Brooklyn Heights Railroad during the next few years are inclines and loop terminals. Besides those already described, there are inclines connecting the Fifth Avenue Elevated and the West End line at 36th St., the Kings County Elevated and the Long Island R. R. at Chestnut St., and soon we will have one at Cypress Hills connecting the present terminal of the Brooklyn Union Elevated with the surface tracks on Jamaica Ave. This latter will probably be in course of construction during the New York convention of the American Street Railway Association.

As to terminal loops, their advantage over other forms cannot be questioned if the traffic to be handled be heavy. We have them installed at Bowers Bay, Brighton Beach, the three Coney Island terminals, the New York end of the Brooklyn Bridge, and the East New York loops, both surface and elevated.

There are several features at East New York which will repay the trouble of inspection. The property owned by the company between Broadway and Fulton St., at Vesta Ave., is at a point where there was not sufficient distance between the two elevated lines in which to construct loops with the length of tangent required on which to stand a five-car train. The side and island platforms are, therefore, built on a curve (the island platform is cigar shaped) and some sort of movable platform is necessary to bridge the distance to the car platforms.

There are two styles in use at the East New York loop, lift and sliding platforms, both styles operated by levers on the main platform. The design of the lift platform, in raising which a knee joint throws over the center and prevents the platform dropping until the lever is thrown, is neat, as is that of the sliding platform.

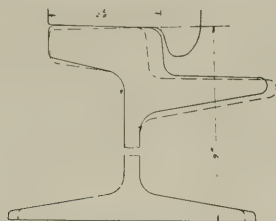
At this loop, the combination of routes between the two elevated lines, the Brooklyn Union and the Kings County, is complex. The trains up Broadway may go around the loop and down or up Fulton St.; down trains on Broadway may go down or up Fulton St., and up Fulton St. trains may go up or down Broadway, and similarly for the down Fulton St. trains. In addition, the yard and shops of the Brooklyn Union Elevated are just east of the loop on the Broadway line, and the water and coaling stations are just west (these latter will be abandoned as soon as electric operation is complete). A considerable interlocking plant is required to protect this junction, and a visit to the loop and the shops should certainly be included in the itinerary of the visitors to the convention.

## TRACK CONSTRUCTION IN BROOKLYN.\*

By E. H. Packe, Engineer Maintenance of Way, Brooklyn Rapid Transit Co.

The traffic conditions in Brooklyn are unlike those obtaining in any other city, at least in America. We have suburban lines running for long distances at a high rate of speed; these converge, and the same cars and equipment run through outlying streets where a high speed can still be maintained until lower Fulton St. is reached. Here during rush hours both morning and night, the cars form almost one continuous train, and can barely crawl along. The number of cars on the New York and Brooklyn Bridge roadways is still greater, and without exaggeration it can be said that on these roadways the maximum of service which any street railway track is called upon to carry is reached.

When it was definitely decided to operate cars over these roadways, it was known that the service would be exceptionally severe,



BRACKENRIDGE DESIGN.

Full line shows Brooklyn Heights standard 9-in., 94-lb. rail. Broken line shows another 9-in., 90-lb. section. With an estimated increase of 4 per cent in cost the life of the heavier rail is double that of the lighter.

and the subject of rail section was thoroughly investigated by Mr. J. C. Brackenridge, at that time chief engineer of the track department of the Brooklyn Heights R. R., and chief engineer of the associated trolley companies. He found that in the sections of 9-in. girder rail then in use, the head of the rail was too far off center and not properly supported by the web. In fact, from the gage line to the center of the web was only 3.32 in. On taking this matter up with the steel companies, and sending them a sketch of

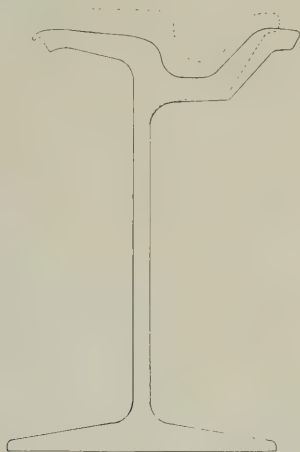


FIG. 1.

the section designed by Mr. Brackenridge, the steel companies claimed they could not roll such a section. Mr. Brackenridge made a trip to Steelton, saw the roll maker, and the latter said of course the rolls could be made. A 5,000 ton order was placed with them,

Paper read before the New York State Street Railway Association, at Rochester, September, 1901.

the rolls were made and the first 9-in. girder rails, in which the head was properly supported by the web, was laid on the roadways of the New York & Brooklyn Bridge in December, 1897.

How well this section was designed, and how closely the actual wear has followed the lines theoretically designed, is seen in Fig. 1, which shows the original section of the rail and the section after five million cars have passed over it in three and one-half years from the date of opening, Jan. 23, 1898, to Aug. 1, 1901.

In this rail, the Pennsylvania Steel Co's. No. 241, the gage line is  $\frac{5}{8}$ -in. inside the center line of the web. This sketch shows that the rail would wear away uniformly until the metal was entirely gone.

Another feature of this groove rail is that it is self-cleaning, so to speak. Mr. Brackenridge had written to various railroad companies, requesting their experience and an expression of opinion as to the merits of groove rails then in use; all informed him that the rails of such sections were uneconomical, as the grooves filled with dirt to such an extent as to cause the wheels to run on their flanges, thus making poor contacts and costing 20 per cent more to operate. On account of the almost perpendicular gage-side of the treads and



FIG. 2—RAILS ON BROOKLYN BRIDGE.

small fillets at the flat bottoms of the grooves, this objection could not be remedied.

In his design for a groove rail, Mr. Brackenridge overcame this difficulty by making the gage-line of the head more oblique and the bottom of the groove the arc of a circle whose radius is 9-16 in., more than twice that of the fillet in previous sections. By giving this shape to the head, the flanges of the wheels plow into any dirt which collects in the groove and crowd it out over the lip of the rail, thus keeping it free and clean, and preserving the good electrical contact which is desired.

This rail, in 60-ft. lengths, is laid on the bridge approaches on a 6-in. bed of concrete, with tie rods every 3 ft., and paved between rails, and outside as well, with granite block paving on the concrete bed, with pitch and gravel joints.

On the suspended structure, another specially designed rail section was laid, on stringers of creosoted yellow pine, bolted down with  $7 \times \frac{3}{4}$ -in. bolts, with the head counter-sunk in flangeway of rail, and a  $2\frac{1}{2} \times 3\frac{1}{2} \times \frac{1}{2}$ -in. washer, and spiral split nut lock. The wear on this section of rail is shown in Fig. 2. This has had the same number of cars pass over it that the 9-in. section No. 241 had—five million in three and a half years.

Although the specifications for the steel were the same in both cases, the much greater wear on the rail on the concrete foundation is notable, amounting to about double the amount of metal.

The standard construction of the Brooklyn Heights Railroad Co. in streets where the pavement is granite block on concrete

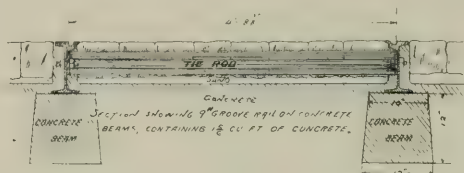


FIG. 3.

foundation, is as follows: The street is excavated to the subgrade, which is levelled off with sand. On this are laid the ties,  $6 \times 8$  in.  $\times$  7 ft., with tamped foundations; on these are spiked the 9-in. girder rails, 60 ft. long, of the section as shown in Fig. 1, with brace tie plates every third tie, Weber joints being used for splicing. After the rails are spiked down, surfaced and lined, portland cement is rammed in between the ties, and around the ends of ties, forming a solid bed of six inches above the subgrade between the tracks and rails and two feet outside. On this is laid an inch of sand in which



to bed the paving. Hemlock rail filler is placed between the flange and head, and flange and tram of the rail, and granite blocks are paved in. The joints are then filled in with heated gravel and hot paving pitch is poured in the joints to fill up the voids.

On streets where the city has not yet adopted granite block paving, no concrete foundation is used and the pavement is laid on sand well tamped, and with sand joints. The sand used is dug by our own men from a sand bank on our own property, loaded in our flat cars and hauled direct from the bank to the point required. Material is also handled on flat cars wherever possible.

Fig. 4 shows different styles of rails and track construction that have been installed in Brooklyn at different times, to be finally displaced by the 9-in. girder rail of section shown.

On the Coney Island lines, on our private rights of way, in several cases, electric and steam trains are operated simultaneously

and cinders is spread over the top of the roadbed to a depth of half the height of the rail; this prevents the dust from flying at the rear of a rapidly moving train or car.

On the heaviest line, Fulton St. below Flatbush Ave., tie rods spaced every 5 ft. are used in addition to the brace tie plates.

In the summer of 1899, in relaying the double track line on Court St., it was decided to lay one track (the north bound) on a concrete beam construction (shown in Fig. 3) and the other, or south bound, track on regular tie construction without tie rods, from Joralemon St. to Atlantic Ave.

The old paving was removed, old track and ties torn up and the trenches for concrete beam excavated and the beams laid by means of molding boards for the sides if the beams, accurately levelled on the upper edge to the proper grades for the base of the rail, the sides being taken off and moved ahead as each section of beam set. The rails were laid on this in 6-ft. lengths, with Weber joints whose sole plates were sunk flush with top of beam; tie rods were spaced 3 ft. apart.

The cost of the concrete beam track was nearly double that of the track on tie work, though some of this extra cost was undoubtedly due to the unfamiliarity of the men with this style of work, and also to unavoidable delays. However, the extra cost does not seem to be justified in view of the increased wear of the rails on the unyielding concrete foundation, as exemplified on the bridge approach and the suspended structure, although after two years the line and surface are still perfect.

### THE OTTUMWA ELECTRIC & STEAM CO.

The reorganization of the Ottumwa Electric & Steam Co., which was outlined in the "Review" for August, has been accomplished and new articles of incorporation have been filed. It will begin business as a new company on October 1st.

The new articles of incorporation permit the company to own and operate interurban lines, etc., to own and operate coal mines in the state of Iowa, and to do other things not provided for in the articles of the old company. The company is now being unavoidably delayed in carrying out its extensions on account of the strike in the steel trade, but as soon as materials can be procured the extensions will be pushed rapidly.

The authorized capital stock of the company is \$500,000. The officers are: President, Joseph H. Merrill, Ottumwa; first vice-president, G. W. Wattles, Omaha; second vice-president, Samuel Mahon, Ottumwa; treasurer, J. W. Garner; secretary, J. B. Saxe; superintendent, Royal H. Hollbrook.

### METROPOLITAN "L" STATION BURNS.

The Logan Square terminal of the Metropolitan Elevated, Chicago, was practically destroyed by fire on September 2d at 2 a. m. The fire started in the oil room, presumably from spontaneous combustion, and gained considerable headway before it was discovered. The elevated structure contains at this place a shed nearly 300 ft. long for storing and repairing cars. The fire was discovered at about the same time by the station agent and a motorman who was waiting with his train. After sending out an alarm the motorman and his conductor pulled all but six cars out of the yards before the fire got too hot for them to work there. The agent secured the money from the cash drawer and escaped with some slight burns. This station was practically destroyed.

### CINCINNATI-TOLEDO LINE.

The Western Ohio Traction Co. will operate a line extending from Findlay to Dayton, which through its feeders will connect Toledo, Cincinnati, Cleveland, Dayton and a number of smaller cities. The greater portion of the line will be completed before winter and early next year the entire system will be in operation. The company has recently increased its capital stock by \$1,500,000, making its total capital \$2,500,000. The new issue will enable the company to build 72 miles in addition to its original line of 34 miles.

The Onconta (N. Y.), Cooperstown & Richfield Springs Railway Co. has increased its capital stock from \$750,000 to \$1,000,000.

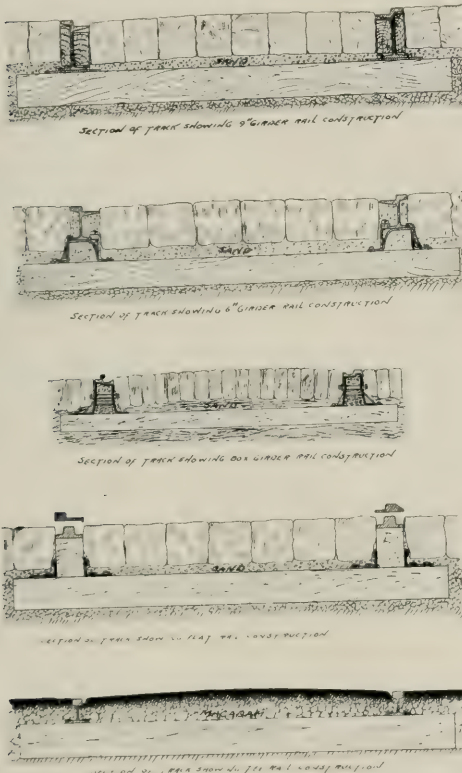


FIG. 4.

with trolley cars. This renders the conditions regarding track work peculiarly exacting, as T rail construction is used, which must pass steam wheel flanges at all frogs and switches, and yet must not drop the smaller treads of the trolley wheels and derail the cars. In such cases, spring rail frogs are used, so placed that in the single spring rail type the open flangeway is parallel with the trolley run, making a practically unbroken main line for the narrow treads of the surface street car wheels. Where both runs in a branch-off curve are used by surface street cars, double spring rail frogs are put in, and in crossings of acute angles, the side frogs are of the movable point type, operated simultaneously with the throwing of the switches, which is done either from a tower or by ground throw, depending upon the importance of the junction. All our T rail track is so constructed as to be capable of carrying heavy steam road traffic. The foundation for the ties, which are 6 in. x 8 in. x 8 ft., is well tamped under and around the ties. A ballasting of



GRANT'S TOMB.

This site is a most commanding one, overlooking the Hudson and the Palisades to the west and north and the great stretch of New York City to the south and east. With the possible exception of the Washington Shaft, at Washington, D. C., Grant's Tomb is the finest monument ever erected in this country by popular subscription to the memory of one man. Architecturally speaking the mausoleum is of the Doric order: it measures 90 ft. on a side and is surmounted by a circular cupola with its pyramidal top terminating 150 ft. above grade. It was built at a total cost of \$600,000, contributed by about 90,000 persons, most of them citizens of New York.

### OHIO NOTES.

The Cincinnati Traction Co. has been granted important franchises in the village of Norwood and will begin the construction of extensions there at once.

The Cincinnati Traction Co. has had introduced into the village council of Oakley, an important suburb, a franchise granting that company permission to lay a double track through the incorporated village. The franchise has had its second reading and will doubtless be passed.

The county commissioners of Franklin County have granted a franchise to the Columbus, Newark & Eastern Traction Co. This company proposes to build to Newark from Columbus by way of Granville. The road is to be completed by 1903. It will ultimately extend the line to Zanesville.

It is reported that the Everett-Moore syndicate has been making endeavors to purchase the Cincinnati, Lebanon & Northern from the Pennsylvania Railroad Co., in order to give them an entrance into the heart of the city, with their proposed cross state line from Cleveland. It is stated that the Pennsylvania will not dispose of the line outright, but that there is some probability of a trackage right being arranged for.

The annual stockholders' meeting of the Southern Ohio Traction Co. was held at Hamilton, Ohio, the first week in September. The following were elected directors of the company: M. J. Mandelbaum, J. Mandelbaum, W. H. Lamprecht, E. W. Christy, J. R. Nutt, L. J. Wolf, all of Cleveland; James Christy, jr., Washington; Peter Schwab and O. V. Parrish, Hamilton; F. T. Pomeroy and A. E. Aikens, Cleveland, and Will Christy, Akron.

The officials of the Southern Ohio Traction Co. and the Cincinnati Northwestern R. R., fearing a temporary injunction, took advantage of Labor Day, when the courts were not in session and put a large gang of men to work at College Hill, and had the connection between their lines complete before their opponents discovered the fact. This will enable the Southern Ohio Traction Co. to enter the city over its own lines as the old Cincinnati Northwestern passed into the control of M. J. Mandelbaum and his associates some time since.

Discussing the possibility of a competing line between Cleveland and Toledo, in opposition to the Everett-Moore line, Mr. F.

T. Pomeroy of the Mandelbaum-Pomeroy syndicate recently said: "We might just as well acknowledge now as at any other time that we intend to extend our line to Toledo. We were granted a franchise to operate cars on the streets of Norwalk, and rails will soon be delivered for the extension. Rails have been delivered at Oberlin, where construction work will immediately begin. The grading from Oberlin to Berlin Heights is about completed, and we expect to commence track laying in Berlin Heights at once."

### SEARCHLIGHT SIGNALS FROM BUFFALO TO TORONTO.

Signals from a 30-in. searchlight on the Electric Tower of the Pan-American Exposition, were sent to Niagara Falls, July 25th, by Prof. George F. Sever, superintendent of electrical exhibits, and since then searchlight signals have been sent from Buffalo to Toronto, a distance of 58 miles, through arrangements completed by Professor Sever in co-operation with Mr. Wm. S. Aldrich, consulting electrical engineer, of Toronto.

The first trial was made from 9 to 10 p. m. August 9th. There were clouds over Toronto, and the local illumination of the overhead sky by the electric arc lights in the streets of Toronto effectually prevented any discrimination being made between the local and the Buffalo illumination of the clouds. The second trial was made about 10 p. m. August 13th, with a perfectly clear atmosphere. Owing to the smoke settling down over the city, no signals could be discerned from the top of the Municipal Hall tower, Toronto, which was the pre-arranged objective point, but all the signals were very clearly seen during the second trial by Mr. C. H. Rust, city engineer, Toronto, who, with party, was located on Center Island, two miles off shore from the city.

### STEBENVILLE'S PROPOSED RESORT.

The Steubenville (O.) Traction & Light Co. is preparing to locate a modern resort at Alikanna, to be known as Dehewahmis Park. The park site covers an area of 82 acres of beautifully wooded land, and adjoins the water works park of over 100 acres. Within the next 12 months, many buildings will be erected, among them an entertainment casino, a club house, a storage battery house and an observation pavilion. It is hoped to have the casino completed in time to furnish accommodations for skaters at Dehewahmis Park this winter. In the spring, tennis courts will be laid out and possibly golf links will be opened. The site has many natural scenic attractions. It is on the cliffs commanding a fine view of the river; and there are four springs and a fine cascade on the property.

### MERGER AT SALT LAKE CITY.

August 15th it was officially announced that the Salt Lake City Railroad Co. and the Salt Lake Rapid Transit Co. had been merged and would henceforth be known as the Consolidated Railway & Power Co. The officers are: President, C. L. Rood; vice-president and general superintendent, W. P. Read; secretary and treasurer, Joseph S. Wells; directors, the officers and E. V. McCune and B. M. Ellerbeck.

### BOND WIRE HELD TO BE REAL ESTATE.

At Sioux City, Ia., two prisoners in the county jail for having stolen copper wire from the Leeds line of the Sioux City Traction Co., were recently acquitted of the charge of grand larceny on the technical ground that the bond wire of an electric railway is not subject to larceny because it is real estate and not personal property. The court sustained the proposition of the county attorney to hold the prisoners for investigation by the grand jury on the charge of malicious trespass, which would cover the offense.

The Cincinnati Traction Co. has tested its new sprinkling cars with entirely satisfactory results. The sprinklers easily throw water the whole width of the street, though for ordinary purposes two feet on either side of the track is all that will be required

## The Interurban Railway as an Investment.\*

BY GUY MORRISON WALKER.

The first application of electricity as a motive power upon street railway lines was made scarcely fifteen years ago, yet so rapidly has it displaced all other systems for city and suburban traction that every city and almost every town is covered with electric lines the modernness of whose equipment has come to be held a fair index of the progressiveness of the city itself. It is less than ten years since the first suburban lines were successfully operated, and it is only within the last two years, since the development of the tri-phase system of transmitting power that we have begun the building of truly interurban electric railways; long distance lines, reaching from city to city, and serving populations other than urban.

The first electric railways being city lines, it was entirely natural that their securities should first find a local market, and this state of affairs continuing so long has made it difficult to secure for the stocks and bonds of interurban lines that consideration which they deserve because of their importance as a growing factor in the transportation of our immense commerce.

In the evolution of American transportation facilities, we have undoubtedly reached the era of interurban electric lines. The building of steam roads will from this time decrease, and the great supply of steam roads securities that has satisfied the investment demand of the past will diminish, while in their place will be offered for some years to come an increasing volume of the securities of interurban electric railways. This fact should lead trust companies, bankers and investors generally to examine in-



GUY M. WALKER.

to the intrinsic value of the securities of the interurban railways now in operation, and to discover if possible something of their future by investigating the conditions under which they are now competing for traffic in their respective territories.

In the first place interurban railways are not as a rule nearly so heavily capitalized as are the steam railroads with which they compete. This means that they do not have such a heavy burden of fixed charges to carry. As an example, the Detroit & Port Huron Electric Railway, running from Detroit, Michigan, to Port Huron, a distance of 72 miles, is capitalized at only \$34,480 per mile, while the Grand Trunk steam railroad, with which it competes, is capitalized at \$93,714 per mile. The Toledo, Fremont & Norwalk Railroad, an electric line, 62 miles long, running from Norwalk, O., to Toledo, is capitalized at \$40,000 per mile, while the Lake Shore & Michigan Southern, which it parallels, is capitalized at \$70,000 per mile. The South West Missouri Electric Railway, running from Carthage, Mo., through Joplin to Galena, Kan., a distance of 41 miles, is capitalized at \$31,700 per mile, while the St. Louis & San Francisco Railroad, with which it competes, is capitalized at \$56,100 per mile. The average capitalization of steam roads in the United States, according to the report of the Inter State Commerce Commission for the year 1900, was \$61,490 per mile, while the average capitalization of electric interurban railways will not exceed \$35,000 per mile.

In comparing the earnings of these interurban roads with the earnings of steam railways it should be remembered that while the passenger earnings of the steam roads comprise but a small, and in some cases almost insignificant, proportion of their gross earnings, the earnings of electric roads are almost wholly derived from this source. Another thing to be considered is the fact that of the passenger earnings a large proportion, and that by far the more profitable, comes from their long ride passengers, or in other words, their through traffic, while the electric roads with their short lines can get no long haul, and their earnings are col-

lected in small sums from local traffic alone. In spite of this fact, the earnings of electric interurban roads from their passenger traffic amount to two or three times that of the steam roads from the same source. The average earnings of steam roads in America from passenger traffic for the past year amounted to \$1,674 per mile, while the average earnings of the interurban electric roads were nearly two and one-half times that amount, being approximately \$3,800 per mile. Many roads, however, run very much higher, as the South West Missouri Electric Railway, which earns \$4,735 per mile, the Union Traction of Indiana with earnings of \$4,984 per mile, and the Northern Ohio Traction Co. with \$5,520 per mile.

The earnings of interurban lines are not so quickly nor so severely affected in times of industrial depression as are the earnings of steam roads. The reason for this is easy to see, for when people begin to economize they naturally first curtail those disbursements which are heaviest, and as the steam road fares usually amount to considerable sums, their payment is a heavy burden and is early cut off, while the fares of the interurban roads, being small and light in comparison with the steam road fares, are hardly felt, and as a consequence traffic on interurban roads continues heavy long after a considerable shrinkage has been noticed in the travel over steam roads.

With the development of interurban railways into great systems, as has been done by the Everett-Moore Syndicate of Cleveland, which have united its electric railways into a continuous line from Port Huron, Mich., around Lake Erie, and through the state of Ohio, almost to the Pennsylvania state line, making it possible to ride in electric cars for a distance of 360 miles, there will come a large development of through passenger traffic over these interurban lines that will prove doubly remunerative. Doubly remunerative because the present local traffic is already highly profitable, and this additional through traffic while swelling the gross earnings will add but little to the cost of operation.

It has long been notorious that the steam roads have not found their passenger traffic profitable, and that in many instances they have been compelled to draw upon the profits of their freight business to pay the cost of operation of their elegant passenger service. It is, however, one of the peculiarities of electric interurban roads that they are able to carry this short haul passenger traffic which the railroads find unprofitable, at rates one-third to one-half less than the rates charged by the steam roads, and yet operate so cheaply as to find this traffic highly profitable. The average fare per mile received by the steam railroads of America last year was 2.003 cents, while the average fare of the interurban roads was only 1.30 cents per mile, and in several districts where population and local conditions are favorable a rate of less than one cent per mile prevails. The result of these low fares on the electric lines has been that passengers make it a point to leave the steam trains at the nearest point at which they can secure an electric car and complete their trip to their destination over the electric line. The Michigan Central has found that from its trains bound for Detroit such a large proportion of the passengers left the train at Ann Arbor and rode on into Detroit over the electric line that it was necessary to take off several of the trains between these cities. The reason for this is obvious, for the steam railroad fare from Ann Arbor to Detroit is \$1.20, while the electric line fare is only 50 cents, so that passengers leaving the steam road at Ann Arbor and continuing to Detroit by the electric line make a saving of 70 cents.

The Big Four railroad running from Muncie, Ind., through Anderson to Indianapolis, had the same experience in connection with the Union Traction Co., and at one time almost entirely discontinued its suburban service between those cities, but it is now undertaking to regain the traffic in competition with the electric line. The contest will be interesting and instructive, but it can hardly be expected to be successful, because while it is possible that with such traffic the steam roads may be able to compete with the electric lines in the matter of rates, it is utterly impossible for them to meet the frequent service offered by the interurban lines.

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Instances of this kind might be multiplied, as in the case of the St. Louis & San Francisco Railroad and the Missouri Pacific Railway, with the Southwest Missouri Electric line between Carthage and Joplin, or of the Lake Shore & Michigan Southern, with the Toledo, Fremont & Norwalk line in Ohio, but the results have all been the same. In the last case mentioned the fare charged by the steam railroad between the termini of the electric line is \$1.60, while the fare over the interurban line is only 90 cents.

It seems probable that with the extension of the electric lines they will make still further inroads into the passenger traffic of the steam roads, and it does not appear that the steam roads will be able to prevent it, for they would be compelled to cut their rates, which are already unprofitable, considerably before they would be able to reach the rates now found profitable by the electric lines and which, if it came to a contest, the electric lines would be able to reduce without seriously impairing their earnings.

The operation of steam roads extending over a period of more than 70 years has been reduced to almost an exact science, while the development of electric roads has been so recent and so rapid, and the improvement of electrical equipment and motive power so continuous that data from which to make any study of the operation of electric lines have not been obtainable. There has been in some cases an utter lack of competent management, and one of the needs of electric railways today is intelligent and economical operators. The extravagant and wasteful operation that some electric lines have survived would have wrecked all but the best of the steam roads, yet in spite of this fact the cost of operation of interurban railways is far below the average cost of operating steam roads. The average cost of operation of the steam roads of this country in 1900 is reported by the Inter-State Commerce Commission to have been 64.6 per cent of their gross earnings, while the average cost of operation of interurban lines was only 54 per cent of their gross earnings. There can hardly be a question as to the future when parallel lines show such a difference in cost of operation. The Union Traction Co. of Indiana is operated for 51.9 per cent of its gross earnings, while the Big Four, which it parallels, takes 69.9 per cent of its gross earnings. The Southwestern Missouri Electric Railway is operated for 56.2 per cent, while the Missouri Pacific, just alongside, requires 69.9 per cent. The Lorain & Cleveland was operated last year for 45 per cent of its gross receipts, while the Nickel Plate and Lake Shore, which parallel it, are operated for 78 per cent and 64.6 per cent respectively. With such a showing in favor of the interurban at the present time, what must we expect when their operation has been reduced by study and comparison to a scientific and economical basis? The most striking thing in connection with these figures is not so much that the electric lines are operated for a lower per cent of their gross earnings than are the steam roads, but that the electric roads handle a passenger traffic which the steam roads find unprofitable at higher rates, for more than 10 per cent less than the steam roads are able to handle their entire traffic, including the enormous volume of freight which they find so profitable.

The fact that electric roads could carry passengers cheaper than they could be carried on steam roads was conceded from the first, but the idea that they could carry freight and express at a profit has only recently been considered reasonable. When the writer first asked the question, "If electric interurban roads can carry passengers at rates but little over one-half the railroad rates which they find unprofitable, and still make a good profit, why can they not carry freight and express, which the steam roads find so profitable, and find it even more profitable?" he was looked upon with pitying smiles for his ignorance. It simply could not be done. Finding no data to support such a conclusion, inquiries were sent to a large number of roads requesting detailed information concerning the freight and express business which they already handled, particularly showing the gross receipts and cost of operation on this line of traffic. It was difficult to get satisfactory information, for most lines handled their freight and express business in combination cars, which made it almost impossible to give correct figures on operation, as train service, power, repair of cars, etc., could not be separated from the cost of passenger traffic operation. A few roads, however, were found operating express and freight cars entirely separate, and from them most valuable information was received. One road reported a freight and express traffic the gross receipts of which constituted one-

tenth of the entire gross earnings of the road, and while the total cost of operating the road was 56 per cent of its gross receipts, the cost of operating the freight and express traffic was only 20.26 per cent of the gross receipts therefrom.

The railroad world has long marveled at the economical operation of the Northern Pacific Railway, which with gross earnings aggregating over \$30,000,000 was operated for 48 per cent thereof, but the low cost of operation shown by Northern Pacific is nothing compared to the showing made by these interurban lines on a volume of traffic in many cases so small that it is almost impossible to see how it can be handled profitably at all. Yet the figures shown by the road just referred to were not exceptional, for another road with only two-thirds the mileage of the first handled a freight and express business twice as great, with gross receipts therefrom amounting to one-third the entire gross earnings of the road, at a total cost of operation of only 21 per cent. Still another road reported gross earnings from its freight and express business amounting to one-fourth of its total receipts, while the cost of operation was 26.16 per cent. From this point the figures range up; two of the larger roads reporting a considerable return from their freight and express business, which was handled at a cost of 40 per cent of gross by one, and 44 per cent of gross by the other. In every instance the freight and express business was handled at a lower cost of operation than the passenger traffic, and was therefore correspondingly more profitable. Two roads only reported the mileage of their freight and express cars, but the car-mile earnings shown thereby were most significant, showing results as follows:

Gross earnings per car-mile.....	39.3 cents.
Operation per car-mile.....	17.6 cents.
Net earnings per car-mile.....	21.7 cents.

On the other hand the average net earnings per car-mile from the passenger traffic was only 9.3 cents.

The freight and express business done by the roads reporting was, with the exception of four roads, entirely local, while the entire amount of through business transferred by the four roads to other roads for forwarding amounted to only one per cent of their total.

In the face of these figures it is impossible to escape the conclusion, that whether they will or no, the electric lines will be forced into the carriage of freight and express and that it will in their case, as it has in the case of the steam roads, prove to be the most profitable branch of their traffic. The possibilities of the development of this class of business when the electric lines shall have been connected into systems and when their roadbed and equipments are standardized so that they will be enabled to exchange traffic with the steam roads are so great that it is idle to speculate concerning them. They need only to be suggested to be seen.

It seems strange in view of these facts that the securities of interurban roads should have escaped as they have the attention of conservative and far-seeing investors. With a capitalization averaging per mile so much less than steam roads, with earnings that compare favorably, with operation still crude, yet already at a far lower per cent of gross earnings than the steam roads have been able to operate for, with rates quite profitable yet far below the figures found unprofitable by the steam roads for the same class of traffic, it is impossible to escape the conviction that the securities of electric interurban roads are intrinsically a better investment than those of steam roads, and when the great undeveloped possibilities of the freight and express traffic are considered, then is one forced to realize, that while the great growth in value of steam railroad securities has come to an end, the growth of value in electric railroad securities has only begun and that the fortunes of the next decade will come to those who, in the language of the London Financial Times, "buy them now while they are cheap."

It is unfair for bankers and investors to discriminate against them. Why, in the face of such a showing as has just been made, should a 3½ per cent bond of a steam railroad sell in the market at a premium, while a 5 per cent bond of an electric railway, built upon a private right of way, with roadbed equal to the best steam road standards, with equipment and plant modern and new, has frequently sold below par? There is no reason for it save ignorance and prejudice! But times are changing, and already some electric railways have found a market for 4½ per cent and even

4 per cent bonds, and not strangely it has been found among those who have made comfortable fortunes out of electric railway bonds bought in recent years at a large discount.

### MR. YERKES ON THE LONDON SITUATION.

On July 31st Mr. Charles T. Yerkes wrote the following letter to the London Times, which may be of assistance to our American readers in reaching an understanding of the situation in London:

"It has not been my intention to enter into any public controversy in regard to the electrification of the Metropolitan Railway and the Metropolitan District Railway for several reasons, mainly because, so far as I can see, the Metropolitan company has in years past not improved the position of its stockholders by the controversies in which it has engaged. But after reading the report of the former company as made by the vice-chairman, where I am placed in a false position, and also seeing the notes of the shorthand writer, and particularly as I concur in the desire expressed by that company that all our affairs relating to such electrification shall be made public, I have concluded to write this letter and respectfully request its publication so that our position might be better understood than by the statements made in the Metropolitan report.

"As to the merits of the electrical systems I will not argue, but merely say what I think of adopting a new system on general principles, and if my refusal to adopt such system makes me 'look absurd,' I am perfectly willing to labor under that condition. I told the gentlemen connected with the Metropolitan Railway, whom we met in regard to the matter, that if the system which they seemed to adhere to had been tried on a railway like the Metropolitan for a period of three years and had worked successfully I would most willingly adopt it on any work that I had to do with.

"To the charge that I am concerned in properties where the general system of electric equipment is being used, and that to adopt a better would cause a great loss by virtue of being compelled to abandon those systems and adopt another radically opposed in principle to it, I will say that we have never been afraid of the scrap-heap when we found we had made a mistake, but we do not court it. It is full of wrecks of failures, and it is just here that I would remark that we do not wish to add to that heap a plant that would cost in the neighborhood of half a million pounds sterling, apart from the expenditure on the power house. I will also say that, as to systems or works or anything applying to electrical traction, I have no financial interest whatever, and my whole object is to see that whatever plan is adopted on any property with which I may be connected is the best. To take a system which has not been thoroughly tested, not for a few but for many months and even years, is a species of business recklessness which I do not wish to try. I also desire it understood that I am entirely free from prejudice, and desire only what is the best. To attempt to experiment now or to be guided by the experience of the little mountain roads in Switzerland, or the road which is being installed in Italy, which is not yet working, would be foolish, and even if it were in operation its success would be no indication of its adaptability to the Metropolitan Railway. If the managers of the Metropolitan company had commenced this experiment years ago, when the Central London was begun, I am satisfied they would have lost some time, but they might have corrected their plant so as not to have been in the humiliating position we find them to-day. They cannot make the excuse that their credit was poor and they were unable to raise money. They have simply waited until the wolf was at their door, and long afterwards.

"Another matter I would like to have understood. The system so called which we propose to use is not the 'Yerkes system.' There is no such thing. I never invented anything pertaining to electricity. It is a system universally used the world over by all modern built railways, and I am only one of the scores of people who are doing this. It is used extensively in England, and only lately Glasgow has adopted it in the important plant which they have recently made and which is the largest in Great Britain.

"In regard to the proposition that was really made to the Metropolitan company, I will now give it and leave it for others to say whether it was fair.

"At the present time I am chairman of the Metropolitan District Electric Traction Co., and we have a subscribed capital of £1000,

000. The subscribers are all gentlemen of means and, I may say, affluence. Our propositions were:—

"1. That we would electrify the Metropolitan Railway, furnish all the rolling stock, also a power house and sub-stations, and do everything and furnish everything necessary to change and operate their road by electricity, charging therefor the sum of 34d. for each passenger they might carry. There were some things, such as keeping their buildings in order, that they were to provide for. But I cannot see any way that they would make such a statement as they made in their report—that we would charge them £291,000 for what cost them £101,000.

"2. The second and most important proposal was that we would work or lease the whole of the railways and general undertaking of the Metropolitan company, subject to the statutory obligations of that company, guaranteeing to the Metropolitan company a net yearly revenue sufficient to pay the whole of its debenture and other fixed charges and its guaranteed and preference interest.

"As to a yearly dividend upon the ordinary share capital, we found that the average dividend for a period of seven years terminating on June 30, 1900—that is to say, prior to the competition which the company has had to meet with the Central London Railway—was £3. 6s. 11d. per annum. We offered to pay on the aforesaid capital stock yearly dividends in perpetuity at the rate of 3½ per cent. The dividend this half-year is at the rate of 2¼ per cent per annum.

"In regard to the surplus land stock, the dividend upon that would be provided, as heretofore, out of the revenues of land especially set apart for payment of interest on the surplus stock, and our proposition did not affect this stock.

"For securing the dividend on the ordinary shares the Traction company proposed at its own expense and cost of not less than £700,000 to convert the railways mentioned in the scheme from steam to electric traction, build all necessary sub-stations (the Metropolitan Railway Co. to supply the land for the same), and supply the rolling stock.

"We propose to increase the capital of the Traction company from £1,000,000 to £2,000,000, or more, if necessary; also to give to the proprietors of the Metropolitan Railway Co. the right to take £500,000 of the increased stock. We also proposed that the whole of the capital or the property of all kinds whatsoever belonging to the Metropolitan District Electric Traction Co. should be placed in the hands of trustees, who should hold the same for the benefit of the contract to be made with the Metropolitan Railway Co. In case we desire to sell or change any securities belonging to the Traction company, we should do so only with the consent of the Metropolitan company.

"The security of the Traction company has been sneered at by the Metropolitan company, but it seems to me that with £2,000,000 of hard cash well invested, a portion of it in the property of the Metropolitan property, this security is such as would not be offered by any other company. The terms that we offered—namely, placing all our property in the hands of the Metropolitan company—were for the purpose of reconciling our differences and endeavoring to join the two companies—the Metropolitan and Metropolitan District—together in such a manner that they could be worked by one official head. It is my belief that if so worked a fair profit could be gained by our company much greater than can be done if the two companies are separate.

"The tender having been rejected, I wish to say that it is the desire of the managers of the Metropolitan District Electric Traction Co. to proceed to carry into effect at the earliest moment possible the electrification of the District Railway; and, as the officers of the Metropolitan company have also expressed the same desire, there is no reason why the latter should hold to the text of the bill which has been passed—namely, that one month should elapse before we can go to the Board of Trade. The losses to both companies at the present time are very great, and I believe there is nothing that will stop the continuance of these losses but the running of the roads by electricity. Therefore every day means money, and it is for that reason that I am extremely anxious that not a moment should be lost."

The New Patz (N. Y.) & Poughkeepsie Traction Co., of which Mr. Edwin R. Case, of Jersey City, is president, reports an increase of 50 per cent in business.

## TRAFFIC CURVES ON THE NEW ORLEANS & CARROLLTON R. R.

By A. H. Ford, Manager New Orleans & Carrollton Railroad Co.

The object of the traffic curve is to show graphically the number of passengers carried throughout the car-day, the number of cars provided to carry them and the adequacy of accommodation. To prepare the traffic curve intelligently, the greatest accuracy is required in the conductors' trip reports in regard to time, and also full and correct data of each trip. The easiest method of arriving at the number of passengers carried during the day is by going through the trip reports and noting on a sheet of paper ruled in 48 sections, (one for every half-hour of the day), and divided to show the in and out trips, the number of passengers carried from one terminal point to another. The number of passengers carried is entered under the hour of arrival at the terminal point. For

total number of persons in transit on the whole line at any given hour of the day, while the counting of each entry as one car and footing them as such will show the number of cars on either the out or the return trip at the same time. With this data, it is not difficult to ascertain whether the service is adequate to the demands of the public. It is only necessary to divide the number of passengers at any time by the number of cars in service at the same time, and compare the average thus obtained with the standard capacity of the cars. For example, the number of passengers carried by all outbound cars between 6:30 and 7:00 a. m. may amount to 550 persons, while the number of cars provided to carry these people was only 10. This gives an average of 55 persons to a car, while the standard capacity of the cars may be only from 40 to 45 passengers. The overload, or the inadequacy of the service, is at once apparent. On the accompanying sample curve, however, the number of passengers in transit between 5:30 and 6:30 p. m. on all cars returning to Terminus No. 1 was 404, who were transported



instance, on the accompanying sample curve, car No. 135 left Terminus No. 1 at 5:00 a. m. and arrived at Terminus No. 2 at 5:27 a. m., having carried 16 passengers, which passengers are considered as being in transit from 5:00 to 5:30, and are accordingly entered at the time the car reaches the end of trip, or in the section marked 5:30. This car returns to Terminus No. 1, carrying 13 persons on the way, which point is reached at 5:55 a. m.; therefore these passengers are entered as 6 a. m. traffic.

The rule which we follow in the preparation of our traffic curve is to consider everything from say 6:15 a. m. to 6:45 a. m. as 6:30 traffic, and everything from 6:45 to 7:15 as 7:00 traffic. This rule, which may appear arbitrary, has to be adhered to very strictly in order to maintain the correct distribution of cars.

Having taken from the trip reports the number of passengers transported by all the cars on each trip, and tabulated them according to the rule set forth above, it becomes a very simple matter, by the addition of each column or section, to arrive at the

by 10 cars. Since the cars in use by this company are rated at a comfortable carrying capacity of 28 persons seated and 12 standing, or 40 people, the nice adjustment of the schedule in this instance to the requirements of the traveling public is readily apparent. The apparent excessive car service in the middle of the day is caused by franchise provisions and competition, conditions which we are unable to modify in order to reduce service to requirements.

As a general rule the highest point in the traffic from the residential to the commercial sections of a city is reached between 7:00 and 9:00 a. m., and the return travel is greatest between 5:00 and 6:30 p. m. This fact is also shown on the attached curve, with a slight upward fluctuation between 12:30 and 1:30 p. m. in the inward traffic, which is caused by what is known as "shopping" and "lunch" traffic. It therefore necessarily occurs that cars running on an overload one way are obliged to make the return trip comparatively empty. Thus the average between 5:30 and 6 p. m. on the outward trip of the curve in question is 40 people, while the re-



**Passengers Carried and Cars in Service on Claiborne Avenue, Wednesday, July 17, 1901.**  
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divided by the allowance of 5 passengers to every small space on the cross-section paper, leaves us an allotment of 3.14 spaces to each car.

To locate the car curve on the diagram, multiply the computed spaces per car by the number of cars for each half hour of the day, and plot points in the same manner as for the passengers. The line drawn from one point to another shows the fluctuation in the same manner as for the passenger curve. It is advisable, in order to more readily distinguish the two curves, which, when correctly figured, often lie almost on the same lines, to use inks of different colors. (This is the dotted line in the reproduction.) Our method is to use the color of the designating signs of each line for the passenger curve, and black for the car curve.

This of course is only one application of a system of graphic illustration of street railway traffic and accommodation, which is capable of being expanded and altered to apply to schedules of any length; but the application is left for each one to work out with a view to the circumstances of earnings, carrying capacity of cars and schedule time which apply to the particular system.

The system was introduced on this road about five years ago by Mr. Geo. H. Davis, of the firm of Ford, Bacon & Davis, former manager of the road, and through its constant application to our business we have been able to secure the best results in operation.

### NEW ENGLAND TROLLEY TRIPS.

"Trips by Trolley Around Hartford" is the title of a small book published by White & Warner, Hartford, Conn., which describes a large number of trolley trips which can be made on the Hartford Street Railway Co.'s system and connecting lines. The book is illustrated with a large number of views of prominent places which may be seen en route.

The number of neighboring parks, towns and rural spots of interest which may be reached by trolley from Hartford are far too numerous to describe in detail, but an idea of the development of the trolley in New England may be gathered from the two special trips mentioned, namely, from Hartford west to New York and east to Boston, a total distance of 273 miles. Of this distance, which is in a practically straight line, the whole is covered by connecting trolley lines with the exception of 28½ miles, which constitutes the length of the short breaks with steam road connections.

The trip to New York includes a distance of 143 miles, of which 20 miles are by steam road. The fare is \$1.96 net, not including some transfers which may be had if the trip is continuous, and the actual running time is 11 hours and 45 minutes, not allowing for the time lost in making connections. The route includes the lines of ten different railway companies.

The trip east to Boston is 130 miles in length, all of which is made by trolley with the exception of 8½ miles which is by steam road. The entire fare for this trip is \$1.66 and the actual running time 11 hours and 51 minutes.

Besides this main trip the book describes a number of side trips, many of which comprise delightful excursions especially to the summer tourist.

### ILLINOIS STATE ELECTRIC ASSOCIATION.

The second annual meeting of the Illinois State Electric Association, which will take place at Rock Island, September 24th and 25th, will include a program of exceptional interest to electrical engineers. Beside the business meetings a number of visits have been arranged in the neighborhood of the three cities of Rock Island, Davenport and Moline in which important electrical and manufacturing interests are located. Among these places are the Rock Island Rapids, where two modern three-phase power plants are operated by water power, and the plant of the People's Power Co., which is also operated from this water power. The United States arsenal will also be visited as well as a number of private manufacturing companies. The meeting will conclude with a banquet at Black Hawk Inn, situated in the park of the Tri City Railway Co. Mr. H. E. Chubbuck, manager of the Quincy (Ill.) Horse Railway & Carrying Co., is secretary of the association.

A \$50,000 car shop is in course of erection for the Winnipeg Street Railway Co.



BROADWAY AT THE POST OFFICE.

This is a typical afternoon scene on New York's famous thoroughfare. The building at the extreme left is the well-known Astor House.

### ELECTRICAL DEVELOPMENTS IN GREECE.

At the present time there is a marked progress in the electrical lighting and railway development of Greece which promises to soon bring the conveniences of travel up to the level of those of any other European country. A consular report from F. W. Jackson, Consul, at Patras, states that the Greek Electric Co., otherwise known as the Thomson-Houston Co., is now completing in Patras the first electric street railway in Greece and in fact in the Orient. The same company operates the gas company of Patras, the electric light plants of Athens and Piræus, and of four or more other cities, and is now negotiating with the Athens-Piræus Street Railway Co. to supply motive power from a central station at Phalerum, near Athens. This proposed power station, if constructed, will be on a scale sufficiently large to supply power for manufacturing purposes, as well as for the lighting of Athens, Piræus and Phalerum. It is also current rumor that the Franco-English Co., already organized to construct a broad-gauge-railroad through the north of Greece to Athens, will soon begin operations. The completion of this road will connect Greece with the north of Europe by rail, and trains will be run from Paris to Athens direct via Constantinople.

Speaking more particularly of the street railway in Patras, the system will be similar to that found in general use in France and Italy. The motive power will be furnished by gas motors of German construction. The steel rails are from Belgium, while from the General Electric Co. of New York there will come the material for the overhead line, insulators, circuit breakers and car motors; and from J. G. Brill Co. the trucks for the cars. The main line of the road is constructed the length of the city, parallel with the sea, and extends some distance beyond the city limits, to a point suitable for coffee houses and baths. Business men generally believe the road will prove of great benefit to the city, but are skeptical as to the results to the company. It will probably be some time before the road will become a paying investment.

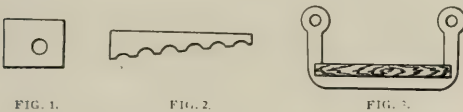
The British Columbia Electric Railway Co. is installing new boilers in the power house at Vancouver. This company is also seriously considering the advisability of erecting car shops and making its own rolling stock.

# MECHANICAL DEPARTMENT

## A BRAKE RIGGING FOR DOUBLE TRUCK CARS.

BY MYRON ROUNDS.

There is no one thing more essential than a good brake. Your truck may have all the long list of virtues that every truck builder declares his has and his competitor's has not, yet it availeth nothing if the good brake is lacking, for the average motorman will loudly declare that his life is made a burden and his arm nearly broken in trying to stop his car within the distance of half a mile, and that



the truck is unsafe to use. He is also equally as loud in praise of the brake that stops his car without undue exertion and in which he has implicit praise. To secure this much desired praise of the motorman (and it is much to be desired) it is essential that you have a right distribution of braking pressure on the various wheels in proportion to their load, so as to avoid skidding, yet stop the car with ease and within a reasonable time. The men who care for the brakes and trucks should receive a large degree of consideration, and simplicity of construction and ease of adjustment will win their praise.

The accompanying diagrams show a brake that has been used on a large number of cars for a long time and given entire satis-

4. The shoes are set with the lowest point within 4 in. of the track. With the weight of car body 9,000 lb. only, this prevents what is called "stuttering" or "chattering" when the brake is applied. Soft shoes are used on motor wheels and hard ones on trailer wheels. Long links are preferable to short ones as their angle changes less as the shoes wear out.

Most trucks have their brake links cushioned on rubber. Some think the only correct way to secure shoes to brake beams is by bolts, it being claimed that this method is safer and the shoes make less noise. The majority use the brake head and keyed shoe, and this method if properly done, is much the cheapest and should be as safe as any.

A uniform size of pins is desirable. A  $\frac{3}{4}$ -in. pin is used with this brake and is held in place by 3-16-in. cotter pin. The welds of the various parts should receive close inspection, especially those in the brake rods; welds are a serious element of weakness. The floating lever that is usually attached to the car body should if possible, be at an angle 45 degrees. The eye of the brake chain should be at an angle sufficient to cause chain to wind downwards.

Fig. 1 shows an oblong block with hole so placed as to take up on brake rods as it is turned, and Fig. 2 shows another device for adjustment that is in common use.

Fig. 3 is a rest for the long brake rod. The rod slides on wood and is better than iron or the ring and chain. The diagram, Fig. 4, gives the pull or pressure of the various points of the brake rigging.

Trautwine in his Hand Book of Mechanics states that a man cannot push from him at the height of his shoulder more than 40 lb. We will assume that 50 lb. is the maximum pull or push on the

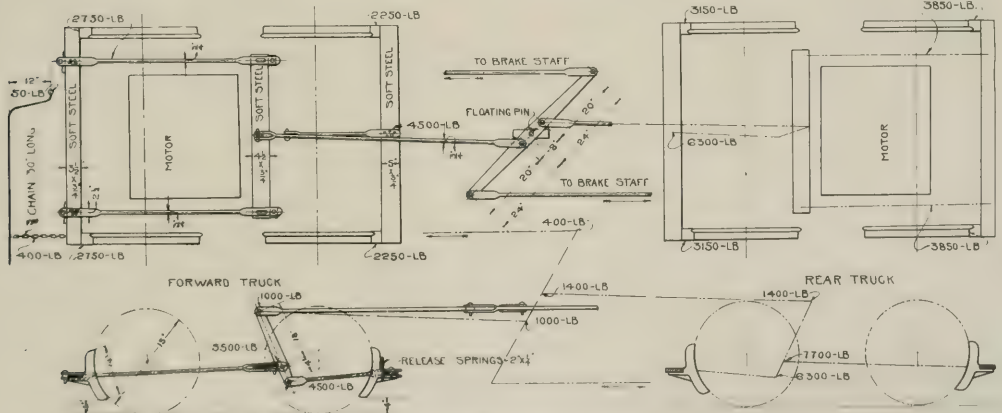


FIG. 4. DIAGRAM OF BRAKE LEVERS.

faction to all, and we will point out the essential features and the reasons for them.

1. The brake is simple and has no crooked rods and forgings and all parts are easily accessible, so as to secure quick adjustment.
2. The top of the upright levers sets well back and is within about 5 in. of the swiveling point of the truck; this prevents the brake being put on by the swiveling of the truck.
3. The brake equalizes without regard to the thickness of the various shoes or the exact length of the brake rods

brake handle, which is a good average; that it is 12 in. from center of the brake staff to the center of the hand on the brake handle, and  $1\frac{1}{2}$  in. from the center of the brake staff to the center of the brake chain. Then, 12 in. divided by 1.5 in. equals 8, or one pound pull or push on the brake handle gives 8 lb. on the brake chain. This multiplied by 50 gives 400 lb. pull on the brake chain, rod, and end of the floating lever. The long arm of the floating lever is 20 in. and the short 8 in.; 20 divided by 8 gives 2.5. Multiply 400 by 2.5 and it will give 1,000 lb. pull on the upright lever of the



forward truck. The long arm of the upright lever is 18 in. and the short arm 4 in.; dividing 18 by 4 gives 1 to 4.5; 1,000 lb. multiplied by 4.5 gives 4,500 lb. on the trailer wheels (2,250 lb. on each). Add to 4,500 lb. the pull on the top of the upright lever and we get 5,500 lb. on the motor wheels (2,750 lb. on each). The pull on the upright lever of the rear truck is found by adding the 400-lb. pull on the brake rod to the 1,000 lb. which gives 1,400 lb.; the other calculations are made in the same manner as for the forward truck.

The hanger for the floating lever has a slotted hole and a pin holds the lever central but has no other effect on it. This arrangement is for a quick adjustment between the trucks. It gives the rear truck the greatest braking pressure and accounts for the rear wheels skidding first. When the brake is applied from the other end of the car these pressures reverse.

A floating lever pivoted at center would reduce the disabling of the brake one-half, should brake rods or any part of mechanism of one truck become disabled, the brake at other end of car could be used which is not the case at present. The use of a coil spring (usually a trolley spring) attached to the short brake rods and car body for the purpose of a release spring, is giving good results.

In conclusion let me say that the railway company that has a multiplicity of brakes with different degrees of leverage and way of adjusting is very unfortunate. A good braking car put into a car house with a lot of poorer ones will soon create discontent and constant complaint where there was none before. The truck builder should always ask himself, "How am I to get out this pin, bolt, or any part of the truck in the quickest possible time, how few parts can I use and still have a good brake, a brake that the motorman has confidence in and knows he can stop his car just as he wants to?" Don't introduce a lot of new parts to overcome a little defect which is a lesser evil than the remedy. Always remembering that the brake with the fewest parts, the one that is quickest adjusted and repaired at the least cost, and sufficiently powerful to stop a car satisfactorily to the motorman is the one that the railway companies are looking for.

### SPEED INDICATOR WANTED.

Two prizes of \$750 and \$375 were offered by the Grosse Berliner Strassenbahn, which is the principal electric railway company in Berlin, for the best and second best speed indicators for electric cars. The following requirements must be fulfilled: In the first place, the maximum speeds are to be indicated to the motorman as well as to the passengers by means of visible or audible signs. The maximum speeds which have to be indicated are 16 km., 20 km., and 25 km. per hour. Apparatus capable of indicating only two speeds—16 km. and 20 km. per hour—may, however, enter the competition, but will be considered after those capable of indicating all three speeds. It is desirable, but not necessary, that the device should be applicable to ordinary two-axle motorcars, as well as four-axle motorcars. Further, the device must be so simple and durable that the jarring of the cars will have no detrimental effect on its operation. Other requirements are simple transmission of motion from the axle of the car to the shaft of the meter, low maintenance, and easy adjustment in case the wheel diameter is changed. The latter may be as large as 60 mm. In case electric current is necessary for the operation of the device, the standard 500-volt circuit will be employed. As the speed indicators will be installed on about 1,500 cars, the cost of the device must be low. All competitors were required to submit their designs to the board of directors by September 1st.

### DEVELOPMENT OF THE RIDGE ROAD PROJECT.

Since securing its franchise along the Ridge road between Rochester and Buffalo, the Rochester, Buffalo & Niagara Falls Railway Co. is rapidly arranging the details of its project for the construction of 127 miles of track between the cities named in the title. William C. Gray, of Rochester, engineer for the company, has estimated the cost of a power house sufficient for the immediate requirements of the road, at about \$500,000. The General Electric Co. will furnish the equipment, which will be similar to that of the Rochester & Sudus Bay Railroad Co.

### FOUR MOTOR EQUIPMENTS.

With the increase in weight and speed of electric cars which is constantly taking place, especially in suburban service, the question of the number of motors and the aggregate horse-power to be used on double truck equipments has aroused considerable discussion in which a variety of opinions has been brought out. On the heavy high speed cars of most suburban roads, however, the use of four motors instead of two is becoming common and there are a number of reasons which support this practice.

The size and speed of modern cars have been greatly increased, and they have to be made proportionally stronger and heavier than formerly. These changes all require additional motive power equipment. Owing to the frequency of stops rapid acceleration is essential in making a fast schedule and this requires in most cases the utmost traction possible especially on poor or slippery tracks. With four motors the total weight is available for traction.

A bulletin, No. 4255, recently issued by the General Electric Co., on this subject gives some figures on the weights on driving wheels on a double truck car with two and one with four motors, the same car being used in each case. With two motors of 75 h. p. each, we have half the weight of the car and trucks added to the weight of the motors as the total weight available for adhesion, which in the example given amounts to 25,330 lb. This divided between four driving wheels gives 6,332 lb. on each driver, and the total weight of the equipment being 43,330 lb. the weight on drivers being 58 per cent of the total weight. By substituting four 38-h. p. motors for the two of 75 h. p. the total weight of the equipment is increased to 44,400 lb., all of which is carried on the drivers, so in the latter case more than 20,000 lb. extra weight is available for adhesion, while the total weight on each driver is increased only about 1,000 lb., and the maximum weight on each driver is reduced about 800 lb. With this great increase of weight available for traction a high schedule speed may always be maintained and lost time made up by rapid acceleration, whatever the condition of the rails or the load upon the car. This is especially valuable in the case of heavy grades or in running through snow.

The efficiency of the equipment with the two larger motors is about 3 per cent better than with four small ones, but this slight improvement in efficiency is often more than offset by the improvement in the service due to rapid acceleration and ability to maintain a faster schedule. The difference in current consumption between the two and the four motor equipments has been found to vary greatly on different roads, the four motor equipments as a rule taking the greater current. The difference in current consumption has been estimated on different roads all the way from 10 to 50 per cent greater for four motor equipment, but it is not correct to attribute this to inefficiency, for in that case the motors would burn out rapidly, while the general experience is that with four motors the repairs are considerably less than with two. The true explanation of the increased current consumption is undoubtedly the fact that more work is done with the four motor car than with two motors. Under similar conditions the former equipment is capable of making its schedule under adverse conditions and of making up lost time where this could not be done with a two motor car, and motormen will invariably make use of this reserve ability when opportunity offers, thus doing more work and consuming more energy. The current consumption, however, depends largely upon the motorman, as he can increase it by wasting time on stops or in slow acceleration, which calls for more current to make up for lost time, or he can often use less current than with a two motor car by taking advantage of rapid acceleration and doing a greater amount of coasting, the latter being a large factor of economy.

The cost of maintenance and repairs, as already mentioned is generally found to be much less with the four motor car and this is due to the smaller heating effect of the four motors. The heating is inversely proportional to the amount of radiating surface which is much greater with four motors. The division of the equipment into four parts instead of two also reduces the strain proportionally on the gears, axles, bearings, etc., thus reducing the wear and tear of these parts.

The bulletin contains a list of 110 roads on which 1,305 four motor equipments are in service and a number of testimonials from high speed railways are strongly in favor of them.



THE OLD EAST RIVER BRIDGE.

The Brooklyn Bridge has been termed "one of the seven modern wonders of the world." Thirteen years of time and about \$16,000,000 were expended in its construction. The total length of the structure is  $1\frac{1}{4}$  miles; the length between the towers, 1,595 ft.; the width, 85 ft.; the height above the water in the center, 135 ft., and of the towers, 271 ft. The bridge carries two drives, a broad free footwalk, a double track cable railroad which is equipped with a third rail for electrical operation, and two tracks for trolley lines. The designer and engineer in charge of this magnificent undertaking was John A. Roebling, who died while the work was yet in progress.

### A NEW TECHNICAL DICTIONARY.

An extensive compilation in the form of a complete technical dictionary in English, German and French is being undertaken by the Society of German Engineers in Berlin. The work will be named the *Technolexicon* and it will comprehend all technical departments, especially those of the technical sciences and those in which patents are granted. Dr. Hubert Jansen, the well-known lexicographer, has been appointed editor, and the co-operation of societies, associations, authorities, technical colleges and important industrial establishments has been invited. All such societies, etc., are requested to give the names of persons and firms that can be useful collaborators. Price lists, catalogs, etc., of the different branches and handicrafts are also specially desired. All communications should be addressed to the Editor of the *Technolexicon*, Dorotheenstrasse 49 Berlin, N. W. 7, Germany.

### THE BERLIN-ZOSSEN EXPERIMENTAL LINE.

The experiments in high speed electric traction for which preparations are being made on the military road between Berlin and Zossen it is expected will begin in September. The manner in which these experiments came to be undertaken is explained in a recent report from Consul-General Mason, of Berlin.

It was felt that the high speed problem involved many details of construction and practice concerning which comparatively little is known. No careful engineer or capitalist would enter upon the construction of a high speed railway for actual service until the whole subject had been thoroughly studied and its feasibility proven by practical demonstration. For this purpose there was organized at Berlin, Oct. 10, 1899, a so-called "Studien Gesellschaft," or "company for experiments," in high speed traction. This company—which has for its president Dr. Schulz, chief of the imperial railway administration—includes as members the General Electric Co. of Berlin, Messrs. Siemens & Halske, the great machine builders Börsig, Krupp, Halzmann, and Van der Zuyden & Charlier, besides several banks, which undertook to supply the capital of 750,000 marks (\$178,500) for the necessary expenses of construction. The mere mention of the foregoing names will show that the *Studien Gesellschaft* represents the foremost scientific and mechanical ability of Germany. After more than a year of study and experiment with motors, conductors, and especially the task of taking up an electrical circuit by a motor moving at high speed, Director Rathenau, of the General Electric Co., in January of this year, had a formal interview with the German Emperor, in which he submitted a plan for using as an experimental electric line the military rail was leading southward from Berlin to Zossen, a distance of 30 kilometers (18.6 miles). The proposition of Mr. Rathenau was promptly and fully approved, and from that moment the whole scheme has had the active support of the Imperial Government.

The line to Zossen is now in process of preparation for the trials. For these experiments two motor cars have been built—one by the General Electric Co., the other by Messrs. Siemens & Halske. Each will carry about fifty passengers, and efforts will be made to attain a speed of from 125 to 150 miles an hour.

### WATER POWER IN SWEDEN.

The Agricultural Department of Sweden in a recent report gives the estimated energy of the principal waterfalls in that country at from 2,000,000 to 4,000,000 h. p. It is not stated whether these figures apply only to sites which may be developed at ordinary expense or include all practical water powers. It is pointed out that the national coal bill for last year amounted to 64,000,000 crowns, and that this sum might be considerably diminished by the employment of the natural motive power possessed by the country.

### ROLLING STOCK TAXED AS REALTY IN CANADA.

The Canadian Court of Appeals has recently decided, in a suit brought against the Cornwall (Ont.) Electric Ry., that the rolling stock of an electric railway is real and not personal property. The personality of railways is not assessable and heretofore rolling stock has been held to be personalty and was not taxed. The court said in part:

"While the rolling stock of the ordinary steam railroad may be hauled by a locomotive resting by its own weight, and generating its own power, over the lines of many different companies, to none of which it belongs, and thousands of miles from its home, that of the electric railway really constitutes, as was argued, part of one great machine confined to a particular locality for which it is particularly constructed and fitted, operated by means of a continuous current of electricity generated in part of the fixed plant in the power house, and passing through the trolley pole of the car, which is fitted to the overhead wire, through the car to the unbroken line of rails back to the generator. Of the entire machine thus operated, important parts, the rails and power house, are unquestionably realty, and the rolling stock forms part of it in a much more intimate and connected manner than does the rolling stock of a steam railway. Detached from the rails it is incapable of use, and I am of the opinion that it may properly be regarded as part of the corpus of the entire machine, and therefore in the nature of a fixture and passing with the land over which it runs." This judgment confirms that of the lower court, which held "that the rolling stock of the company was an essential part of the railway, the latter being useless without it for any purpose, and therefore that it was real property."

## FRANCHISES.—IV.

BY H. S. COOPER.

Any full and proper franchise for a surface electric railway, whether urban or interurban, should contain most or all of the following terms and conditions, and the points should be considered in about the sequence given.

1. Term or duration of the franchise.
2. Privilege of extension, (if there be any), duration and terms of same.
3. Right or privilege belonging to, or reserved by grantor to abrogate or resume, wholly or partially, the privileges granted, upon failure, by the grantee to, at any time, partially or wholly fulfill the terms of agreement.
4. Rights or privileges belonging to, or reserved by, the grantor as to full or partial purchase, lease, operation or control of the property during, or at the termination of, the original franchise or any allowed extension.
5. Special privileges, other than occupancy of and operation over route, granted or conferred on grantee.
6. Fees, taxes, licenses, percentages, bonuses, privileges or any other consideration given or to be given or allowed by the grantee as whole or partial compensation for the privileges conferred.
7. Route. A. Fixed and alternative.  
B. Extensions, changes, abandonments and the procedure, restrictions or conditions under which they may, or must, be made.
- C. Location and limitation of turnouts, branches, switches, junctions, Y's, termini, stands, stations, etc.
8. Construction. A. Time limit for commencement of construction and of partial or final completion.  
B. Privilege and terms of extension of this limit for unavoidable causes.  
C. Arrangement as to supervision by grantor or as to reference of disputed or unforeseen points.
- D. Restrictions as to obstruction of streets, alleys, sidewalks, parks, private or public entrances or property.
- E. Restrictions as to surface construction, gage of track, grades or change of grades or street surfaces, height of rail, guard-rail and special work above pavement, elevation of outside rail on curves, crossings, pavements, manholes, drains, gutters, culverts, etc.
- F. Restrictions as to sub-surface construction, pipes, conduits, sewers, ties, chairs, braces, depth of rail, etc.
- G. Restrictions as to overhead construction, poles, wires, guys, guard-wires, trees, signs, buildings, signals, signal-boxes, height of trolley wire, etc.
- H. Character, amount and period of indemnifying bond for construction or its results.
9. Operation. A. Time limit for commencement of partial and of complete operation.  
B. Privilege and terms of extension of this limit for unavoidable causes.  
C. Car service, seasons, days, hours, also minimum necessary to hold franchise. Exceptions to same for unavoidable causes.  
D. Stopping points at street crossings, intersections, or at other points such as "fire-streets," engine-houses, etc.  
E. Running-speed, as a whole or as limited within certain sections.  
F. Alarm or cautionary signals or precautions through certain places or at certain points.  
G. Obligations as to use of fenders, wheel-guards, side-screens or guards, vestibules, etc.  
H. Right of way as against other vehicles, competing or crossing lines, at bridges, in narrow streets, on viaducts, etc.  
I. Restrictions as to right of way against fire apparatus, ambulances, funerals, processions, etc.  
J. Obligations as to pavement, repavement or repair of pavement. Limitation as to width on each side of track or tracks and as to "devil-strip."  
K. Obligations or restrictions as to cleaning and clearing of track, crossings, etc., from snow or dirt.  
L. Privilege of use of sand, salt, brine or grease on track, rails, curves or special work.

M. Conditions, obligations, restrictions or limitations as to repairing or renewing of track or line.

N. Arrangements as to supervision of work under "J" and "M", and as to reference of any or all disputed or unforeseen points under "Operation".

10. Transportation. A. Fares or rates of fare, tickets, transfers, passes, etc.

B. Restrictions or obligations as to free carriage of passenger's bundles, packages, etc.

C. Conditions as to carriage of and charges for bundles, packages, express or freight for hire.

General. Rights or privileges reserved by grantor for itself, its agents or appointees or for private citizens or corporations to use or disturbance of the property or operation of grantee such as by digging of ditches, putting in of water and gas mains, sewers or drains, laying of pavement or sidewalks, raising of banners, felling of trees, moving of buildings, etc. Limitations, restrictions of and compensation for same.

These will cover pretty generally all the points that usually come up with urban lines; with suburban or interurban lines there will be a few additional items of construction such as planked or paved crossings at unpaved streets or roads and cattle-guards at road crossings. There will also be certain items of operation such as limitations as to stopping places or stations, speed at or on highways, alarm signals when approaching highways, teams, persons, houses close to track, etc., also as to danger or alarm signals or notices at highways, or even watchmen or gates at such points, the tendency, with the increasing speed and size of car now being used on electric interurbans, being to place them under the same class of restrictions in this respect as are steam railroads.

There will also be in each locality, local laws, ordinances, customs and physical and social conditions that will necessitate special terms and conditions, these however, are not a part of the general conditions met with in franchises and will not be discussed here, the foregoing abstract being intended to cover only those general items necessary for mutual and equitable adjustment.

To discuss these general items separately. The term or duration of the franchise should be absolutely specific and as a matter of fact should be definitely limited. Many of the so-called "perpetual" franchises are not all they seem to be and even if genuinely so, their perpetuity is not—in these days of public-ownership ideas—an unmixed advantage, as the fact of their immortality is often a bar to their owners obtaining desirable privileges or concessions or it obliges them to accept such privileges or concessions for short periods and—virtually—limits their own profitable term to a shorter time than if their basic franchise was limited. For various reasons, financial and politico-economical, the term of thirty years seems to be, at this time, the favorite length in the more thickly settled portions of the country, and if taken as approximately the life of a generation in this country it has a good reason for being so, if only from a financial standpoint. A shorter period or term is apt to affect its desirability as a—so-called—permanent investment and, in consequence, to make its financing more costly and its fixed charges larger. On the other hand any large excess over this length does not add materially to the stability or desirability of the investment and does add considerably to the opposition of those who believe in public operation, ownership or control and who desire to see their theories tested while they are on earth.

If however, owing to violent opposition or for unalterable conditions or other good and sufficient reasons it is impossible to obtain anything but a much shorter time than this for the original franchise, it should be the earnest endeavor of the grantee to obtain either compensating advantages in the way of favoring or favorable conditions, or to obtain the option of a reasonable extension on predetermined conditions. If this can not be done and the case is one where half a loaf is better than no bread, then that is all there is to say about it, but such a case is generally one that bodes no good or profit—at least no legitimate one, to either grantor or grantee. Electric railroad building, operation and maintenance are getting to be more and more standard and the investment in and consolidation of such properties is approaching more and more to the lines of other standard securities such as those of steam railroads, consequently it behooves civic authorities to remember that in the granting of franchises it is now as necessary to pay attention to the limitations of finance and the reasonable require-



ments of capitalists as to the improved theories of those whose chief concern seems to be the "mortgaging of the heritage of our posterity," whatever concrete idea that assemblage of words may convey to their minds. At the present time the general investment in the securities of such roads by even people of small or moderate means, is an added reason for such caution on the part of the civic authorities as they will find very often that in setting traps for the wicked capitalist they catch only the useful citizen. One of the conditions most ardently desired by capital, whether great or small, is stability of investment; one of the greatest incentives to honest and efficient labor is stability of position and both these are best conserved and assured in the case of quasi-public enterprises—public service corporations, by reasonably long-term franchises.

In regard to the right of the grantor to abrogate or resume the privileges granted if the grantee fails or neglects to fulfil the conditions, the franchise should be particularly specific. This right is a just and equitable one if justly and equitably enforced, but there have been in the history of both steam and electric railways too much litigation, damage and loss to both parties to the contract because this point has not been definitely settled at the beginning. Much of the misunderstanding, which has not been intentional on one side or the other, has been caused by the vagueness and laxity of expression of the conditions in dispute and this cause can easily be remedied as long as ink, paper and words are as cheap as they are now. But outside of this there should be a specific penalty for each non-fulfilment of conditions agreed on, instead of a general penalty of abrogation of all rights for any such non-fulfilment. The punishment should fit the crime in all cases; to annul a franchise because the grantee will not—perhaps for some good reason or for some unavoidable cause—fulfil some one unimportant condition, is going back to the good old times when they hanged a man impartially for either murder or the stealing of a 34-lb. pig. There are certain of its contracted obligations that a grantee should be compelled to fulfil or lose its grant, there are others where such a penalty would be utterly unreasonable but where there should be either a commensurate penalty or a method of enforcing the unfulfilled duty or service, and such enforcement should be made easy, quick and not costly. The same should apply as against the grantor should it endeavor to coerce the grantee unreasonably in the fulfillment of conditions or terms or should it neglect its civic duties towards the grantee. The recent spectacles in many parts of this country of civic authorities intentionally coercing street railway corporations for political profit or private gain and the more striking cases of certain civic bodies in refusing to give legal protection to their grantees in the cases of strikes and riots shows the danger and loss that can come from non-fulfilment of conditions on the part of the other part and for such non-fulfilment there should be provided in the franchise a specific guarantee and penalty—what is sauce for the goose is sauce for the gander.

Under the pressure of public ownership ideas many municipalities and some larger civic bodies are embodying in franchises, provisions by which, at the end of a longer or shorter fixed period, they are to obtain control or ownership of the property. This phase of the situation tends to make it much more complicated, as it seems to necessitate extra precautions on both sides for mutual self-protection. On that of the grantor it seems to be necessary in order that neither the physical condition nor the earning power of the property shall be allowed to unduly depreciate nor be intentionally lessened in value at or near the time of transfer, and that speculative issues are not otherwise allowed to take advantage of the impending change. On the part of the grantee it seems necessary in order that the money invested in the property may be regained without loss or without the expense due to the necessity and risk of re-investment. These precautions take various forms, in fact the variety of expedients adopted by the various parties in interest to prevent the others from "not playing fair" is pretty nearly commensurate with the number of such cases in existence as there seem to be no settled standard of procedure.

That there is such a standard or that such a standard is possible seem to be doubted by many, but that there is such a possible standard may be proved by a little consideration of the matter, and that standard is to pay for the property what it is actually worth as an earning property at the time of sale, taking into con-

sideration its physical condition and the appreciation or depreciation that has been made or allowed by the grantee, but not taking into consideration either the previous gains or losses from its operation, nor any increase or diminution in the earning value or physical condition that is due to fortuitous circumstances at the moment or immediately preceding. Adjustments of value of this kind are accomplished between private parties every day, with equity to both and no great difficulties found in the process; plenty of roads have recently changed hands or been absorbed in combinations with as much simplicity and equity as if they had been a piece of land or a building, and if such can be done between individuals or private corporations it can be done by others. In fact, in the case of a positive termination of the ownership and operation by one party, the transaction is robbed of one element of uncertainty—the refusal of either party to trade at all even when an equitable offer is made; the sale being a fixed fact, the only other thing to fix is the price and if the basis of this has been previously fixed, as it certainly ought to have been, the transaction is a simple one, instead of the bug-bear that it would seem to be from the precautions that are usually hedged around it.

Such a fixed basis as is suggested has only two practical points to be urged against it at the first view, and these will, on full examination, be found to be more theoretical than practical. The first of these is that, under such an arrangement, the purchaser—the civic government—might attempt to temporarily depreciate the condition or earning power of the property by adverse acts or legislation a short time before, or co-incidental with, the transfer of the property; this is a possibility but hardly a probability, as it presupposes an act of public rascality without any possible advantage to the direct agents of it—the civic officials. It might possibly be done as an act of spite or revenge against the grantees and in certain cases might possibly carry with it the favor of the community represented, but even in such a case the enforcement of the condition in the fixed basis which will be spoken of later would preclude this action having any great effect. The second of these objections is, in the present condition of political ethics, a much more serious one; it supposes that the seller—the grantee—might so influence the civic officers, or a majority of them, as to cause, at or near the time of sale or transfer, favoring legislation to be passed that would, directly or indirectly, greatly appreciate the condition or earning power of the property. As long as the cardinal belief of practical politicians is that public office is a private snap and as long as practical politicians rule in civic matters, just so long will such things be likely to happen, but even if they did happen in such a case the application of the condition above spoken of will prevent it being of any avail. This condition is that—no value added or taken away by fortuitous circumstances, at the moment or immediately preceding, must be taken into consideration in the fixing of the price to be paid—and among such "fortuitous" circumstances must be included anything done by either party beyond the scope of the franchise agreement and which tends to materially change the value of the property.

The advantage of this "fixed basis" is that it tends on both sides to keep the property at its best by giving to both sides an incentive to make it so; on the part of the seller that it may bring him a maximum price, on the part of the buyer that for the price paid it gets the goods in the best possible condition and at an equitable cost. Such a property would not only be at its best from an earning point, but also from the standpoint of public accommodation and this is an asset that is of greater value to the civic body than to the private owner if the matter is viewed rightly. It is an axiom these days that, between two similarly conditioned and similarly situated public services operated by private parties, the one that pays the best and is in the best physical condition is the one that gives the greatest accommodation to the greatest number, and the tendency of the foregoing "basis" would be to make the seller bend every energy towards making the property as paying an institution as was possible without depreciating its selling value. Under such an arrangement he can be trusted not to kill the goose in order to get the golden egg.

The Rockford (Ill.) Railway, Light & Power Co. is negotiating for a site on which to erect a depot for its electric lines. Rockford parties propose building a modern hotel adjacent to the depot so soon as a site for the latter shall have been selected.

### A UNION ENGINEERING HEADQUARTERS.

A suggestion in regard to an engineers' building in New York City for the joint use of the various engineering societies which now occupy different headquarters has been advanced by the American Machinist, and the plan appears to be one which is at least worthy of serious consideration. The suggestion is opportune from the fact that at the present time the house of the Mechanical Engineers has come to be too small for the increasing membership and a project for increasing the dues of the society to provide for a larger home is under discussion.

The present plan of maintaining this house certainly appears wasteful. At the time of the annual fall meeting, which lasts for three or four days, the house is over crowded, and is in fact entirely too small for this function. During the remainder of the year, however, the house is almost a solitude, and with the exception of the regular office force, a very few readers in the library and occasional out-of-town members who make use of the sleeping rooms constitute the whole of the occupants. The rooms are rented for a few evenings in the course of the year to other societies from which a small revenue is received.

Nearly the same condition exists in the house of the Civil Engineers, although its monthly meetings bring this house into somewhat more use than the former one.

### FIRST ELECTRIC INTERURBAN IN TEXAS.

There is nothing more significant of the prosperity and rapid development of the southwestern portion of the country than the activity displayed by capitalists in building interurban electric railways in that territory. Such lines had a phenomenal growth in the eastern and central states and rapidly pushed to the west and south, and during the present year the conquest of the Lone Star state was begun by the Denison & Sherman Railway Co., which began operating its line on May 1st last. In our last issue we gave details concerning another similar enterprise in Texas, work on which is being rapidly carried forward.

The two cities connected by this pioneer electric interurban are Denison and Sherman; with populations of 17,000 and 13,000 respectively, giving the line an urban population alone of 30,000 people to draw upon. To stimulate the interurban traffic a park known as Woodlake has been established about midway between the two cities. The property consists of a 50-acre tract, the natural beauties of which have been enhanced by the skill of the landscape gardener. In the center of the park is a lake covering some 10 acres, whose gleaming surface surrounded by its wooded borders lends greatly to the picturesqueness of the scenery and to the delight of the visitor. Two pavilions have been erected in Woodlake, one for the white and the other for the colored patrons of the park, in



INTERURBAN CAR. DENISON & SHERMAN ROAD—JEWETT CAR CO.

The policy of the Mining Engineers is to maintain a secretary's office only, and the Electrical Engineers do the same, through motives of economy, however, as they have been raising a building fund for some time past. The Naval Architects and Marine Engineers' Society is a tenant of the Mechanical Engineers' house.

The plan outlined by our contemporary does not contemplate any union of the societies, but simply an engineering building adequate to the needs of all and worthy of the commanding position held by the profession. Such a building should contain one large audience hall, a union library in which the ownership of the books should be kept separate, suitable offices for the office force of each society and the requisite number of sleeping rooms. A special advantage of this arrangement would be the union library, which would soon grow to be an invaluable means of reference. The plan might also be enlarged to include means for making experimental research.

While such a plan may not be feasible no objections appear on the surface, and the undoubted economy of it to the individual members would be so great as to make it worthy of careful consideration.

The contract for cars for the Pittsburg, McKeesport & Connellsville Ry. was let last month to the John Stephenson Co. The order is for 25 cars, 48 ft. long, with vestibuled ends; October delivery. These cars will be mounted on Peckham trucks, each truck having two 75-h. p. motors made by the Lorain Steel Co.

which the usual entertainment of summer resorts of this class is to be found. The park is also favored with an especially long season, situated as it is in a climate where summer reigns during the greater part of the year.

The interurban line proper is 10½ miles in length and penetrates to the center of the town at each terminus. The system also comprises three small local roads which were acquired by the present company and consolidated with the interurban. These roads were the Denison Electric Street Ry., the Sherman Street Ry., which was a horse road, and the College Hill & Park Electric Ry., of Sherman, all of which aggregated about 5 miles of track, making the total mileage of the present system 15½ miles.

The Electrical Installation Co., of Chicago, was the prime mover in this enterprise and took the first steps in securing options on the local roads in both towns. It was then instrumental in organizing the company for which it subsequently acted as engineer and general contractor.

The officers and operating staff of the Denison & Sherman company are: James P. Crerar, president and treasurer; Fred H. Fitch, secretary and general manager; Henry Morrison, superintendent; Oscar Knowles, chief engineer; Moseley & Smith, Denison, attorneys. The company was organized and the charter granted in the fall of 1900.

The road is constructed with single track and turnouts, the maximum grade being but 2 per cent. The general direction of the interurban line is northeast and southwest and the curves are but few and of very long radius, making it practicable to attain a high



TRACK AND LINE CONSTRUCTION.

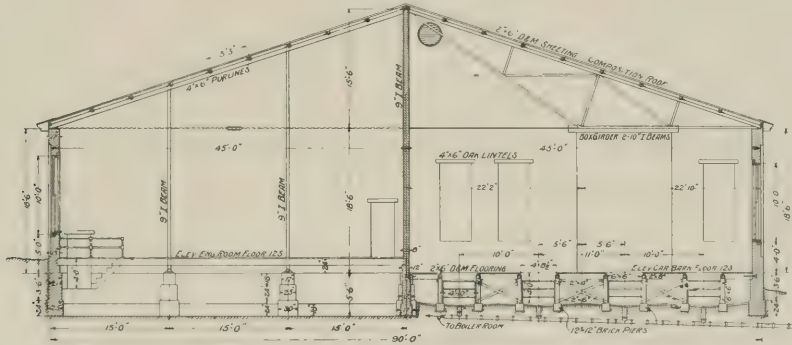
rate of speed with safety. The track consists of 70-lb. T-rails laid on oak ties 6x8 in. x 8 ft. in size and ballasted with gravel. The joints are made with 30-in. anglebars with 6 bolts, and the bonding is with protected bonds of the American Steel & Wire Co. type. In connection with the track laying the company employed a rail un-

The tracks are laid to standard gage and the ballast is crowned up above the center of the ties. The entire line and roadbed construction is of a substantial character suitable for heavy cars and high speeds. On the line are 11 trestles, aggregating 750 ft. in length.

The power house and car house are combined under one roof, but are divided by an 8-in. partition wall, making them practically two distinct buildings. The structure is of brick with steel roof trusses and is situated at Woodlake, which, as already stated, is midway between the termini. It is 90 ft. wide and 116 ft. long, the partition wall dividing it longitudinally into two equal parts.

The power house is divided into an engine and a boiler room, the former being 72x45 ft. in area and the latter 44x45 ft. The boiler room contains two 300-h. p. Cahall water tube boilers, which are operated at 100 lb. pressure. The engine room is equipped with two Allis corliss simple condensing engines with cylinder dimensions of 20x42 in., and two Westinghouse belt-driven 200-kw. generators. The piping from the boilers to the engines and condensers as well as all valves and fittings were made by the Crane Co. The condensers are of the syphon type and the boilers are fed by means of Metropolitan injectors. The switchboard is the standard Westinghouse railway type with two generator and two feeder panels. The power house floor as will be seen from the illustration is laid 2 ft. above the level of the boiler room and car house.

The car house contains four tracks running the length of the building, all of which are provided with pits. The latter are supplied with steam from pipes from the boiler room laid under ground.



ELEVATION OF POWER HOUSE, WOODLAKE.

loading car which greatly facilitated the work of removing the rails from the flat cars on which they were shipped. This consisted of two single trucks placed about 30 ft. apart and connected with two rails similar to a wagon reach. On top of the trucks, platforms of planking were built up, and two other rails 3 ft. apart stretched between the platforms. The upper end of these rails came even with the flat car flooring and they had a gradual slope downward to the other end, rollers being placed between the rails at intervals. This structure was coupled to the back of the car loaded with rails and as each rail was pulled back upon the rollers it slid down the incline to the end of the unloading car and thence to the ground by means of a short skid attached to the rear truck.

The overhead lines consist of a No. 0 trolley wire and a 450,000 c. m. feeder which extends the whole length of the interurban line. These are supported on wooden poles furnished by the Valentine Clark Co. and the overhead material is of the Ohio Brass Co. make.

The cross section of the roadbed is 20 ft. wide in cuts and 14 ft. wide on fills. The cuts have side slopes of 1 to 1 and the slope in fills is 1½ to 1. On each side of the roadbed in the cuts is a trench for drainage 4 ft. wide on top with 1 to 1 side slopes and 1 ft. deep. The poles are 30 ft. long with 6-in. tops and are set 22 ft. apart at the base, with a rake of 3 at the top away from the perpendicular. They are set 6 ft. in the ground and support the trolley wire at a height of 22 ft. at railroad crossings and 18 ft. elsewhere. One side of the pole line carries two cross arms, the lower one of which carries the feeder line and the upper one the telephone lines.

The repair shop is located in a separate brick building having an area of 100x30 ft., and its equipment includes the following tools: 22-in. shaper, 2-in. bolt cutter, 42-in. upright, drill friction sensitive drill, 18-in. by 10-ft. lathe, 12-in. tool grinder, 4 in.x4 in. shop saw, 32-in. band saw, variety saw, blower, etc.



TRESTLE, LENISON &amp; SHERMAN ROAD.



The rolling stock consists of 5 interurban, 4 local and 7 trail cars. The interurban cars are 42 ft. 8 in. over all in length and 8 ft. 7½ in. wide, and are divided into three compartments for white and colored passengers and baggage. The baggage compartment is in the front of the car, which is vestibuled, and is 9 ft. 9 in. long, having sliding doors on the sides. The passenger entrance is from the



POWER HOUSE, WOODLAKE.

rear end of the car only. The colored compartment is behind the baggage room, is 8 ft. 9 in. long, and seats 12 passengers. The white compartment is 19 ft. 8 in. long in the rear of the car and seats 28 passengers. These cars were made by the Jewett Car Co. and have cross seats with center aisles. They are supplied with Feist trolley harps and wheels, which have been used with great success in Sioux City and elsewhere, and electric heaters made by the Consolidated Car Heating Co. The bodies are mounted on Peckham No. 14 A extra heavy double trucks, each of the long cars being equipped with four Westinghouse 12 A motors. These trucks have Griffin 33-in. wheels weighing 525 lb., with 3½ in. tread and 1 in. flange. The axles are 4½ in. in diameter, with 3½-in. journals. Christensen air brakes are used with independent motor driven compressors.

commutation tickets are sold for \$1.50 and the local fare on the city lines is 5 cents. The schedule speed of the interurban cars is 20 miles per hour and each of the regular cars makes 180 car-miles per day. From 5 to 7 tons of bituminous coal per day are used for this service. The staff of the Electrical Installation Co. engaged in the construction of this road was: A. H. Stocking, chief engineer; O. E. Miles, civil engineer; George E. Morine, superintendent of electrical work, and J. L. Eades and James H. Clark, superintendents of track work.

### MASSACHUSETTS STREET RAILWAY ASSOCIATION.

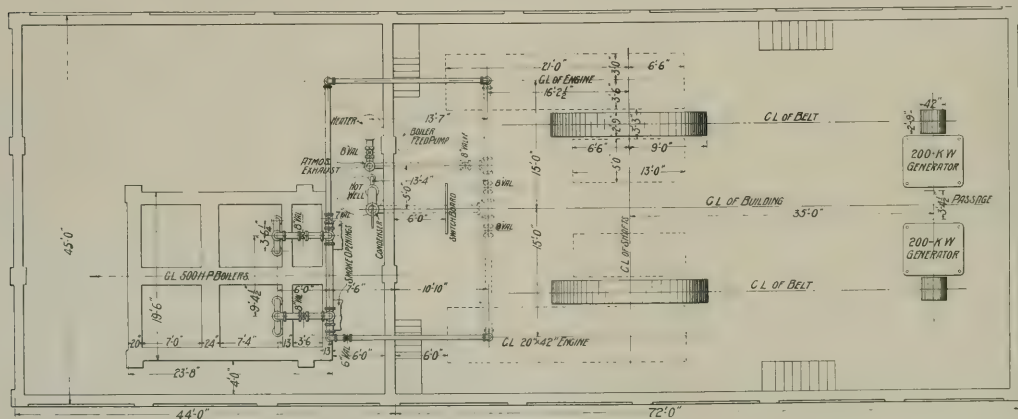
The annual summer outing of the Massachusetts Street Railway Association occurred on August 21st when the members of the association were the guests of the Fitchburg & Leominster Street Railway Co. at its pleasure resort, Whalom Park. Each guest was provided with a badge which entitled him to the free use of all the privileges at Whalom, including the steamboat, canoes, bathing, bowling alleys, shooting gallery, billiards and the water slide. The party which numbered about 75 met at the company's offices and after a brief salutation were taken on a special car for a short ride about the city and then to Whalom Park, which was the central point of the day's entertainment.

On arrival at Whalom, the members of the party were conducted over the grounds, and the various attractions were not only thoroughly inspected, but put to a practical test. The time was pleasantly passed until the dinner hour as their inclinations prompted. At 1 o'clock a banquet was served at the Whalom Inn, after which a special performance of the "Grand Duchess" was witnessed at the park theatre.

The program for the day was of an informal nature and the guests were not burdened with long speeches at the banquet or elsewhere. The courtesies extended by the Fitchburg & Leominster road were greatly appreciated by the members of the association and the outing was pronounced a great success.

### BULLETIN UNIVERSITY MISSOURI.

A bulletin of the department of engineering of the University of the State of Missouri has just been issued which sets forth the requirements and scope of that institution. The University was established in 1839 and located at Columbia, Mo. The tuition is



PLAN OF POWER HOUSE, WOODLAKE.

The four local cars are those previously in service, having 16-ft. bodies mounted on Peckham single trucks. The trail cars were rebuilt out of old car bodies and are 32 ft. long over all with double trucks of the Laclede and St. Louis makes. These are all open cars and are used for the interurban service.

The fare for the trip over the whole route is 25 cents. Ten ride

free in all departments, the only charges being a library fee of \$5 a session. Besides the general library there are four special engineering libraries. The engineering department also contains well equipped laboratories, extensive power, heating, lighting, pumping and refrigerating plants and well equipped shops covering a wide range of wood and metal working.

## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### AWARD OF \$250 DAMAGES FOR WRONGFUL EJECTION OF PASSENGER REDUCED TO \$100.

*Conlon v. Metropolitan Street Railway Co. (N. Y. City Ct.), 60 N. Y. Supp. 653. Mar. 26, 1901.*

Although it holds that a passenger wrongfully ejected by a conductor for a refusal to pay fare after tendering a transfer ticket may be awarded compensatory damages for the technical assault involved in the conductor laying his hands on him and telling him that unless he got off he would be pulled off, as well as for the indignity, the humiliation, and injury to his feelings caused thereby, nevertheless the general term of the city court of New York thinks a verdict for \$250 excessive, and that \$100 would be a fair, reasonable, and a just compensation for the damages sustained.

### MEASURE OF DAMAGES FOR BREACH OF CONTRACT TO BUILD EXTENSION TO BENEFIT LAND.

*Belt v. Washington Water Power Co. (Wash.), 64 Pac. Rep. 525. Mar. 30, 1901.*

For breach of contract to construct and operate an extension of a street railway, where the party to the contract suing therefor was the owner of a large amount of real estate suitable for and only for suburban residences, which was laid off in lots, blocks, streets, and alleys, and duly dedicated, and it was for the purpose of benefiting these lots, and increasing their value, and making them available as city property, that the contract in question was entered into, as was known by the company charged with the breach of contract in failing to construct and operate such extension as agreed, the supreme court of Washington holds that the proper measure of damages was the difference between the value of the land if the contract had been carried out and its value with the contract unfulfilled.

### PRESUMPTION AS TO ACCIDENT FROM STRANDING OF CABLE—FAILURE TO CALL WATCHER AS WITNESS—EXCLUSION OF REPORTS.

*Smith v. Metropolitan Street Railway Co. (N. Y. Sup.), 69 N. Y. Supp. 176. Mar. 8, 1901.*

In affirming a judgment for damages for injuries to a passenger caused by a collision of cars which was caused by the stranding of the cable at a point where it had been spliced eight days before, the second appellate division of the supreme court of New York holds that the presumption of negligence arising from the happening of the accident was not completely overcome by evidence which established the fact that the cable was the best in use; that a system of constant inspection was in operation; and that the defect in the cable which caused the accident was not discovered in time to prevent the occurrence; but holds that the case was properly submitted to the jury, and that a nonsuit would have been error. It also makes a point of the failure to produce as a witness one of the watchers on duty at the power house the afternoon that the accident occurred who was in the city at the time of the trial, the other watcher being out of the state. Nor does it think that it was reversible error, under the circumstances, that their written reports were excluded, as it says that it was evident that nothing contained in them could affect the determination of the question of the care with which the splice was made, or that of the credibility of the witnesses in regard to it.

### NO RIGHT TO THROW INTENDING PASSENGER FROM MOVING CAR FOR MANNER OF BOARDING IT.

*Hart v. Metropolitan Street Railway Co. (N. Y. Sup.), 69 N. Supp. 996. Apr. 22, 1901.*

Here, according to the evidence in his behalf, an intending passenger, who had safely boarded the front platform of a car while in motion, was seized by the gripman, and thrown from the moving car into the street. Being upon the car as a passenger, the

appellate term of the supreme court of New York holds, he was entitled to protection from an assault by the employe in charge thereof, whatever the motive of the assault; and if he was not entitled to remain on the car, through some infraction of the reasonable rules of the company, he was subject to removal by the use of no more than reasonable force, if he refused to leave voluntarily. If it be assumed (for there was no proof) that the company's rules prohibited an entrance by way of the front platform, in this instance not obstructed by a gate, he might possibly have been refused passage, but no rule of law required him to take his instructions of the company's rules at the risk of his life. Then, the court says that it certainly cannot hold that his recovery of damages was prohibited by his having boarded the car while in motion. If this had contributed to the situation which resulted in his injury, as a proximate cause, there would be no doubt that his case must fail; but he placed himself in a position of safety, so far, at least as the movement of the car had any bearing upon his injury, and, while his act may have contributed to the fury of the gripman, it was not contributory negligence.

### STATEMENT OF MOTORMAN SHORTLY AFTER ACCIDENT EXCLUDED—AUTHORIZATION OF SPECIAL RATE OF SPEED IS VALID.

*Ruschenberg v. Southern Electric Railroad Co. (Mo.), 61 S. W. Rep. 626.*

A witness was here asked if, after he reached the car, he heard the motorman make any statement as to the cause of the accident in this case, while the motorman was standing on the street, having left the car to assist in extricating from the wheels the body of the boy killed. The supreme court of Missouri, division No. 2, holds that there was no error in sustaining an objection to this question. It holds that any statement the motorman might have made at the time indicated was incompetent as an admission of the company. The statement called for was incompetent as a part of the res gestae, or essential circumstances of the accident. On its face, it sought to elicit a narrative of a past event. It was not pretended that it was an exclamation or statement characterizing the conduct of the motorman pending the accident. So, as applied to this case, the court considers that the offer was to prove a narrative of a past occurrence, and not a circumstance so connected with the main fact as to characterize the act itself.

Another thing that the court holds is that, where there is a provision in a city charter which declares invalid any ordinance inconsistent with a prior general ordinance, unless such prior ordinance or the conflicting parts thereof be repealed in express terms, and there is a general ordinance providing that no car shall be drawn at a greater speed than a certain specified number of miles per hour, a subsequent ordinance granting a franchise for a street railway which contains a clause permitting cars to be run at a greater speed must be taken to constitute an exception to the general act or provision, and not a repeal, and is not invalid.

### LIABILITY FOR INJURY OF PASSENGER CAUSED BY COLLISION WITH PAVING STONE.

*Dusenbury v. North Hudson County Railway Co. (N. J. Sup.), 48 Atl. Rep. 520. Feb. 27, 1901.*

In this case a passenger was badly injured by having a trolley car on which she was riding derailed and so suddenly brought to a stop that the car windows were broken, the stove was overturned, the rear end of the car was smashed in, and she was violently thrown from her seat to the floor. On the part of the company, it was shown that derailment and sudden stoppage of the car were due to the fact that it had struck a loose paving block, which was lying between the rails, and was wholly or partially covered by snow and slush. Such being the case, the supreme court of New Jersey holds that it was for the jury, not the court, to determine whether the presence of the paving stone might not have been discovered, and the accident avoided, by the exercise of that

high degree of care which the law imposes upon common carriers for the safety of their passengers. It holds that by the evidence offered on the part of the passenger a prima facie case was made out against the company. The mere happening of the accident in the absence of explanation of the cause of its occurrence, justified the inference that it was due to some negligence on the part of the company. At the close of the passenger's case, therefore, the burden rested upon the company of proving that the accident was not the result of lack of care on its part. The company and its employees were charged with the exercise of a high degree of care for the safety of this passenger upon its car, and its liability depended upon whether the motorman who was running the car would have detected the presence of the paving stone if he had used that great care which the law imposed upon him; and, if he would have discovered it, then whether the presence of the stone should have suggested to him the danger of an accident, such as that which it brought about, in case the car was attempted to be run over it. These were clearly questions which should have been submitted to the jury, rather than answered by the court.

#### LIABILITY FOR COLLISION DUE TO NEGLIGENCE OF EMPLOYEES OF CONTRACTORS IN OPER- ATING SIGNALS.

*Ortlip v. Philadelphia & West Chester Traction Co. (P.), 48 Atl. Rep. 497. Mar. 25, 1901.*

A motorman employed on a single track electric railway was injured in a collision between his car and a car owned and operated by contractors who were engaged in ballasting the roadbed with broken stones. The road was operated by a block system, with electric signals, which were set by the men in charge of the cars, and the collision resulted from the failure of the contractors' workmen properly to adjust a signal after entering a block. The traction company denied liability on three grounds: (1) That it was not responsible for the negligence of independent contractors; (2) that it was not negligent in intrusting the operation of its signals to the employees of its contractors; (3) that the motorman, by remaining in its service with knowledge of the manner in which the signals were operated, assumed the risk of injury from that cause. But the supreme court of Pennsylvania affirms a judgment in favor of the motorman. It holds that it was unnecessary to determine whether the contract was an independent one, or whether the company could absolve itself from liability in regard to so vital a matter as the operation of its signals, by delegating it to its contractors. The contract related to the construction of the roadbed, and, if independent, it was so only as to the doing of that work. The operation of the signals was not, as an independent matter, intrusted to any one, but remained in the charge of the company. The use of the tracks was under the direct control of the company's superintendent, who retained and exercised the right to direct the management of the cars and signals. In all matters incident to the use of the track, the contractors and their workmen represented the will of the company, and its responsibility remained. The motorman could not be charged with contributory negligence in remaining in the service of the company after the contractors were allowed to use its track. The ordinary risk of his employment was slightly increased, as it would have been if more passenger cars had been used, but the additional use of the track presented no obvious danger.

#### CONSENTS—NATURE OF—JURISDICTION VESTED BY NOT AFFECTED BY WITHDRAWAL, SALE OF LAND, LAPSE OF TIME—BOARD OF EDUCATION CANNOT GIVE—AS TO WHAT PROPER- TY MAY BE GIVEN—EFFECT UPON OF UNAUTHORIZED RESTRICT- TION—LOCATION OF A ROUTE.

*State (Currie, Prosecutor) v. Atlantic City (N. J. Sup.), 48 Atl. Rep. 615. Feb. 25, 1901.*

The supreme court of New Jersey holds that the "consents in writing of the owners of at least one-half in amount of property," fronting upon a street railway route, required by "An act to regulate the construction and maintenance of street railroads in this

state," approved May 16, 1894, and by "An act to regulate the construction, operation and maintenance of street railroads in this state," approved April 21, 1896, are not licenses or concessions granting to the railway company some interest in land or right in the streets. They are, in effect, votes for the adoption of a legislative scheme by which a special jurisdiction over highways is conferred upon the governing body of the municipality.

The court further holds that there can be no effective withdrawal of any consent after jurisdiction has vested in the municipal body. Jurisdiction that has vested in the manner prescribed by the legislature will not be ousted by the subsequent conveyance by an owner of the property, by virtue of the ownership of which he had consented to such jurisdiction. Jurisdiction that is acquired over a special subject is not exhausted by lapse of time, or by ineffectual exercises of it.

A board of education, nothing more appearing, cannot give a valid "consent" with respect to a schoolhouse lot for the statutory purpose in question.

When the beginning point of a proposed street railway route is to the north of a natural boundary that bisects an owner's property, such owner can give a valid consent with respect to so much only of his property as lies to the north of such boundary. A consent based upon the ownership of property fronting upon a street over which permission is desired is limited to such street, and has no application to any street upon which the property does not front.

The court leaves as a quære: As to the effect upon an otherwise valid consent of an unauthorized restriction upon the exercise of the jurisdiction conferred.

"Location of a route," in a statute, implies, the court holds, the right to construct and operate a railway upon such route, if that was its meaning at the time it was used in the legislative act.

#### RESPONSIBILITY FOR UNAUTHORIZED UNLAWFUL ACTS OF WITNESS SEEKER.

*Nowack v. Metropolitan Street Railway Co. (N. E. Rep. 22. Apr. 16, 1901.*

The court of appeals of New York says that if an honest man by mistake employs a dishonest one to look up witnesses for him, and the latter, through excess of zeal, resorts to bribery, although it was never thought of by his employer, it is better, for cleanliness and purity in the administration of justice, that the facts should be known, with the fullest opportunity for explanation, than to exclude all evidence of the evil acts upon the ground that they were not authorized, because authority may properly be inferred from the nature of the employment. And it holds that evidence of attempted bribery that would be admissible against an individual employing a man to look up witnesses is admissible against a corporation employing one under similar circumstances. It does not consider that such evidence is inadmissible against a corporation without proof of some corporate act expressly authorizing the agent to tamper with witnesses. A corporation, it says, can act only through agents, and where a branch of its business, whether broad or narrow, is intrusted to an agent, without any restriction, whatever he does which directly relates to that part of the corporate business, and tends to promote it, is binding upon the corporation. Having authority to accomplish a certain result, with no limitation as to the means to be employed, his acts, so far as they directly contribute to that result, even if unlawful, are corporate acts. They are done for the corporation by an agent clothed with general authority to effect a certain purpose, which they aid in attaining. Any admission made by him through acts done to carry on his branch of the business, and which reasonably tend to advance it, is regarded in law as made by the corporate body which authorized him to act for it with reference to the subject of his employment. So, if a man is employed to find witnesses, if possible, who will swear to such a state of facts as will prevent a recovery, and the method of doing this is left to his judgment and discretion, if he adopts a method not contemplated by the company, still it will be responsible for what he does, in the line of his employment, to promote its interest, and his acts will have the effect of an admission that its case is weak and of casting doubt on the testimony of other witnesses looked up by him and sworn by the company.



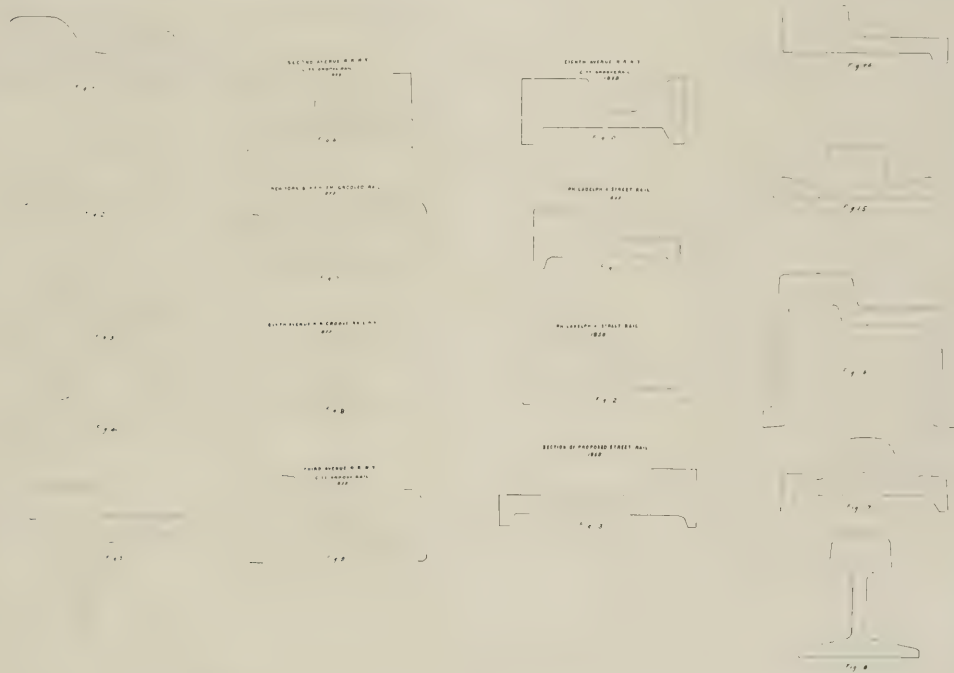
## Rails and Track Construction on the Island of Manhattan.

BY W. BOARDMAN REED, ENGR. MAINTENANCE OF WAY, METROPOLITAN STREET RAILWAY CO.

The first street surface railway ever built received its charter from the New York legislature in 1831 to construct "a railroad or way in New York City from any point on the north bounds of 23d St. to any point on the Harlem River, between the east bounds of Third Ave. and the west bounds of Eighth Ave., with a branch to the Hudson River between 124th and 129th Sts."

Surveys were made and Fourth Ave. was chosen as the most desirable route. The branch to the Hudson River was never built. The road was used for the carrying of both freight and passengers, steam locomotives being used for hauling of trains, while horse cars were used for local passenger business. The line was later extended by various legislative grants as far south as the present

different set of railway managers and promoters would have different ideas on the subject and the number of sections was augmented by the various city officials who had to pass on the subject. As a result we find almost as many different rail sections as there have been street railway companies. Previous to the advent of electric cars nearly all street railway rails were flat tram rails spiked to wooden stringers which were held in place by wooden cross ties. In some cities cast iron was used but in New York nothing but rolled iron or steel was used for straight track. As early as 1855 there was in use in New York City at least five different sections of rail known as the Second, Third, Sixth and Eighth Avenue and the New York & Harlem sections. Boston



EARLY TYPES OF STREET RAILWAY RAILS USED IN NEW YORK. ONE FOURTH SIZE.

terminal at the Postoffice for passenger cars hauled by horses only, though for some years freight cars were hauled over the same tracks with horses.

A portion of the line was built with light section of T-rail spiked to wooden stringers, which were held in place by wooden cross ties. Other portions were built with flat iron about  $2\frac{1}{2}$  in. wide and  $\frac{1}{2}$  in. deep, fastened to stone stringers 10 or 12 in. wide by 6 or 8 in. deep. The stone stringers were supported on stone cross ties, a number of which were unearthed during the construction of the present Fourth Ave. line. This style of construction must certainly have been expensive and it was doubtless difficult to keep the flat iron properly fastened to the stone.

From the earliest days of street railway there has been much objection to the laying of rails on streets on account of their being a nuisance to vehicles. Improvements in the rolling of iron enabled the rail to make a more even surface of rail so the railway promoter and manager spent much time and energy in designing shapes that would be acceptable to city authorities and at the same time not too objectionable from a railway point of view. Each

had five or more sections while Philadelphia had at least two. See Figs. 6 to 13.

To overcome public prejudice railway promoters claimed that instead of being a hindrance street railway rails were a great help to vehicle traffic, for wheels of trucks could run on the flanges, thus materially increasing hauling capacity of truck horses and making smoother riding for light vehicles. In many cities the gage of tracks was made to accommodate the gage of trucks, so that Newark, N. J., Philadelphia and other cities are now suffering from having tracks with a gage of 5 ft. 2 in. Rails were also made, as has been stated, for the accommodation of vehicles as well as cars. The general shape was similar to the side bearing rail now so generally in use, having usually a 3-in. flange, a 2-in. head and being 1 in. or more in thickness. Figs. 6, 7, 8, 9 and 10 show that attempts were made to overcome the difficulty of turning vehicle wheels out of the rails. It is evident that with Figs. 6 and 9 it was hoped to keep wheels of large vehicles out of the groove while smaller wheels would run in it.

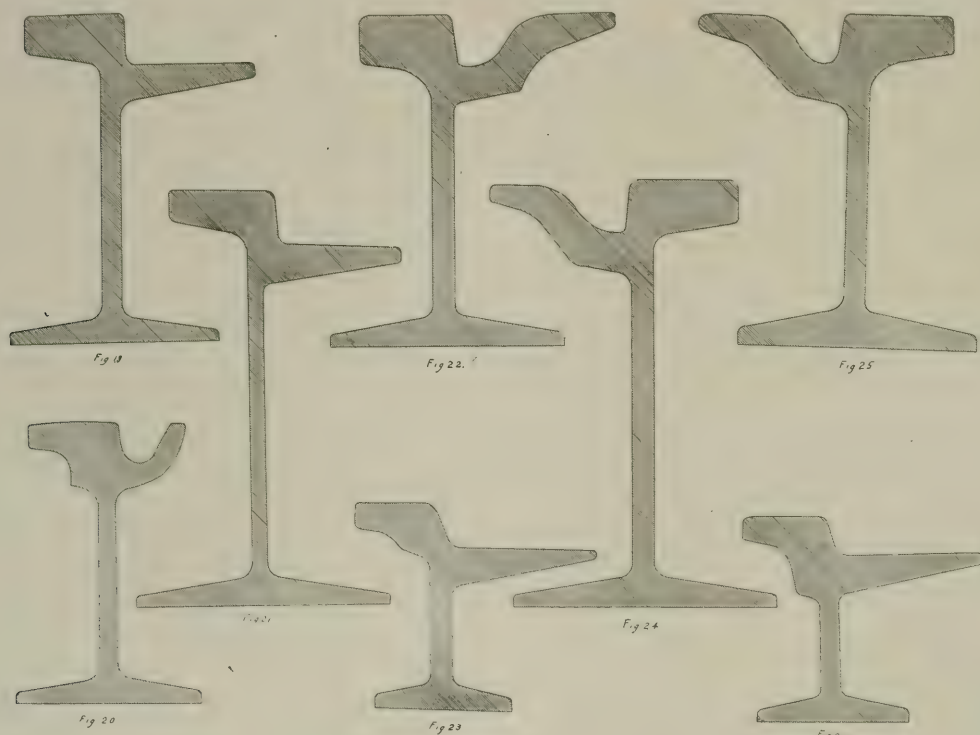
It was not long before truck drivers made extensive use of the

rails and railway companies found that not only was their traffic much interfered with, the speed of cars in crowded sections being regulated by speed of trucks, but the wear caused by trucks was more than that caused by the cars. Many attempts were made to overcome these difficulties and Mr. Abram S. Hewitt, afterwards mayor of New York and a well-known ironmaster, was appealed to. He designed what has since been known as the center bearing or Hewitt rail (Fig. 15) which is undoubtedly for a street railway company the best section of rail ever rolled. The head being in the center with a flange on either side there is no opportunity for dirt or mud to be pushed on it by wheels of vehicles and in times of snow this rail is of great advantage, for wheels of cars will push the snow off as it falls and often with a light fall of snow it is not necessary to run out sweepers, while with any other shaped rail snow is being continually dragged or thrown on the head by the wheels of vehicles and the feet of horses. The flange

yet with the introduction of smoother pavement rails were more or less of a menace to traffic and efforts were made by city authorities to compel the use of less objectionable sections.

We find the City of New York, as a relief from the center bearing rail, falling back to the side bearing type. This not satisfying the authorities, the full grooved section, Fig. 20, was tried. This requires so much extra power on account of the accumulation of dirt in the groove which is not thrown out by the car wheels but packed more and more solidly until the cars ride on the wheel flanges that railway companies were loath to adopt it.

For the construction of the Broadway cable line a three-quarter groove rail 7 in. high, weighing 91 lbs. per yard (Fig. 27) was used. This was very much preferable to either side bearing or full groove. Vehicles could readily pass across it either at right angles or obliquely and truck wheels could not follow it and the flange being lower than the head car wheels tended to push out the accu-



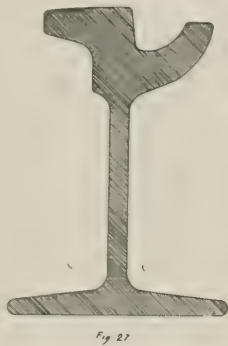
MODERN TYPES OF STREET RAILWAY RAILS USED IN NEW YORK—ONE THIRD SIZE.

on either side being but  $1\frac{1}{2}$  ins. in width truck wheels cannot ride it and of course they cannot remain on the head. On the other hand this rail is a great nuisance in the street. If the pavement is brought up level with its head there are grooves with vertical sides on either side of the rail which it is difficult to turn a small carriage wheel out of. If the pavement is kept only as high as the flanges there is practically a bar of iron 1 in. high by 2 in. wide for vehicles to get over and horses or people to stumble on. There was so much opposition to this section that the New York legislature passed a law prohibiting the laying or relaying of center bearing rail. And Mr. Hewitt states that is was largely through his influence when mayor of New York that the statute was passed. As he put it: "To be a rail manufacturer working in the interest of his railway customers was one thing; to be mayor of a city looking after the interests of the public was another."

While in the earlier days of street railways the rails were doubtless of benefit to vehicles and preferable to the existing pavement which was mostly of cobble and often times not in the best repair,

yet with the introduction of smoother pavement rails were more or less of a menace to traffic and efforts were made by city authorities to compel the use of less objectionable sections. The pavement was granite block laid on a concrete foundation with tar and gravel joints. If the pavement was laid level or a little above the head of the rail, trucks following along the track with more or less of a wobbling motion soon wore it down, below the top of the flange. The flange would then become something of an impediment to the side motion of the wheels and a rut would form. The writer had charge of the maintenance of this pavement and endeavored in a number of ways to avoid the wearing of this rut but with very little success. All repairs to pavement on lower Broadway had to be done at night, which made the work doubly expensive. To overcome this difficulty and at the same time have a rail that would be both acceptable to the city authorities and not objectionable to the railway company, in 1896 the writer in conjunction with Mr. L. J. Hirt at that time assistant chief engineer of the Metropolitan Street Railway Co., designed what is generally known as the Trilby section, Fig. 25.

The first design of this rail had the flange somewhat lower than the head, but Mr. E. P. North, then the city engineer, insisted that head and flange be made the same height, Fig. 22. A quantity of this rail was rolled and laid for horse car traffic. When the present conduit electric construction was designed the height of rail was made 9 in. and the shape of the top of the rail again altered, so as to make the head  $2\frac{1}{4}$  in. and the flange 3 in., the flange being  $\frac{1}{8}$  in. below the head; but the top of head and flange are in about the same plane, Fig. 24. This section was accepted by the city authorities and is now exclusively used in all new construction in Greater New York. While there is the same objection to this as to any other section having a groove, or the head level with the surface of the pavement, yet these objections are minimized for the shape of the groove is such that any accumulation is thrust up the inside edge by the car wheels. Pavement is laid about level with the head on the outside and level with tram on inside so no impediment at all is offered to traffic crossing the tracks, while wheels of vehicles following the tracks, if the tires are 2 in. or more in width will have little more tendency to ride on the rail than on smooth pavement. Narrower tired wheels will run in the groove, but no difficulty is experienced in turning out. It is the practice in New York to lay to any other section having a groove, or the head level with the surface of the pavement, yet these objections are minimized for sheet asphalt up against the rail without toothing stones, and if this is properly done the result is very satisfactory.



In the days of horse cars the flat tram rail answered its purpose very well, though as will be noted by the sections shown a number of girder rail sections have been laid for horse car traffic. But with the advent of mechanical traction heavier rails were necessary. The Broadway cable road was built with 7-in. rails, weighing 91 lb. per yard. This rail wore out in seven years, though the joints got very bad a year sooner, so that shimming and other temporary repairs had to be resorted to. During this time, however, probably about 1,250 cars passed over the track each twenty-four hours. The yokes on this construction were 4 ft. 6 in. apart. In rebuilding this line for electric cars it was necessary to use the same height of rail. A Trilby rail weighing 107 lb. per yard was used, see Fig. 25, and a special joint plate was designed to get more rigidity at the joints, which were suspended.

Though New York thinks so much of the Trilby rail other cities seem to prefer other sections. Boston uses a three-quarter groove, Washington a full groove, while Philadelphia sticks to the side-bearing section. Thus while the steam railroads have nearly all adopted a standard section for their roads, street railways seem as far and even farther from a standard section than they were 50 years ago. As a result street railway companies are obliged to pay much higher prices for their rails and the mills cannot afford to keep any stock on hand. If any railway wishes a few miles of track they must wait until sufficient orders come in from other companies using the same section to warrant the mill in setting up that particular set of rolls.

Being obliged to submit to the whims not only of their own engineers but of the city fathers and engineers of all cities and villages where there are railways it will not be easy for street railway managers to adopt a standard rail, but with a campaign of education it ought certainly to be possible to materially reduce the number of sections needed. At present the Pennsylvania Steel Co. shows 25 sections and the Lorain Steel Co. 31 sections in their respective catalogs. With street railways as with steam roads the weakest parts of the permanent way are the rail joints. Using 60 ft. rails does away with one half the trouble, but yet enough remains. In New York City on all new construction 9-in. girder rails weighing 107 lb. per yard are used. The joints are channel bars  $\frac{3}{8}$  in. long with twelve  $1\frac{1}{4}$ -in. bolts, the holes being staggered. Track with this style of construction has been in service about four

years and the joints have, generally speaking, held up very well. Some have given out, but it was either owing to carelessness in putting them on or to the fact that the plates did not well fit the rail. It is impossible to get rails or plates of perfect sections; as a result when plates are tightened up instead of having a full bearing the whole length of bottom and top flange they bear only in spots; as one might say it was much like putting two pieces of sand paper together. The vibration of the rail causes a wearing away of the bearing surfaces which in time makes a loose joint. This same trouble exists in all joints except the welded and must, the writer believes, be overcome before anything like a perfect joint is obtained. There seems but one way to accomplish this end which would be the machining of both rails and joint plates to a template; whether this will ever be made practical time alone will tell.

Most of the street railway lines rebuilt or newly constructed on the Island of Manhattan during the past eight years have been for the underground conduit system, and this work has been described in detail in the "Review" and most of the engineering periodicals. (See "Review," Vol. V, page 401, and Vol. VII, page 248.)

This construction is necessarily very expensive, none of it having been built for less than \$100,000 per mile of single straight track. On crosstown streets in New York it is especially costly owing to the larger proportion of special work required at intersecting lines. The geographical formation of the island being such that the traffic is mostly north and south, there is a street railway on each of the avenues but one. On 23d St., for example, between the North and East Rivers, a distance of about two miles, there are 14 avenues crossed upon which there are surface tracks so that that number of pieces of special work was required, and slotted special work material costs from three to five times as much as ordinary surface special work. In addition, at every avenue crossing numerous sub-structures such as sewers, gas and water pipes and electric subways are encountered.

The cost of building the four miles of single track on 23d St. was something over a million dollars or more than \$250,000 per mile. The intersection at Sixth Ave. cost \$59,633.20, and that at Fourth Ave. cost nearly as much. On 34th St., between First Ave. and the East River, a distance of about 400 ft., are two double track terminal lines; the cost of building the track on this 400 ft. of street was \$95,333.97.

Street railway men will readily understand that there are but few lines that would warrant such outlays, but 23d St. with earnings of something like 60 cents per car mile can stand it.

The Metropolitan Street Railway Co. in its search for some motive power that could be operated economically without such expensive installation decided to try both compressed air motors and storage batteries; so in 1900 the writer rebuilt the tracks on 28th and 29th Sts., each street having a single track, and the double track line on 34th St. from Second to Twelfth Ave., on Tenth Ave. from 34th St. to 42d St., and on 42d St. from Tenth Ave. to the North River. This work was done without interfering with the operation of cars then running on these streets, horse cars on 34th St., compressed air cars on 28th and 29th Sts.

The standard 9-in., 107-lb. New York City rail in 54 ft. lengths with 12-hole angle iron joint plates, 36 in. long, was used, with 7-in. guard rails on curves. The style of construction varied with character of the pavement. On streets with either asphalt or granite pavement on concrete foundation, concrete beam construction was used; for it was thought that the grade of these portions of the streets was fixed. But on portions of streets where the pavement was stone with sand joints ordinary tie construction was put in, it being probable that within a short time asphalt would be laid necessitating a change of grade. On the tie construction long leaf yellow pine sawed ties 5 in. x 7 in. x 7 ft. were spaced 30 in. on centers, with a Marks railway brace plate on every fourth tie. Joints were broken and supported. Where no side track was laid for cars in operation, the new rail was first laid on the old ties for four or five hundred feet; new ties were then put under the rail at their proper locations and very carefully tamped with native soil, which is mostly sand. The old ties were then removed and the track lined and surfaced, after which earth was solidly tamped under the bottom of the rail. Under the head and flange of the rail properly molded terra-cotta blocks, or fillers, were used to pave against. Just previous to paving all joints were gone over, the bolts hammer-tapped, and the nuts drawn tight.



In laying concrete beam construction where no side track was used for operation of cars rails were laid on old ties as described; new ties were then put in, 5 ft. between centers, with a tie under each joint; the old ties having been removed, the track was brought to proper line and surface and each alternate tie well tamped with earth. Excavation was then made under the rail 8 in. deep and 18 in. wide and under the remainder of the ties 4 in. deep, 12 in. wide; the trenches thus made was filled with portland cement concrete mixed 1 part cement, 3 parts sand, 7 parts 1½-in. broken stone; this was mixed rather dry, well rammed and tamped hard under the ties and under the bottom of the rail. Where granite block pavement was used the foundation for the pavement was put in at the same time as the beam making a monolith which securely holds the track in position. Where asphalt was used the space between the ties was filled with earth well rammed and on top of this was laid the 6-in. foundation for asphalt. On each tie that was tamped with concrete a Marks railway

Paving material .....	1.390
Paving labor .....	.487
Superintendence .....	.218
Miscellaneous .....	.144

\$6.967

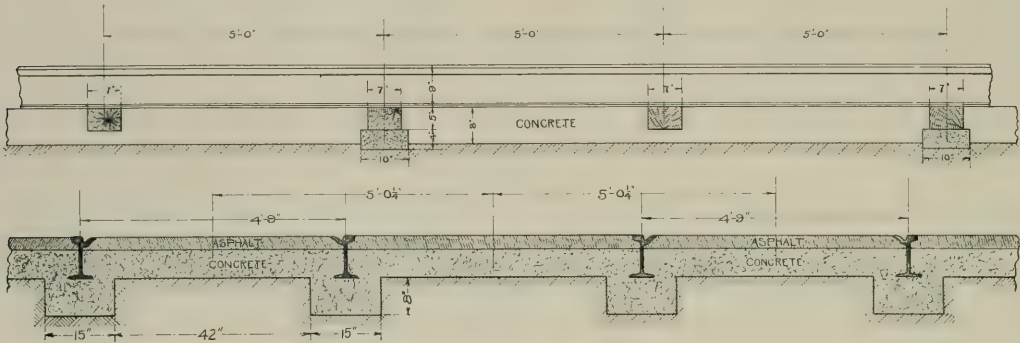
The average cost in granite pavement including cost of side-tracks, etc. on 34th St. was about \$37,000 per mile.

In asphalt pavement owing to the cost of asphalt, it was about \$56,000 per mile.

The excessive cost in asphalt is caused by city engineers changing the grade of the tracks thus necessitating the taking up and relaying a large amount of pavement outside of the tracks.

In stone pavement where there were sand joints, the ordinary tie construction being used, the average cost was about \$30,000 per mile.

The average cost for labor in removing old track and getting



CONCRETE BEAM CONSTRUCTION—METROPOLITAN STREET RAILWAY.

brace plate was used and these held the track to good line and gage without the use of tie rods.

In granite pavement the terra-cotta fillers were used to pave against but in asphalt the concrete was brought to within 3 in. of the top of the rail. The asphalt company then rammed under both the head and the flange a rich mixture of asphalt which was followed closely by the laying of the pavement consisting of 1 in. of binder and 2 in. of surface. This work has been in now on 34th St. for about 12 months and the rails are standing up perfectly; only a few joints seem at all loose and no perceptible ruts have been worn along the rails. On this street there is much vehicle traffic and the storage battery cars are the heaviest cars in operation on a single track; they weigh 13½ tons.

Little difficulty was experienced in rebuilding the 28th and 29th St. line where air motors were in operation; it was simply necessary when the old rail was thrown out to get in the new one on the old ties and spike it to gage. Excavating could be done for new ties without difficulty. Where horse cars are run, however, much care must be used to maintain a footing for the horses as well as a track for the cars and this interferes so much with the carrying on of the work that it always pays to build a sidetrack when practicable. The practice on a double track street is to build one side track then rebuild one of the tracks; after it is completed use that and the sidetrack while the other is being constructed.

New York is an expensive place for railway construction as for other things and a few figures may be interesting.

The cost per mile of track in granite pavement with concrete foundation, tar and gravel joints, was \$36,785.76 made up as follows:

	Per track foot.
Track laying .....	\$0.305
Removing old track .....	.175
Excavation .....	.390
Miscellaneous .....	.144
Side track .....	.213
Track material .....	2.053
Tools, plank, etc. ....	.169
Paving concrete material .....	.608
Paving concrete labor .....	.453

new track ready for paving with concrete beam construction was about \$8,000 per mile. Material cost \$12,000, the rest being made up of the expense of paving.

Mr. W. Boardman Reed was born at Poughkeepsie, N. Y. He graduated from Union College in both scientific and engineering courses in 1882, receiving the degrees of A. B. and C. E. From 1882 until 1891 he was engineer of magnetite mines at Mineville, N. Y., having charge of laying out the mine workings so as to secure economy and safety of operation, locating bodies of ore by magnetic surveys and drilling; at the same time he did the engineering work required on about 20 miles of steam railroad connecting the mines with Port Henry, the shipping port on Lake Champlain. During 1891 and a portion of 1892 he was associated with William Gifford,



W. B. REED.

of Schenectady, doing general engineering and surveying work. During this period was in charge of the construction of the gravity system of water works at Northville in Fulton County. From 1892 until 1894 Mr. Reed was engineer in chief of the construction and equipment of the Cayadutta Electric railroad between Fonda and Gloversville; this was one of the first electric roads to be built on private right of way, and was described in our issue for 1894.

From 1894 to the present time Mr. Reed has been engineer of maintenance of way of the Metropolitan Street Railway Co., of New York, having direct charge of maintenance of all track work and pavement and also of the construction of all surface work as distinguished from slotted work which is looked after by the construction department. Has also charge of the reconstruction of car houses, formerly used for horse or cable cars, for the present electric cars.

## NEW COOLING TOWER.

The advantages of operating steam engines condensing have long been appreciated, and in order to permit of condensers being used at plants where the cost of water is high considerable attention has been given to the design of water cooling towers to enable the condensing water can be reused.

The accompanying illustrations show two types of cooling towers designed by the Victor Cooling Tower Co., 812 Olive St., St. Louis,



FIG. 1.

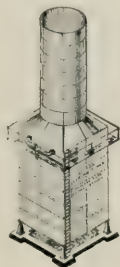


FIG. 2.

both of which have given excellent satisfaction in service. Fig. 1 shows the standard form of the Victor tower with mechanically induced draft. Fig. 2 is the Victor tower with natural chimney draft, which does not reduce the temperature of the water as low as where a fan tower, but is to be recommended because it costs nothing for operation.

Fig. 3 shows in detail the arrangement of the plates forming the superficial cooling surface and the flow of the water and air with respect to them. In designing these plates great care was taken that the retardation of the water would not produce a corresponding retardation to the flux of the air. For this reason the plates are perforated in such a manner that ledges are formed and the water flows from ledge to ledge, the rate of flow being considerable slower than if the plates were solid, the air, however, is given free course and passes through readily, carrying with it all the moisture it can absorb. The plates are set at a slight angle with the vertical, the slope of each being in the opposite direction from that immediately above or below it. This gives the water a zig-zag course and prevents its flowing to one side of the tower as would be the case if all the plates were inclined in one direction. The zig-zag arrangement diffuses the air and gives each particle of air an opportunity to absorb moisture.

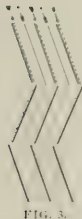


FIG. 3.

The fan used on this tower is especially designed for this purpose. The blades are enclosed by a shell, shaped like a truncated cone, the large base being toward the interior of the tower, which is riveted to the blades and revolves with them. The idea of the design is first, to strengthen the fan, and second, to deflect the air, which by centrifugal force is thrown toward the periphery, into the tower, and eliminate the eddy currents.

A commendable feature of the design is the light weight which enables the tower to be safely installed on the roof of an ordinary building.

## NOTES FROM KANSAS.

When the Kansas City-Leavenworth line was in course of construction it was the general impression that it was to be a feeder to the Kansas City lines, or at least to Kansas City. Now it seems a through Leavenworth is to be the radiating point for a number of new lines to be constructed.

The Leavenworth city lines under the direct management of the Leavenworth Electric Railway Co. have been absorbed by the Kansas City-Leavenworth Co., which has also absorbed the Leav-

enworth & Lansing Co., the Kensington Railway, Leavenworth Traction Co. and the Leavenworth Construction Co. The consolidation has been incorporated under the state law, as the Kansas City-Leavenworth Electric Railway Co.

The officers elected are: President, D. H. Kimberly, Cleveland, O.; vice-presidents, W. H. Gabriel and H. C. Ellison; treasurer, Charles O. Everts, all of Cleveland; secretary, H. W. Wolcott, Leavenworth. Directors: D. H. Kimberly, W. H. Gabriel, H. C. Ellison, C. O. Everts, H. W. Wolcott, all representing Cleveland interests, and C. F. Hutchings, Charles H. Wheeler and U. G. Walker, representing western capital.

The capital stock has been increased to \$3,750,000 and the new company has decided to authorize the issue of new bonds to raise money with which to construct and equip a line from Leavenworth to St. Joseph; another to Platte City and Weston, Mo., and another to Topeka. The St. Joseph and Atchison line is to cross the Missouri over the old Kansas and Missouri bridge, used by the Rock Island and other steam lines in former years, but abandoned for several years past. This bridge is owned by bondholders residing in New York City and Holland and can be secured at a nominal price.

The Leavenworth and Kansas City lines have been doing a good business for the past year and as the prospect increases for the rehabilitating of Ft. Leavenworth as a military school, with a garrison of 5,000 men, the field is considered one of the best for electric railway operations.

Beside being an important military post, Ft. Leavenworth will be the place at which large bodies of the national guard will be concentrated for field and camp instruction every year, drawing together upward of 20,000 men at a time. These will bring visitors and they will bring money to the electric lines centering here.

The Kansas City-Leavenworth company is now building a new car barn, office building, power distributing plant, etc., in the heart of the city of Leavenworth, with a view of handling all the business and controlling the operation of all the cars from that point.

It is probable that the large cars now running between Leavenworth and Kansas City will be run through from Kansas City to Ft. Leavenworth extending the run from Leavenworth three miles. The distance to Topeka is 65 miles, Platte City, 7 miles, Weston, 5 miles, Atchison, 21 miles and St. Joseph about 65 miles.

## GRADE CROSSING ACCIDENT IN CHICAGO.

A collision in which the motorman and five passengers were killed occurred on the evening of August 17th between a Pittsburg, Ft. Wayne & Chicago R. R. train and a 47th St. car of the Chicago City Railway Co. The gates at the crossing were down and the flagman had signalled the approach of the train when the street car arrived at the crossing. The motorman failed to stop the car in time and shouted a warning to the passengers some of whom managed to jump off the car. The car crashed through the gates and was struck by the front end of a mail coach which broke it into a number of pieces. The coroner's jury which examined into the matter threw all the blame of the accident upon the motorman and the most probable theory is that he became confused on his approach to the crossing and neglected to use the brake or the reverse soon enough to check the progress of the car, or else he was too venturesome. The car had been through the shops two weeks before the accident and was presumably in good order.

## ELECTRIC LINES FOR CHINA.

In the opinion of those familiar with the conditions in China that country offers exceptional opportunities for the development of interurban railways. The cities and towns are so densely populated that there is practically no field for urban railway lines, but there is a great need for cheap transportation between cities. Messrs. Brown Brothers, of New York, who have been largely interested in steam railroads in China have decided that electric interurbans now afford greatest promise of financial returns and will undertake their construction. Mr. C. D. Jameson, who has been in China for the last ten years engaged in civil engineering work, has recently visited America and made a study of American interurban lines with the view of organizing an electric railway department for Brown Brothers on his return to China.

### MADISON SQUARE GARDEN.

This mammoth structure which will be at the disposal of the American Street Railway Association for the week beginning October 6th occupies the entire block diagonally opposite the northeast corner of Madison Square, New York City. It is bounded by Madison Ave., 27th St., Fourth Ave., and 26th St. The building was erected in 1890, and is a handsome structure, absolutely fire-proof, and built wholly of masonry, iron and glass, and finished in buff brick and light terra cotta. At the southwest corner a tower rises to a height of 300 ft., surmounted by a gilded statue of Diana which is so balanced as to form a weather vane. The tower is ascended by elevators and staircases and is provided with summit balconies commanding a wide landscape. The building contains an amphitheater, a theater, a restaurant, a concert hall, a roof garden, and several smaller rooms, with all possible conveniences for public and private entertainments.

The amphitheater which will be devoted to the display of exhibits is 310x194 ft., and 80 ft. high, with an arena large enough to con-



MADISON SQUARE GARDEN.

tain a race track one-tenth of a mile in length. It has a permanent seating capacity of 6,000 people, inclusive of 150 private boxes, and for conventions and similar purposes, can be arranged to seat 12,000 people. Under the permanent seats, and extending around the entire amphitheater, is a continuous hall with upward of 30,000 sq. ft. of floor space. Madison Square Garden is New York's largest assembly building and here are held the great fancy balls, the annual horse, dog, and flower shows, the circus in the spring, bicycle, automobile and horse races, autumn conventions, and midsummer concerts.

The restaurant on the ground floor in the Madison Ave. and 26th St. corner of the building, is 80x90 ft. in dimensions, and is handsomely decorated. Its kitchen is on the roof. Over the restaurant is the concert hall, seating 1,500 people. The theater is one of the largest and most conveniently arranged of any similar hall in the city. The concert hall and theater will be used for the business sessions of the A. S. R. A. and the Accountants' Associations, and for the usual exhibit of blanks and forms.

On the front corner of the building is the roof garden, reached by elevators, and now one of the most successful open-air vaudeville theaters in the country.

### OFFICERS A. S. R. A.

President, Walton H. Holmes, president Metropolitan Street Railway Co., Kansas City, Mo.

First Vice-President, Herbert H. Vreeland, president Metropolitan Street Railway Co., New York, N. Y.

Second Vice-President, N. H. Heft, president Meriden Electric Railroad Co., Meriden, Conn.

Third Vice-President, John B. McClary, general manager Birmingham Railway, Light & Power Co., Birmingham, Ala.

Secretary and Treasurer, T. C. Penington, treasurer Chicago City Railway Co., Chicago, Ill.

Executive Committee, the president, the vice-presidents and—  
John M. Roach, president Chicago Union Traction Co., Chicago, Ill.

Frank L. Fuller, assistant to president and general manager of the United Power & Transportation Co.

George W. Baumhoff, St. Louis, Mo.

John R. Graham, president Brockton Street Railway Co., Brockton, Mass.

John Harris, superintendent Cincinnati Traction Co., Cincinnati, O.

A complete list of the cities where the conventions have been held and the presiding officer is as follows:

Boston	Moody Merrill	1882
Chicago	H. H. Littell	1883
New York	William H. Hazzard	1884
St. Louis	*Calvin S. Richards	1885
Cincinnati	Julius S. Walsh	1886
Philadelphia	*Thomas W. Ackley	1887
Washington	Charles B. Holmes	1888
Minneapolis	George B. Kerper	1889
Buffalo	Thomas Lowry	1900
Pittsburg	Henry M. Watson	1891
Cleveland	John G. Holmes	1892
Milwaukee	D. F. Longstreet	1893
Atlanta	Henry C. Payne	1894
Montreal	Joel Hurt	1895
St. Louis	H. M. Littell	1896
Niagara Falls	Robert McCulloch	1897
Boston	Allison E. Lang	1898
Chicago	C. S. Sergeant	1899
Kansas City	J. M. Roach	1900
New York	Walton H. Holmes	1901

\*Deceased.

### LOCAL COMMITTEES.

#### GENERAL COMMITTEE.

H. H. Vreeland, Pres. Metropolitan St. Ry.  
Clinton H. Rossiter.  
David Young, Vice-Pres. North Jersey St. R. R.  
Col. N. H. Heft, Pres. Meriden Electric R. R.  
Edward A. Maher, Pres. Union Ry.  
D. B. Hasbrouck, Vice-Pres. Metropolitan St. Ry.  
A. M. Young, Pres. Bridgeport Traction Co.  
John R. Beetem, Vice-Pres. N. Y. & Queens County Ry.  
E. P. Bryan, Gen. Mgr. Subway.  
Alfred Skitt, Vice-Pres. Manhattan Ry.  
James H. McGraw, Street Railway Pub. Co.  
Gen. Eugene Griffin, General Electric Co.  
B. H. Warren, Westinghouse Elec. & Mfg. Co.  
Harry Sanderson, Pres. N. Y. Elec. Transportation Co.  
Frank J. Sprague, Sprague Electric Co.  
Henry L. Shippy, Treas. John A. Roebing Sons Co.  
John L. Heins, Pres. Coney Island & Brooklyn R. R.

#### ENTERTAINMENT COMMITTEE.

J. L. Greatsinger, Pres. Brooklyn Rapid Transit Co.  
H. D. Cooke, Pres. Compressed Air Co.  
Ralph H. Beach, General Electric Co.  
Edward E. Higgins, Success.  
W. Boardman Reed, Engr. Maint. of Way, Met. St. Ry.  
Maj. H. C. Evans, Lorain Steel Co.  
F. H. Taylor, Westinghouse Elec. & Mfg. Co.  
E. A. Merrill, McIntosh & Seymour Co.  
Thomas C. Wood, Ball & Wood Co.  
James C. Barr, Weber Railway Joint Mfg. Co.  
H. Webster, Babcock & Wilcox Co.  
H. M. Littell.  
D. M. Brady, Pres. Brady Brass Co.  
Charles F. Brooker, Pres. Coe Brass Co.  
C. B. Fairchild, jr., "Street Railway Review."  
Col. H. G. Prout, Railroad Gazette.



## OFFICERS AND EXECUTIVE COMMITTEE OF THE AMERICAN STREET RAILWAY ASSOCIATION.

H. H. VREELAND,  
First Vice-President.W. H. HOLMES,  
President.N. H. HEFT,  
Second Vice-President.J. B. MCCLARY,  
Third Vice-President.

JOHN M. ROACH.



JOHN HARRIS.

T. C. PENINGTON,  
Secretary and Treasurer.

G. W. BAYMHOFT.



F. L. FULLER.



JOHN R. GRAHAM.

H. Sanderson, N. Y. Elec. Vehicle & Trans. Co.  
T. C. Martin, Electrical World and Engineer.  
James H. McGraw, Street Railway Pub. Co.  
H. L. J. Pomer, Bethlehem Steel Co.

## TRANSPORTATION COMMITTEE

James H. McGraw, Street Railway Pub. Co.  
W. W. Wheatley, Brooklyn Rapid Transit Co.  
Milton G. Roach, New York Central.  
W. E. Baker, Gen. Supt. Manhattan Ry.

## EXHIBIT COMMITTEE.

Milton G. Starrett, Ch. Engr. Metropolitan St. Ry.  
Oren Root, jr., Asst. Gen. Mgr. Met. St. Ry.  
C. D. Menecly, Secty. Brooklyn Rapid Transit Co.  
Eugene Chamberlain, Supt. of Equipment, B. R. T. Co.  
Calvert Townly, Westinghouse Elec. & Mfg. Co.  
Charles M. Jarvis, Vice-Pres. American Bridge Works.  
J. R. Lovejoy, General Electric Co.  
Capt. L. Candee, Okonite Co.

E. E. Gold, Gold Car Heating Co.  
 Peter M. Kling, Gen. Mgr. John Stephenson Co.  
 Frank McGovern.  
 A. H. Berry, H. W. Johns Mfg. Co.  
 R. L. MacDuffie.  
 L. G. Read.  
 Thomas Millen, Master Mechanic Met. St. Ry.  
 Col. A. C. Woodworth, Gen. Mgr. Consolidated Car Fender Co.  
 John T. McRoy.

#### PRESS COMMITTEE.

St. Clair McKelway, Brooklyn Eagle.  
 Adolph S. Ochs, New York Times.  
 Colin Armstrong, New York Sun.  
 Charles E. Miller, New York Times.  
 William Van Benthussen, New York World.  
 John Burke, New York Herald.  
 H. B. Cosgrove, New York Tribune.  
 Henry L. Stoddard, Mail and Express.

#### RECEPTION COMMITTEE.

Col. T. S. Williams, Vice Pres. Brooklyn Rapid Transit Co.  
 A. C. Tully, Gen. Pur. Agt., Met. St. Ry.  
 Charles E. Warren, Secty., Met. St. Ry.  
 E. H. Mullen, General Electric Co.  
 James M. Wakeman.  
 Henry W. Blake.  
 E. C. Long, Peckham Manufacturing Co.  
 L. B. Stillwell, Elec. Engr. Manhattan Ry.  
 Harold P. Brown, Plastic Rail Bond Co.  
 Giles S. Allison.  
 Jacob Wendell, jr.  
 Charles W. Price, Electrical Review.  
 H. A. Robinson, Solicitor Metropolitan St. Ry.

#### CONVENTION PROGRAMS.

Papers will be presented at the A. S. R. A. convention on the following subjects:

"Street Railways: A Review of the Past and a Forecast of the Future." By Robert McCulloch, general manager, Chicago City Railway Co., Chicago, Ill.

"The Adoption of Electric Signals on Suburban and Interurban Railways, Single or Double Track, and Their Economy of Operation." By William Pestel, superintendent of motive power, Worcester Consolidated Street Railway Co., Worcester, Mass.

"The Values of Storage Batteries as Auxiliaries to Power Plants." By W. E. Harrington, vice-president, Camden & Suburban Railway Co., Camden, N. J.

"The Public, the Operator and the Company." By C. S. Sergeant, vice-president, Boston Elevated Railway Co., Boston, Mass.

"The Best Manner and Mode of Conducting the Return Circuit to the Power House." By E. G. Connette, vice-president and general manager, Syracuse Rapid Transit Railway Co., Syracuse, N. Y.

"The American Street Railway Association: The Purpose of its Organization and the Benefits Accruing to Investors in, and Operators of Street Railway Properties by Membership Therein." By G. W. Baumhoff.

"The Economies Resulting from the Use of Four Motors Instead of Two on Double Motor Equipments."

"The Best Form of Car for City Service: A Consideration of the Various Types of Car as to Size of Car and Arrangement of Seats, Including Best Types of Brakes and Wheels." By Eugene Chamberlain, superintendent of equipment, Brooklyn Rapid Transit Co., New York, N. Y.

"Practical Results Obtained from Three-Phase Transmission and Rotary Transformers or Motor Generators in Transmitting Power on Railway Lines."

"Relations of Interurban and City Railways." By Ira A. McCormack, general manager, Cleveland Electric Railway Co., Cleveland, O.

"The Modern Power House, Including the Use of Coaling Towers for Condensing Purposes."

The program of the Street Railway Accountants' Association will open with an address of welcome by Bird S. Coler, comptroller of the city of New York, and reports of standing committees will

be received relating to the Standard Unit of Comparison, Standard Blank and Accounting of Material, Standard System of Accounting and Standard Accounting for Electric Light Companies.

The following papers will be read:

"Consumers' Account.—Electric Lighting Companies." By S. E. Moore, comptroller, Consolidated Traction Co., Pittsburg, Pa.  
 "Capital Accounts from the Standpoint of the Investor." By Col. T. S. Williams, vice-president, Brooklyn Rapid Transit Co., New York, N. Y.

"Car Mileage and How to Obtain it Easily." By J. M. Smith, comptroller, Toronto Railway Co., Toronto, Can.

"Conductors' Accounts." By Elmer M. White, cashier, Hartford Street Railway, Hartford, Conn.

Thursday, October 10th, has been set apart as the day for the examination of the supply men's exhibits. No session of the associations will be held that day, so that all may have time to view the exhibits. It is requested that managers have their heads of departments present on that day. The annual banquet will be held Friday evening, when the officers elect will be installed.

The headquarters of the A. S. R. A. will be the Murray Hill Hotel and that of the Accountants' the Fifth Avenue Hotel.

#### OFFICERS ACCOUNTANTS' ASSOCIATION.

President, William F. Ham, comptroller Washington Traction & Electric Co., Washington, D. C.

First Vice-President, J. A. Harder, auditor Metropolitan Street Railway Co., Kansas City, Mo.

Second Vice-President, J. M. Smith, comptroller Toronto Railway Co., Toronto, Can.

Third Vice-President, W. G. McDole, auditor Cleveland Electric Railway Co., Cleveland, O.

Secretary and Treasurer, W. B. Brockway, assistant secretary and auditor New Orleans & Carrollton Railroad Co., New Orleans, La.

Executive Committee, the officers and—

C. N. Duffy, auditor Chicago City Railway Co., Chicago, Ill.

G. E. Tripp, auditor Seattle Electric Co., Boston, Mass.

C. S. Mitchell, auditor United Traction Co., Pittsburg, Pa.

C. M. Heminway, cashier Connecticut Lighting & Power Co., New York, N. Y.

A list of the cities where the Street Railway Accountants' Association has held meetings and the presiding officers is as follows:

Cleveland .....	*Morris W. Hall, Chairman.....	1897
Niagara Falls .....	C. N. Duffy, Vice-President.....	1897
Boston .....	H. L. Wilson .....	1898
Chicago .....	J. F. Calderwood.....	1899
Kansas City .....	C. N. Duffy.....	1900
New York .....	W. F. Ham.....	1901

\*Deceased.

#### ADDITIONAL EXHIBITORS.

In addition to the list of exhibitors at the convention as given on pages 514 and 515 of our August issue, the following companies and firms will have exhibits:

American Electric Heating Corporation, at the space of the Mayer & Englund Co. (53).

Bliss Manufacturing Co.,

Corning Brake Shoe Co.,

Granger Safety Tread Co.,

Ham Sand Box Co.,

Hipwood Barrett Car & Vehicle Fender Co., and

Lehigh Car Wheel & Axle Works, Limited, at the space of Francis Granger (84).

W. T. T. MacAllen Co.,

Protected Railbond Co.,

Bierbaum & Merrick Metal Co.,

Franklin Incandescent Lamp Co.,

Globe Electric Manufacturing Co.,

Hunter Illuminated Car Sign Co.,

Keystone Electrical Instrument Co.,

McGuire Manufacturing Co.,

Streeter Brake Shoe Co.,

Speer Carbon Co., and

## OFFICERS OF THE STREET RAILWAY ACCOUNTANTS' ASSOCIATION OF AMERICA.



J. A. HARDER,  
First Vice-President.



W. F. HAM,  
President.



J. M. SMITH,  
Second Vice-President.



W. G. McDOLE,  
Third Vice-President.



W. B. BROCKWAY,  
Secretary and Treasurer.



C. N. DUFFY.



C. M. EMINWAY.



C. S. MITCHELL.

Sterling Varnish Co., at the space of the Mayer & Englund Co.  
Weber Railway Joint Manufacturing Co., at the space of the  
Pennsylvania Steel Co.  
Adams & Westlake Co.  
American Car Seat Co.  
Curtain Supply Co.  
E. L. Dunning & Co.  
Dallert & Co.  
Electric Storage Battery Co.  
Garl Electric Co.  
Globe Ticket Co.  
Gould Storage Battery Co.  
Hale & Kilburn Manufacturing Co.  
Kohls Belt Conveying Co.  
Stuart-Howland Co.  
American Circular Loom Co.  
Fowler & Robert Manufacturing Co.

## BUREAU OF INFORMATION.

As has been the practice since the Boston convention in 1898, a Bureau of Information where delegates can have all their questions promptly answered will be established at the convention hall; this will be located in the office of the secretary of the association. The New York Telephone Exchange Co. and the American Telephone & Telegraph Co. will have offices in the first balcony, at the entrance, to convention hall.

Two street cars equipped with motors, that were being shipped to Newport News on board the Str. Jefferson of the Old Dominion line, broke loose from their "moorings" on the freight deck when the steamer listed suddenly on turning into the Capes, shot overboard and went to the bottom. An effort will be made to raise them.



## MANHATTAN "L" ROAD HEATERS.

In a previous issue we have referred to the contract for the supply of electric heaters for the Manhattan Railway Co., of New York, which covers heaters for 1,200 cars, and the accompanying illustrations show the general style in which they will be made. While they are constructed on the same principle employed in all

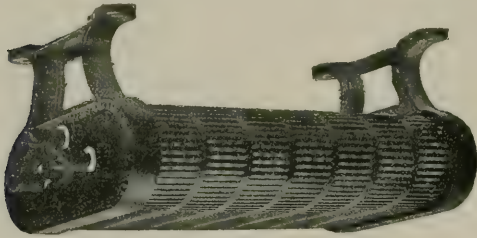


FIG. 1.

the Consolidated Car Heating Co.'s heaters, known as the spiral coil construction, and have the same resistance wire which has been tested in nine consecutive seasons' use, their arrangement has been modified to meet the requirements of the Manhattan roads.

The chief difference in construction between this heater and others furnished by this company lies in the fact that three entirely independent coils are used in each of these heaters, while in the previous construction only two coils have been used. Fig. 2 dis-

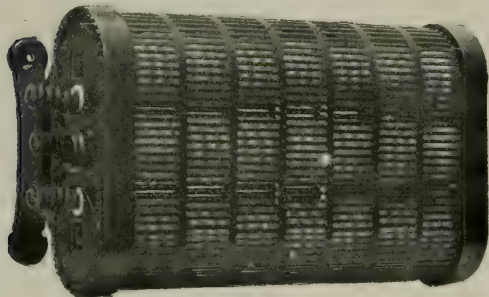


FIG. 2.

tinctly shows this feature of the construction. The heaters (18 per car) are to be suspended beneath the seats about half way between the seat and the floor, as shown in Fig. 1, and the heat is to be still further distributed by means of deflectors arranged above the heaters, which are not shown.

It is an interesting fact in connection with this order that over 1,350 miles of wire will be required in the construction of the heating coils.

## SHALL WE DO IT OURSELVES?

By George E. Fisher, President Chase Construction Co.

You may or may not have experienced the ups and downs and ins and outs of financing a prospective railroad, or, rather, selling the bonds in advance of the construction. This has been done and may be done again, yet we wish to assure you that it is an extremely interesting experience, and conditions must be unusually favorable to meet with ultimate success.

If your proposition is a good one, and this can be readily determined, by all means, put your own money into it and keep the property under your own control. The flotation of bonds upon a railroad "in operation" is comparatively simple; whereas, the sale of "construction bonds" is beset with financial pitfalls that are dangerous alike for the promoter and bond buyer.

The latter must necessarily protect himself against mismanagement and the improper diversion of funds, and the relationship

of the former is very different indeed, when the road is finally completed.

Interurban railroads have come to stay, and open a field for investment that is not excelled by any other industry, yet many excellent propositions are ruined by an excessive bond issue.

In regard to the question of engineering and contracting with one company; engineering is a business of itself, and you can well afford to eliminate any financial interest on the part of your engineer in any contract you may make. We do not claim, broadly, that it is not perfectly legitimate for companies to undertake both the engineering and construction, especially if they finance the deal themselves. We do claim, however, that where proper financial arrangements are made by the purchasers themselves, that the latter cannot afford to entertain a proposition from a company on these lines. One function of an engineer is to scientifically determine all physical problems, such as the roadbed construction, if a railroad; design the power house, general character of equipment, etc., and recommend for adoption that which will produce the very best results with the least expenditure of money. He must necessarily determine all questions of this character that naturally arise between the purchaser and the contractor. In what position is the purchaser placed if his engineer is the contractor?

The other way of doing the work is to secure the services of competent, disinterested mechanical and electrical engineers by whom every feature entering into the cost of construction will be carefully considered in advance. Carefully drawn specifications should be prepared by the engineers, covering and separating the various divisions of the work. Then bids are received from contractors whose reputation and experience can readily be determined.

Under the contract system it is possible to determine exactly what a specified piece of work will cost whether it be the power house and equipment, the roadbed, overhead work or other work requiring the assembling of raw materials, machinery, etc., to produce certain results.

A good business man should always want to know the final cost and will not "go it blind" unless misled or deceived with the idea that the contractor's profit can be saved. This is bad advice, and why? The experienced contractor has many advantages for doing work over a railway company having a road to construct. The contractor has an equipment of tools and paraphernalia that no company could afford to buy for a single piece of work. He also has an organized force of experienced men and a system that requires years to establish. If these men are working for a permanent construction company, with a reputation, they learn by experience that work must be done right, and not temporarily.

Another important advantage of a contractor over a company attempting to do the work itself is the question of superintendence. The work of the successful contractor is invariably superintended by some one directly interested in the results, having a thorough knowledge of the business, technically and otherwise, and particularly adapted to the requirements of such a position.

Many men are thoroughly competent from a technical standpoint yet lack the ability, experience and organizing qualifications to progress systematically with the work and produce even fair results for their employers.

[Extracts from a pamphlet recently published by the Chase Construction Co., of Detroit, Mich.]

## NEW YORK'S FIRST MINING EXPOSITION.

This exposition will open December 2d at the Grand Central Palace and will continue for 15 days. Manager Allen S. Williams, whose office is in the Park Row Building, states that he is already assured of a large number of exhibitors.

The general plan of the exhibition will be manufacturing and commercial exhibits of tools, machinery and supplies, exhibits of ores, oils and other minerals, concentrates, metals and non-metallic products, maps and illustrations of mineral resources of regions by railway companies, scientific displays of minerals by states, mining bureaus, schools and individual collectors, and pictorial and various advertising exhibits of ores and products by corporations engaged in all mineral industries, including mineral springs. Exhibits representing the petroleum industry will be given due prominence.

### CARS FOR SOUTHPORT, ENGLAND.

Our illustrations show exterior and interior views of one of the electric cars recently built for the Southport Tramways Co., of Southport, England, by the Brush Electrical Engineering Co., Ltd. These cars are of the 4-wheel top-seat type with reversed staircases, and screen in front to protect the driver, and seat 22 inside



BRUSH CAR FOR SOUTHPORT, ENGLAND.

and 34 outside. They are handsomely fitted up inside with mill-board roof, painted white and picked out in gold. Swing ventilators are fixed at the sides over the windows and cushion seats and roller blinds are provided.

The motors used are of a special kind and have been designed to the requirements of Mr. Raworth (the chairman of the Tramway company) to meet the case of a tramcar running on a perfectly flat line and are fitted with roller bearings. It is confidently expected that the combination of the roller bearings with the special motors



INTERIOR OF CAR.

will reduce the amount of energy per car-mile to something like one-half the amount that is used on other lines.

The controllers are of the new parallel type with an electrical emergency stop. By means of this brake the car can be pulled up in less than one-half of its length. A further specialty is the construction of the trolley heads. These are made of aluminium, which, being so much lighter than gun-metal allows the trolley

poles to be of more slender dimensions and enables surer contact to be made with the trolley wire.

The trucks are of the standard four-wheeled pattern adopted by the Brush company, which is proud of the fact that it now produces trucks to fill every possible requirement of tramways, light railways and heavy railways, of a design and excellence second to none, and that it is the only firm in Great Britain which makes complete electric cars.

### SOUTHERN MICHIGAN TRACTION CO.

The Southern Michigan Traction Co. has been incorporated under the laws of Michigan and engineers are now in the field making surveys for an electric road from Kalamazoo to Grand Rapids, with a branch to Otsego. Mr. F. H. Ginn and Mr. Geo. T. Bishop of Cleveland are at the head of the project and E. P. Roberts & Co. are chief engineers.

It is proposed to build a road of the most modern character and provide for both passenger and freight service. The passenger cars will be larger than those ordinarily in use on interurban roads, and will be equipped with four 75 h. p. motors and will operate at a high rate of speed. Motor cars will also be provided for freight and will act as electric locomotives for hauling box freight cars. The road will be constructed on private right-of-way outside of the towns and for a considerable distance in the corporate limits of some of the towns, and the grades and alignment will be such as to admit of high speed service.

### SOME GOOD ADVERTISING MATTER.

The Elektrizitaets Actien Gesellschaft, formerly W. Lahmeyer & Co., Frankfort on Main, Germany, publishes a number of trade catalogs which are notable examples of the highest class of advertising literature. The catalogs are attractive not only on account of the well arranged contents and excellent illustrations but also for the fine typographical work, heavy paper and handsome covers. One of these which describes the range of work of the company gives brief but interesting accounts of a number of installations made by the company in different places in which appear its large variety of continuous, alternating and three-phase current dynamos, all kinds of motors for belt driving and direct coupling, transformers of any size and tension, etc.

Another of these catalogs describes and illustrates the company's manufacturing plant at Frankfort on Main which was put into operation in 1892. The magnitude of these works are better told by the excellent photographs of all the departments than by the brief description by which they are prefaced. Two other catalogs of the same style of excellence are devoted to illustrations and short descriptions of the municipal electrical works in Bockenheim and Weisbaden and of the central station of the Homburg Electricity Works and the Homburg-Saarlburg mountain railroad.

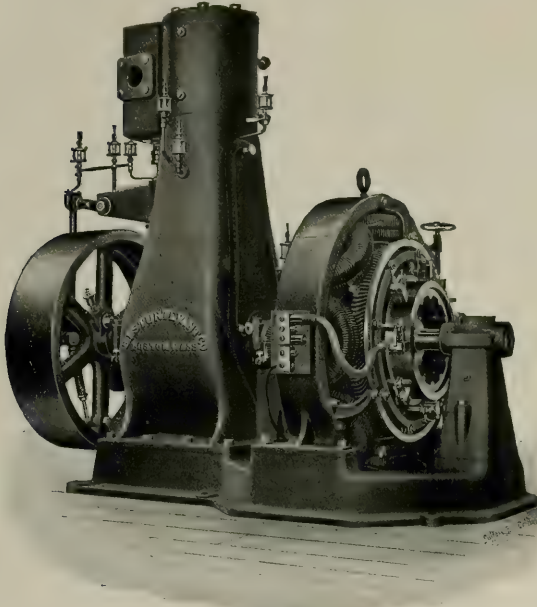
### MICROPHONE BURGLAR ALARM.

Burglar alarms and other electrical devices with the improved locks of today make it very difficult to enter a vault by the usual entrance, and to enter a vault in any other way except by the door requires a large amount of patient work which must be done at night and must be accompanied with more or less noise. While this sound may not be discernable to the human ear it cannot escape the microphone, which is capable of magnifying and transmitting the most delicate sound. The Ericsson Telephone Co., 296 Broadway, New York City, makes a microphone attachment for this purpose, so that the drilling of a wall or floor may be easily detected by the watchman by listening at the telephone receiver at intervals during the night.

The Ericsson transmitter is admirably adapted for this purpose on account of its extreme sensitiveness and immunity from packing. Many transmitters will work when used frequently, as this serves to agitate the carbon granules, but very few will work after having stood a long time in absolute stillness without first being shaken slightly. This gives the Ericsson a great advantage for this class of work, and combined with the receiver and other apparatus of equal merit makes an equipment that can be thoroughly relied upon.

### A NEW STURTEVANT GENERATING SET.

In the accompanying illustration is shown a new design of generating set built by the B. F. Sturtevant Co., of Boston, Mass. The engine is the company's single cylinder vertical type of very substantial construction. The frame and cylinder are cast and bored in one piece, the design being such as to combine the maximum of rigidity and accessibility. The valve is of the balanced-piston type and receives its motion through a rocker, from a pin on the governor weight, which is so pivoted to the wheel that a change in the position of the weight causes the pin to swing across the shaft. This movement changes the travel of the valve and regulates the points of cut-off and compression, the former between zero and seven-eighths of the stroke. The perfect balance of the valve renders such action both rapid and effective. High pressure engines of this type are built in seven sizes and designed for 90



STURTEVANT GENERATING SET.

lb. boiler pressure. A similar line of four sizes of low pressure engines, designed for 40 lb. pressure, is also built.

The generator is of the 8-pole type primarily designed by the Sturtevant company as a motor for direct connection to centrifugal fans. Its large diameter and relatively low speed particularly adapts this design for attachment to an engine of this type. The entire arrangement is rendered very compact, the length in the direction of the shaft being reduced to a minimum. With the exception of the smallest size, wrought iron field cores are used in these generators. They are secured to the frame by bolts and are readily detachable, thus rendering the removal of the field coils a very simple matter. In the smallest size the field cores are cast solid to the frame and the pole shoes only are removable.

The armature is usually of the barrel wound toothed, hollow drum type, the lamination of special steel plate being mounted on a cast iron spider, the hub of which is extended to support the commutator. This makes the armature and commutator self contained and specially adapted for direct connection. These generators have shown that after a full load run for a sufficient length of time to attain the maximum temperature the latter rarely exceeds 30° on the hottest part. The open frame and ample ventilation serves to keep the temperature at a minimum.

The Cincinnati Traction Co. will discontinue the practice of giving letters of recommendation to employees who leave the service.

### CANADIAN NOTES.

The Ottawa Electric Co. proposes building a new distributing station on the canal reserve, near the site of the new driveway.

The Halifax Electric Tramway Co. has been awarded the contract for lighting the city of Halifax for a period of five years.

There is talk of building a line of electric railway between Cornwall and Trenton the necessary capital, it is said, being available.

A company has been formed to install an electric power plant at Whitehorse, B. C. J. Wylie, A. G. Smith and John Boyd are the chief promoters.

Work has been commenced on the electric line between Three Rivers and Shawanigan Falls, the first steel having been laid on St. Roch St. September 3d.

Mr. George R. Walkem, formerly superintendent of the British Columbia Electric Ry., has been appointed manager of the Vancouver Engineering Works.

The Montreal Street Railway Co. is making extensive alterations and additions at its William St. power house. Two 1,600-h. p. units are now being installed.

The plans for the construction of the Fort Erie Ferry & Electric Railway Co. lines along the west side of the Niagara River from Chippewa to Fort Erie, have been submitted to the Minister of Public Works for approval.

The Toronto Ry. is to build a line along Arthur St. through to the west end of the city. This will make a new cross town route, and will, it is expected, relieve the congested traffic on the Queen St. and College St. lines.

The contract for building the new Schomberg-Aurora Electric Ry. from Richmond Hill to Schomberg, north of Toronto, has been let to MacKenzie & Mann. This is another link in the radial railways which are being built out from Toronto.

The Cascade (B. C.) Power Co. has commenced erecting its lines for the transmission of power between Cascades and Phoenix mining camp. The dam at the head of the falls on Kettle River is nearing completion, but the power house has not yet been erected.

The Canadian Niagara Power Co. has appointed Cecil B. Smith, formerly assistant city engineer at Toronto, to be resident engineer in charge of new work, and A. Munroe Grier, of Toronto, has been appointed resident solicitor for the company. The shaft for the new power plant is now down about 90 ft.

The annual picnic of the employees of the Montreal Street Railway Co. was held in Sohmer Park on September 2d. This was their seventh annual celebration and was very largely attended. The affair was most enjoyable and a huge success financially. The proceeds are devoted to the sick fund of the employees' organization.

The car which will carry the Duke of Cornwall and York and the royal party from Quebec to Montmorency Falls will be one of the most magnificent cars ever constructed, and probably the first electric car ever constructed for royalty. The car is to be finished in the royal colors, and on either side will be carved the royal arms.

Negotiations which have been for a long time pending between the Montreal Street Ry. and the town of Westmount may result in a line being built along the upper level of the mountain side. The company have agreed to construct the line if the town will acquire a certain tract of land and open a public thoroughfare through same.



Arrangements are now under way looking to the construction of an electric railway in Stratford with branch lines running through from Woodstock to Goderich, and connecting there with the Canadian Pacific Ry. G. G. McPherson, of Stratford, is largely interested and John A. Foster is representing the Cleveland capitalists who are behind the project.

The new generator in the power house at Woodstock, Ont., was tampered with sometime on September 1st, and as a result there were no cars running between Woodstock and Ingersoll during the early part of the week. Examination disclosed the fact that some one had entered the power house and deliberately driven several long nails into the generator.

Some time ago the Privy Council decided that the switches and sidings of the Toronto Ry. were chargeable as mileage by the city the same as ordinary track, and the mayor of Ottawa has been endeavoring to have the local company assessed on the same basis. A decision has been given against him, on the grounds that the charters of the two roads are entirely different.

The Everett-Moore syndicate of Cleveland has purchased the lines of the Sandwich, Windsor & Amherstburgh Electric Railway Co. The amount paid has not been made public, but with its 15 miles of track, power houses and equipment, the system was an important one. The Windsor line will now become part of the Detroit United Ry.

The Keewatin (Ont.) Power Co. is asking for tenders for the development of a water power at the outlet of the Lake of the Woods, it being the announced intention of installing a plant capable of developing 6,000 h. p., most of which, it is said, will be transmitted to Winnipeg. The company proposes having a double line in order to guard against possible break-downs.

A Montreal syndicate, comprising S. H. Ewing, A. F. Gault, S. Finley, and Hanson Bros., has secured control of and amalgamated the Hull Electric Co., the Pontiac & Pacific Junction Ry., the Ottawa Northern & Western Ry. and the Inter-Provincial Bridge Co., at a cost of \$5,000,000. The company will be under one management and will be known as the Ottawa, Northern & Western Railway Co. The price for the Hull Electric Railway was \$1,000,000.

An extension of the Park & Island Ry. system to Ste. Annes de Bellevue, and so on around the west end of the island of Montreal, is being talked of. The lake shore is now practically one long village, and there would be much traffic for a continuation of the Lachine line to Ste. Annes and Senneville, joining on to the Cartierville route. It is improbable that the line will be built at once, as the street railway company is occupied with the new Beaver Hall Hill line and the new Amherst circuit.

Notice has been given that an application will be made at the next session of the Provincial Parliament of Ontario for a charter to build an electric railroad from Goderich, on Lake Huron, to Dunlop, Lucknow, Wingham, Brussels, Seaforth, and through to Bayfield, taking in several smaller places and making a county belt line. Several branch lines are contemplated to connect with various other roads, both steam and electric, and municipalities are being asked for right of way. There is plenty of capital behind the project. M. C. Cameron, D. McGillicuddy and J. T. Goldthorpe, of Goderich, Ont., are actively interested in the enterprise.

Another employe of the Montreal Street Ry. has accepted a position with the Compagnie Generale du Traction, of Paris, France. This time it is Mr. Bessette, for many years connected with the street department of the Montreal road who goes to Paris to fill the position of storekeeper for the French company. A dinner was tendered Mr. Bessette by his fellow employes at the Boni de l'Isle Hotel, and he was presented with an address and a well-lined purse. Mr. Trudeau, whose acceptance of the position of superintendent of the Bordeaux system was announced last month,



THE REMODELED GRAND CENTRAL DEPOT, 42D ST. AND MADISON AVE.

This building is the only steam railroad passenger station on Manhattan Island, and it is the terminus of the New York Central, the New York, New Haven & Hartford and the other Vanderbilt roads. The building has been completely reconstructed and is now considered the finest and most advantageously arranged passenger station in the country.

and who was also the recipient of a handsome souvenir from the men whom he has handled so well, shared with Mr. Bessette the honors of the evening.

The observation cars, the latest innovation in Quebec for the traveling public, and which the Quebec Railway Co. has been running on their line between Quebec and Montmorenci Falls, are now a thing of the past, the last car having made its final appearance August 31st. The idea was a success as far as continued, but the opposition of local hackmen and livery stable owners on the ground that it was interfering with their business, was very strong, and rather than cause trouble the company decided to withdraw the cars.

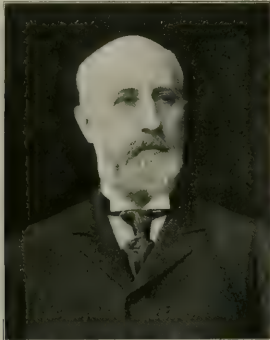
## ELASTIC SELF-LOCKING NUTS.

The National Elastic Nut Co., of Milwaukee, Wis., has published a list of testimonials from a number of leading manufacturing concerns which highly endorse the elastic self-locking steel nut for all purposes where nuts are liable to work loose from jarring. This quality of locking itself perfectly upon the bolt without the aid of any extraneous nut-locking device is due to the peculiar manner in which the nuts are manufactured. They are made out of blanks punched from spring steel and having dove-tailed ends. These blanks are bent in the form of a circle with the grain of the metal running around the bolt and are then pressed into the shape of a finished nut leaving a seam where the ends of the blank come together. They are then tapped with a scant sized tap which causes the seam in the nut to open slightly when forced onto the bolt, and it is this springing open and the consequent firm clasp of the nut around the bolt which locks it perfectly in any position in which it is left. These nuts have stood a three years' test under the most unfavorable conditions. The company has also installed a complete bolt and nut factory and supplies the elastic nuts at the same price as the ordinary kind.

The German Embassy in Paris recently protested to the municipal council of that city against the construction of a projected street railway in the Rue de Lille, on the grounds that this thoroughfare, though one of the most fashionable in Paris, is too narrow to accommodate an electric line, which would, moreover, disturb the morning slumbers of the German diplomats. The Paris aldermen at once ordered a change in the route of the proposed street railway so that it should not traverse the Rue de Lille.

## New Works of the Peckham Manufacturing Co.

The consumers of any class of goods or the user of a piece of apparatus is not necessarily particularly interested in each minute detail in the process of making them. But the conservative and careful buyer is interested in knowing in a general way where his goods come from and what care has been taken in their manufacture to insure reliable workmanship and freedom from flaws in materials. Slip-shop methods in making, mean unsatisfactory and unreliable goods. On the other hand the name plate of a house which has built its reputation on the wearing qualities of its products, is a guarantee of excellence, just as the ancestry and



E. PECKHAM.

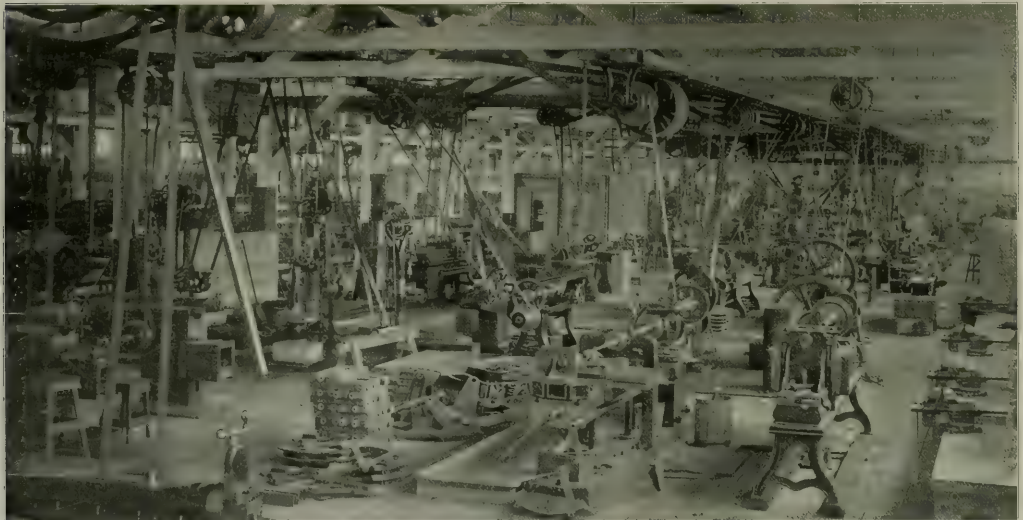
birthplace of a man are some indication of his characteristics. In no other line of industry are careful inspection and reliable workmanship more essential than in the making of street railway supplies, where a crack or blow hole may mean a bad accident and possible loss of life.

In the works of the Peckham Manufacturing Co. at Kingston,

Mr. E. Peckham, president of the Peckham company, is one of the early pioneers in truck building. Late in the 80's when a street railway truck was practically unknown and car bodies were carried on two independent axles set directly into the main side sills, Mr. Peckham was engaged in the car-wheel business. One day in 1888, when the science of electric railroading had hardly passed beyond the experimental stages, Mr. Frank J. Sprague, in conversation with Mr. Peckham, spoke of the necessity of developing a good truck frame, capable of properly supporting the car body and motors, if the experiments with electric traction were to be pushed to success. Mr. Peckham made further inquiries to determine just what was required, and in association with Mr. George L. Fowler, at once undertook to develop a suitable electric railway truck. He opened a small shop at Kingston, N. Y., on the Hudson River, where after a number of efforts he finally turned out a truck that was believed to embody the essential features of success. His design met with immediate favor with railway engineers, and substantial recognition soon followed in the shape of large orders, one of the earliest contracts being for 1,000 trucks for the Brooklyn Heights Railroad Co. It is of interest to add that a number of second hand car bodies mounted on the identical trucks furnished in this early order were recently sold for service on a medium-sized system, it having been determined that there were still several years of wear in the truck frames.

Mr. Peckham began building a regular system of trucks to meet the varying requirements and the constantly changing demands of city and interurban roads. The shop facilities were extended as the business grew until last year, when it was decided to erect an entirely new plant, laid out with special reference to the needs of each department in its relations to the other departments.

To this end an extensive piece of property at the junction of the Ulster & Delaware and the West Shore R. R. in Kingston, was secured and here during the last fall and winter were erected a substantial brick machine shop, 120x314 ft., a blacksmith shop, 70x225 ft., a power house, 46x76 ft., stock building 40x250 ft., and a two-story office building, 50x50 ft.; other buildings are contemplated.



MACHINE SHOP.

N. Y., this necessity is fully recognized and the arrangements for shop supervision and inspection combined with expert skill in designing, are responsible for the present wide spread use of Peckham trucks.

Kingston is but 89 miles from New York and 53 miles from Albany, and as there are five spur tracks from the West Shore main line entering the yards, the receiving and shipping facilities to and from the works are of the best.



The main machine shop in many respects is a model institution, the arrangements having been planned with more skill than is commonly found in the usual run of machine shops. The centre aisle, running the entire length of the building, 314 ft., is apportioned to the erecting department. It has two raised tracks on which the assembling of trucks is done, and a 50-ton electric crane overhead for handling the heavy materials.

On either side of the erecting shop extend similar aisles devoted

to the arrangement for keeping this stock that constitutes one of the noteworthy features. Certain of the machines in the shops will of course work on certain class of stock, and care is taken in filling the bins to keep each kind of stock as near as possible to the tool that is to use it. When a car loaded with material arrives, it is switched to the point on the unloading platform nearest the bin that is to receive the goods, and they are unloaded from the car directly into their apportioned space. When any



FRONT VIEW OF MAIN BUILDING - PECKHAM MANUFACTURING CO.

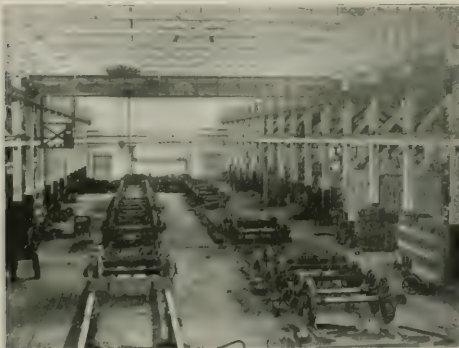
to the various divisions of the machine shop, with a full equipment of the latest patterns of lathes, drills, punches, shears, key-seating machines, etc., for carrying on the work of the wheel and axle departments, finishing work on the steel side frames and other parts, riveting, chipping, and all the thousand and one detail processes that enter into the working of a large establishment like this. The machine tools are operated by belts from ceiling shafting, driven by specially wound motors, taking 500-volt current from the company's own power house in another corner of the grounds. The shafting is divided into sections so that if desired any one section can be used without starting the others. Arrangements are such that current can be taken from the local electric railway circuit through a meter, should it ever be necessary to shut down the company plant. Running the length of the building, just under the roof, are compressed air pipes, with branches and turn cocks at frequent intervals, to which can be attached hose for the many portable pneumatic tools employed in the work of finishing and assembling. The air pipes are kept under 90-lb. pressure by an Ingersoll-Sargent air compressor in the power house. Still further away from the centre and extending the length of the machine

machinist wants a part he has to step but a few feet to get it from its proper bin. This involves absolutely no unnecessary handling of stock and reduces the carrying to a minimum.

The divisions of the machine shop are arranged in sequence. The various truck parts pass from machine to machine as the work progresses until finally all the parts of one truck meet at one point on the erecting floor. Near the centre of the building is a



BLACKSMITH SHOP.



ERECTING SHOP.

shops are the storage bins, one on each side, and separated by a partition from the shops. These bins open onto unloading platform at the side of our tracks from the West Shore R. R.

In the bins are kept the rough tools, castings, small parts and other supplies that are purchased in the rough from other cities.

small room where are kept the drill points, lathe and other hand tools needed in the shops. These are given out to the men on the brass check system.

In the blacksmith shop are 14 forges and oil and coke furnace, four hammers, several heavy bulldozers for shaping the steel end frames, motor bars, equalizer bars, etc., and an 800-lb. trip hammer worked by compressed air. All smoke and gases from the furnaces and forges enter down-draft flues and pass to the main stack, so that the blacksmith room is entirely free from soot and dirt. There is also a heavy Ajax forging and upsetting machine for turning out long bolts, bolster links, brake hanger links, etc.

The power house for the works is a separate brick building with steel stack. It contains two 140-h. p. simple Corliss engines, driving a jack shaft, to which are belted two Thompson-Houston 500-volt railway generators, of 90-kw. and 75 kw. capacity for furnishing power, and one small machine for lighting the entire plant. There is also a small pump for pumping crude petroleum from a storage tank buried in the yard to the oil furnaces in the blacksmith shop. In the power station is also the heating apparatus for warming all the buildings. The exhaust steam from the engine passes through



a Berryman feed-water heater and then through a second heater from which the hot water flows to the heating pipes in the shops, storeroom and offices. The engine takes steam from two 250-h. p. boilers.

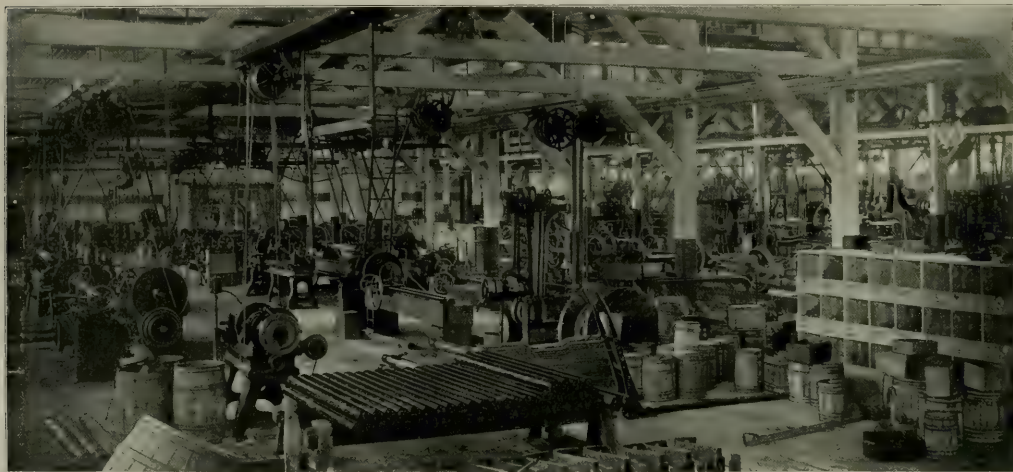
Next to the power house is the snow-plow department, where extensive preparations are under way for meeting the demand for the Peckham rotary snow plows, which demand already bids fair to exceed that of any previous year.

The Price friction-brake department, which occupies one corner of the main machine shop, is crowded with work. Mr. W. G. Price, the company's engineer and assistant manager, has perfected a new hydraulic friction brake, so designed as to do away entirely with the necessity of readjusting the friction clutches of the Price brake to take up the wear. The improved pattern also has an oil storage tank, which will automatically lubricate the surfaces for three or four months without attention of any kind. Mr. Price, who has developed a number of the recent improved trucks, is an engineer of wide experience and ability, thoroughly familiar with the requirements of electric railroad service.

The shops are in charge of Mr. B. R. Stare, with the title of general superintendent. Mr. Stare, before coming to Kingston,

## THE SYSTEM OF THE HUDSON VALLEY CO.

The Hudson Valley Railroad Co. in August effected the consolidation of the following companies in Central New York: the Stillwater & Mechanicsville Street Railway Co.; the Glens Falls, Sandy Hill & Fort Edward Street Railroad Co.; the Greenwich & Schuylerville Electric Railroad; the Warren County Railroad Co.; the Saratoga Traction Co.; and the Saratoga Northern Ry. The capital stock of the new company is \$2,600,000, and the following directors have been chosen: Edwin Langdon, president of the Central National Bank and Merchants' Trust Co., New York City; Joseph A. Powers, Troy; Hon. Addison B. Colvin, president of the Glens Falls Trust Co., Glens Falls; Hon. E. C. Knight, comptroller of the State of New York, Buffalo; W. W. Worden, Saratoga Springs; J. L. Hees, president of the Fonda, Johnstown & Cloversville R. R., Fonda; G. T. Rogers, president of the Binghamton Railroad Co.; Thomas O'Connor, Waterford; Hon. George E. Green, Binghamton; C. E. Brisbin, president of the National Bank of Schuylerville; Hon. Lewis W. Emerson, Warrensburg; W. N. Sprague, Greenwich; Thomas S. Coolidge, New York City;



WHEEL AND AXLE DEPARTMENT—PECKHAM MANUFACTURING CO.

had several years experience in active railroad work. The company pursues the policy of treating its shop employees with the greatest consideration and liberality, believing that by so doing the establishment is able to turn out superior work. All the men participate in the annual earnings, receiving a dividend on their total wages for the year, equal to the percentage paid to the common stockholders. There is also a premium system by which each man is paid a sum of money for all work above a stated amount that he turns out in a week. That is, the average output of all the men on each class of work is determined and any employee who turns out more than the average is paid accordingly.

The Peckham system of trucks has kept fully abreast of developments in the street railway field, heavier and stronger patterns being constantly brought out to meet the harder conditions of high speeds and heavier loads, and the company is fully able to guarantee a satisfactory truck for any conditions however severe. The company's New York office is in the Havemeyer Bldg., 26 Cortlandt St., Manhattan.

August 12th, the safe in the office of the Atlantic Coast Electric Railway Co., at Allenhurst, N. J., was robbed of \$2,000. The two watchmen on guard were held up at an early hour in the morning by six masked men who gagged and bound them, afterward making good their escape with the money.

Peter McCarthy, Troy; and John W. McNamara, general manager of the United Traction Co., Albany.

The officers elected are: Hon. Addison B. Colvin, president; Hon. George E. Green, vice-president; Thomas O'Connor, secretary, and Frank L. Cowles, treasurer. The following appointments have also been made: Charles T. Ames, supervisor of freight department; Frank W. Thomas, master mechanic; H. G. Sinerer, superintendent of lines; J. W. Harris, roadmaster, and J. H. Armstrong, chief engineer. W. C. Colburn, private secretary to Mr. Powers, will continue in charge of the purchasing department for the consolidated system.

The roads consolidated aggregate 100 miles of track. They were formerly included in what was known as the Powers-Colvin traction system, and it is stated that two-thirds or more of the stock of the constituent companies is owned by Mr. Powers and Mr. Colvin. The Hudson Valley Ry., as the consolidated system is called, extends from Troy and Albany to Waterford, on the south, and to Warrensburg, on the north. Extensions are projected which will require the construction of 101 miles of track, a part of which is to be in operation by the end of the present year.

Mr. Powers and Mr. Colvin may be said to be the projectors and organizers of the Hudson Valley system. Mr. Powers is a native of Massachusetts, having been born at Lansingburgh in 1858. He graduated from the Rensselaer Polytechnic Institute with the de-

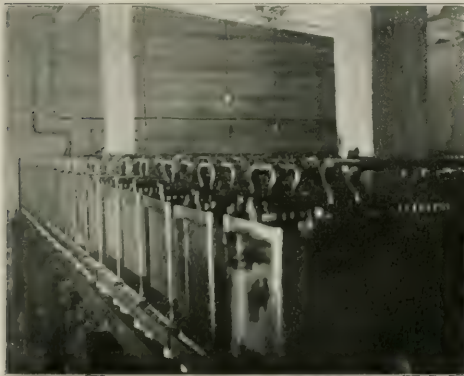
gree of civil engineer, in the class of 1880, and his first position was assistant to the consulting engineer of the New York, Lackawanna & Western R. R. Several years later he returned to Lansingburgh and engaged in the manufacture of dynamos, but abandoned this business to accept the appointment of bridge engineer for the Delaware & Hudson R. R. Again engaging in electrical engineering, he secured the contract for lighting the city of Troy and built the principal lighting plant in that city. In 1891 he built the pioneer electric line in the upper Hudson valley. This was the five-mile line connecting Glens Falls and Fort Edward. The line from Stillwater to Mechanicville was built by him in 1894 and extended to Waterford in 1897. Mr. Powers entered into partnership with Mr. Colvin in 1898 and together they built the Greenwich-Schuylerville line.

Hon. Addison B. Colvin, president of the Hudson Valley company, is a native and a resident of Glens Falls. At the age of 18 he became the publisher of the Glens Falls Daily Times, and was then the youngest editor in the United States. He was the organizer and first vice president of the Commercial Union Telegraph Co., now the Postal company, and one of the organizers of the United Press Association. Mr. Colvin was interested in building the first street railway in Glens Falls, and the establishment of the People's National Bank at Sandy Hill. He has also followed a distinguished political career, serving two terms, from January 1, 1894, as treasurer of the State of New York.

### STORAGE BATTERY AT LANSING, MICH.

A storage battery plant which has recently been installed by the Gould Storage Battery Co., for the Lansing (Mich.) Street Railway Co., shows forcibly the advantages of using a battery for regulating work in street railway service.

Up to the time the plant was installed, the Lansing Street Railway Co. was operating about 7 miles of single track road with three branch lines, one 1½ miles in length, another 3 miles and the third three-quarters of a mile. From eight to twelve cars com-



GOULD STORAGE BATTERY—LANSING STREET RY.

posed the equipment. The generators used on this line were two of 60-kw. capacity each, and it was found that although the average load was equal to the capacity of one machine the heavy drafts of current for a few moments exceeded the capacity of both. It was therefore very apparent that as the two machines must constantly be in service, the efficiency was very low. It was decided to install a battery of 240 cells which had a normal capacity for eight hours of 40 amperes, but which was able to discharge at 10 times this amount or 400 amperes for a period of 15 minutes. This would be equivalent to 200 kw. for a short period.

The load curves which are reproduced herewith show in the first section a generator load without the battery, which at the highest possible point require the full current from both the 60-kw.

units, and in the second section the generator load after the battery had been installed. Here the average current is something below the capacity of one machine, the extra current generated being used to charge the battery so that when the call was made on it for the extra work it could supply the necessary current. The battery was floated across the line at the point indicated on dia-

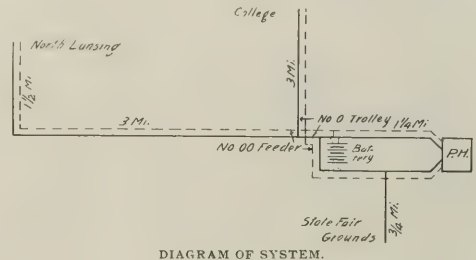
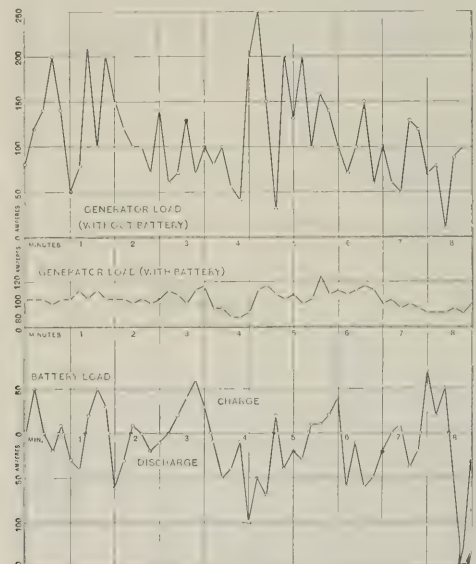


DIAGRAM OF SYSTEM.

gram about 1½ miles from the power house, with no regulating equipment whatever.

Shortly after the installation of the battery an accident happened to the generator sets and the battery carried the full load for two hours. The plant is now run with one unit at the highest possible point of efficiency, and after some months of use it has been



LOAD CURVES OF LANSING POWER STATION.

found that the operating expenses have been materially reduced.

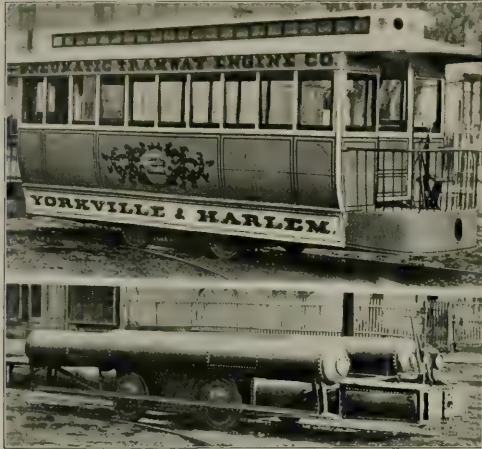
The capacity of the Gould storage battery to discharge at abnormally high rates for a short period of time is one of its most prominent features, and is accounted for by the fact that the active material is distributed in a very thin layer over a very large surface.

It is stated that the Consolidated Traction Co. of Pittsburg, will discontinue amusement features at its Duquesne Garden next season. The garden may be sold or rented, in which case the company will build an addition to its present car house in Fifth Ave., otherwise the garden will be equipped to serve the purpose of a new car house.



## COMPRESSED AIR TRACTION IN NEW YORK CITY.

In 1870 a compressed air motor of what was then and is now known as the Hardie motor type, was given a trial upon the tracks of the Second Avenue Railroad Co., New York. This motor was built upon approved locomotive lines, having outside connections, and being driven by means of main and connecting rods directly



COMPRESSED AIR MOTOR—1879.

from the cylinders to crank pins on the outsides of the wheels. At that time high pressures were practically unknown, and this motor had only a pressure in its storage of from three to four hundred pounds, using a working pressure of about 100 lb. per sq. in. The air was used in the cylinder without reheating. This motor was used for some time and good results were looked for from it, but, like many another good thing, it was allowed to fall by the wayside. We have been fortunate to obtain an old

ground trolley, it would have adopted compressed air as its chief motive power.

In the two motors on 125th St. a great many changes and improvements were naturally made over the one tried in 1879, one of the most radical being the storing of air at a pressure of from 2,000 to 2,500 per sq. in., a pressure made practicable by using seamless steel cylinders. These steel cylinders are tested to and guaranteed to stand a pressure of not less than 4,500 lb. per sq. in., and in tests which have been made for that purpose, it has been found that a pressure of about 6,000 lb. is necessary to burst them. It was found that the bursting of them does not result in an explosion and the blowing of the tube to fragments but merely in the rupture of the cylinder, causing only a small opening through which the air rapidly escapes. Another radical change was the introduction of a reheater for the purpose of expanding the air to, or nearly to, its original volume. By reheating the air, at a very small cost, it is found that the efficiency of the air motor is greatly increased.

While the two Hardie cars were performing a regular service on 125th St., the Metropolitan Traction Co. was making tests on the Lenox Ave. line with what is known as the Hoadley-Knight motor. This motor was designed and constructed to conform as nearly as possible to standard electric methods, and consisted of a standard electric truck, with a small engine geared to the axle of each. This system followed the Hardie system in that the air was stored at a high pressure, in fact, in some instances, a much higher pressure was used, and also in using a reheater, although of a different type. It should be mentioned in this connection that in both systems before the air is reheated and expanded, it passes through a regulating valve which reduces the high pressure to the constant working pressure. In June, 1899, the 28th and 29th St. cross-town line was equipped with 20 of the Hoadley-Knight compressed air motor cars, which were operated on that line with varying success until June, 1900, when they were all withdrawn from service.

In the meantime, however, the two cars which had been operated on 125th St., together with another of the same type, had been taken to Chicago, commencing regular service on the night of May 30th, 1899. These cars perform what is known as the "owl" service on the North Clark St. line in that city, leaving the barns when the cable stops, and are in use at the present time.

In September, 1900, the Metropolitan Street Railway Co. re-equipped the 28th and 29th St. cross-town line with 20 air motors of the Hardie type. In designing and building these motors, it



TRUCK AND STORAGE TUBES OF COMPRESSED AIR MOTOR—1901.

picture of this car, giving two views, one of the car itself, and another showing the method of storage and its mechanism.

On Aug. 2, 1896, two compressed air cars commenced running on the 125th St. line of the Third Avenue Railroad Co. These cars were also of the Hardie type, being direct and outside connected, and ran in between the cable cars then in use on that line. They were in regular service on that line until Aug. 2, 1897, when, owing to the change of motive power from cable to underground electricity, they were taken off. During that time, the two cars ran 32,195 miles, and carried 188,854 passengers without an accident of any kind. It is probable that had the railroad company not had its underground conduit laid for the cable before the compressed air cars were installed, which greatly simplified the work, and reduced the cost of changing that power to the under-

was thought that in view of the fact that cars of this type had been run on 125th St., New York, and then run in Chicago for more than a year without mishap, it would be perfectly safe, and, in fact, desirable, to lighten the construction. This was accordingly done and for a time the cars gave a splendid service, and the report of that line to the state of New York for the quarter ending December, 1900, showed a net profit, as against a deficit for the corresponding quarter of the previous year when the line was equipped with Hoadley-Knight motors.

It was found, however, that the construction of these motors had been made too light, and on Apr. 6, 1901, they were withdrawn from service.

While the foregoing was occurring upon the surface lines of old New York City the Manhattan Railway Co. had made a test



of an air locomotive upon its elevated structure. This locomotive was started Aug. 10, 1897, and made a number of trips upon the Sixth Ave. line. The locomotive was never put into regular service, however.

At the time of going to press we are informed that the Brooklyn Rapid Transit Co. is considering the use of air locomotives, and that one is now in service running between the Fulton St. ferry and the Navy Yard. We are unable to give any detailed accounts of its running, as it did not commence operation until September 16th, but we are enabled to show an illustration of this locomotive. It will be seen that in order to conform to conven-



AIR LOCOMOTIVE FOR BROOKLYN.

tion, the machine has been made as nearly like one of the Brooklyn Elevated engines as possible.

As a result of its experience with compressed air motors, both in New York and in Chicago, the Compressed Air Co., of New York, has been modifying and improving its motors. Larger cylinders, stronger frames, larger axles, larger bearings, the substitution of steel for iron in certain of its wearing parts, simplification of valve gear and platform devices, all combine to make a stronger and simpler motor. Five of its most recent motors are now in service upon the lines of the Rome (N. Y.), City Street Railway Co. During the County Fair, which was held at that place a few weeks ago, these motor cars hauled two and three trailers, mounting a 7-per cent grade without any difficulty. These new cars are reported as proving themselves, substantial, noiseless, odorless, efficient, economical, and free from every objection which has been made to any type of air motor. The operation of these cars is being closely watched by street railway men throughout the East.

#### CHANGES AT BIRMINGHAM, ALA.

With the consolidation of the railway, gas and electric lighting properties at Birmingham, Ala., under the corporate name of the Birmingham Railway, Light & Power Co. some changes have necessarily been made in the official management. The president of the company is Mr. Robert Jamison, a thoroughly practical street railway man. Mr. George H. Davis, of the well-known engineering firm of Ford, Bacon & Davis, New York, has been appointed general manager of the consolidated properties. Mr. J. B. McClary, who has been closely identified with street railway interests in Birmingham for 14 years, has been appointed manager of the railway department, and judging from Mr. McClary's past success in the street railway business we have every reason to look forward to a splendid street railway system in Birmingham in the near future. Mr. J. M. Bradley is to be manager of the electric lighting department and Mr. Timothy Byron, superintendent of the gas department. Mr. George H. Harris, who has up to September 1st been chief engineer of the railway company, has been appointed superintendent of equipment; Mr. Harris is still a very young man, but one who by close application has familiarized himself with every detail of his department and we feel sure has a brilliant future before him.

Ford, Bacon & Davis have assumed active control of the improvements which are to be made and are pushing the work of relaying rails, extending lines and converting steam roads for elec-

tricity as rapidly as possible. The work of double tracking the Ensley road, seven miles in length, has been temporarily suspended on account of some right of way matters.

Some surveys have been made and the management has under serious consideration the extension of the North Birmingham lines to Sayreton, a small mining town about a mile and a half from the present terminus. Also the extension of the Gate City line to the Mary Lee mines, a distance of about three miles from its present terminus.

All of the suburban cars have just been equipped with Wilson trolley catchers, which have been found to be highly satisfactory, not only giving the conductor more time to devote to the collection of fares, but reducing the delays caused sometimes by the tearing down of wires.

With the consolidation of the different roads and each road having a standard color of its own for the rolling stock, this company found that it had a rather queer assortment of colors for the cars it had acquired, and a large force of painters has been kept busy for the past two months painting all the cars the standard lemon color. The signs painted on the cars have been replaced by Hunter illuminated signs, so that now they present a more pleasing and uniform appearance.

The company will erect a large board at each station, having painted thereon the arrival and departure of every car going in both directions, so when a passenger reaches a station he can tell exactly when the next car is due. This scheme not only serves as a convenience to the passenger, but also serves to make the motor-man strive to keep more closely to schedule time.

#### THE CONSOLIDATION AT UTICA.

The Utica (N. Y.) & Mohawk Valley Railway Co. has effected the consolidation of the following companies at Utica: The Utica Belt Line Street Railroad Co.; the Utica & Suburban Ry.; the Utica & Mohawk Railroad Co.; the Deerfield & Utica Railroad Co., and the Herkimer, Mohawk, Ilion & Frankfort Railway Co. Horace E. Andrews, of Cleveland, and A. M. Young, of New York City, are principally interested in the company, which will have a capital of \$5,000,000 preferred stock and an issue of \$2,500,000 of 4½ per cent bonds. The capital stock has been subscribed and paid in; the bonds, to the amount named, have been placed with N. W. Harris & Co., Chicago.

The five roads comprised in the consolidation aggregate 100 miles of track and serve a population of about 100,000. The system will extend to Clinton, on the south; to Rome, on the west, and to Little Falls, on the east.

#### TWIN CITY RAILWAY ASSESSMENT.

The tax assessment on a valuation of \$1,025,904 was recently contested by the St. Paul Street Railway Co. and was taken into the courts for adjustment. The hearing of the case was continued over to the October term of the court and without waiting for this the county commissioners compromised the assessment on a basis of \$1,600,000. This reduced the company's taxes about \$7,000. A recent decision of the court holds that the county commissioners exceeded their authority in reducing the assessment and that the railway company must pay the original amount.

#### COMMISSIONERS' REPORT OF EAST GREENBUSH COLLISION.

The railroad commissioners of New York have issued a report of the collision on the line of the Albany & Hudson Railway & Power Co., at East Greenbush, May 26th, in which five persons were killed and 80 injured. The report places the responsibility for the accident on the motorman of one of the cars for not stopping at a certain siding to ascertain if it were safe to proceed; and in a lesser degree the conductor of the same car is held responsible.

The Cincinnati Traction Co. is considering the purchase of the famous Zoological Gardens of that city.

## NEW YORK STATE MEETING.

The 10th annual meeting of the Street Railway Association of the State of New York was held at Rochester on September 10th and 11th, some 200 persons being in attendance. The headquarters were at Powers' Hotel and the exhibits and meeting hall were at Fithugh Hall.

The meeting was called to order at 10:30 a. m. Tuesday by the president, G. Tracy Rogers, and after the regular routine business he delivered the

### ANNUAL ADDRESS.

President Rogers after a reference to the dastardly attack upon President McKinley, spoke as follows:

"The street railways of this state have carried, during the past year, over one billion passengers. The net earnings from operation are the same as the year previous, \$1,055 per passenger. There seems to be considerable development in the freight and express business on trolley roads. The increase in this state in this class of receipts during the past year was nearly \$50,000 over the previous year. While there is a considerable increase in the floating and funded debts of the street railways of the state during the past year, there is a decrease in the amount of interest paid for the same period, which signifies an increased confidence on the part of investors, and consequently we are now able to borrow money at a much reduced rate.

Some time in the early eighties steam railroad building had its great impetus in this state. The West Shore, Lackawanna, Nickel Plate and other large projects were carried into execution. This year seems to mark a new era in street railway building. Never before were so many long interurban lines contemplated.

A number of certificates have been granted by the Board of Railroad Commissioners, among which are the Buffalo, Niagara Falls & Rochester Railway Co., to build from Rochester to Lockport, Buffalo and Niagara Falls also, Genesee & Orleans Railway Co. to build from Batavia to Lake Ontario; the Syracuse, Skaneateles & Moravia Railroad to build from Moravia, through Skaneateles, to Syracuse; the Golden Bridge Electric Railroad Co. to build from Golden Bridge to Danbury, Conn. They have now before them for consideration many propositions for long interurban lines, among which are an application of the Rochester & Eastern Rapid Railway Co. to build from Rochester, through Canandaigua, to Geneva; the Lyons & Sodus Bay Electric Railroad to build from Lyons to Sodus Bay on Lake Ontario; the New York & Port Chester Railroad Co. to build from the end of the underground tunnel in New York at about 129th St. and Third Ave., through Mt. Vernon and Port Chester, to the state line of Connecticut.

In addition to the numerous applications for certificates for new roads, there are many projected extensions of existing electric railways for considerable distances through the state.

Many important consolidations of interurban lines are now taking place in our state in connecting up smaller roads. These extensions and consolidations, connecting towns with towns and villages with villages and both with cities or with the trunk line which leads to them, can not help but work to the advantage of the public.

The success of the interurban trolley roads has opened up a new field for the promoter. A number of the proposed interurban franchises now in their hands are purely speculative. It would be a detriment to interurban development to give life to the hopeless and worthless propositions, but this apprehension is needless, as this state is to be congratulated upon having an able Board of Railroad Commissioners, which is alert, wise and painstaking in its administration and oversight over our affairs.

The large number of interurban roads which are now pushing their way through the country is a favorable commentary on the growth of the electric railway industry. The modern street railway is no longer a tramway. It installs the heaviest tracks, employs large and commodious cars and runs them into the country upon well ballasted and thoroughly constructed tracks, in many instances on its own right of way, and in many cases at nearly as high speed as the steam roads.

The modern interurban road should be well equipped, and, where the traffic will allow, double-tracked on its own right of way, at as near a minimum grade as possible. In many instances

these features have been recognized by the trolley roads, and much of the work now under way and contemplated is equal to first-class steam railroad construction. This class of work leads to public comfort, confidence and financial stability. The interurban road builds cities and towns, makes travel a pleasure, is conducive to good health, helps to correct the morals and to benefit the public in general. This growth of long suburban and interurban lines carries with it the promise of a new and great public usefulness and certain new needs and responsibilities which must be carefully studied and considered. The same question is always before us: How can the electric road best serve the public? It is the duty of the management to study the needs of the public and endeavor to meet them. Those who neglect this duty will soon come to grief. The opening to habitation and developing of unused suburban districts and furnishing easy and cheap means of transportation to our cities seems to be the work of the trolley expansionists. This work is in its infancy and an immense work of development still remains to be done. In this rapid and almost startling development there must be experimental work, and we may be able to assist one another through our association as to the best methods of caring for the different problems as they present themselves.

A decade ago a horse car with straw on the floor was accepted with little apparent inconvenience and the public seemed to be satisfied. But as we have advanced and the numerous conveniences and comforts have been offered to the public, it has become more and more critical, much more is demanded and expected of us, and in many cases properties have been financially crippled in their endeavor to meet this public demand.

No doubt the small roads of our state have had, and are having, a struggle for existence. In most cases this fact is not recognized by the public until the receiver takes charge of the road or reorganization takes place. This class of roads must be assisted in every possible way by the public and relieved from the heavy penalties imposed upon them in the shape of heavy taxation, paving and requirements for expensive construction. The burdens on small roads must be lightened if the people using the same want rapid transit. Financial men are not putting their money into this class of enterprises from purely philanthropic sentiment. The capitalists will withdraw from this class of investments, which means abandonment, or the local people must take up the burdens unless they are treated fairly. Some years ago money could be obtained to build roads in small cities, but such is not the case at present, and this result has been brought about by the heavy obligations placed upon them.

I have called your attention a number of times to the injustice of the law in regard to the obligations of street railways to pave. The decision of the Court of Appeals, in Conway vs. The City of Rochester, holding that the general law requiring street railway companies to pave, in all cases, between their tracks and 2 ft. outside, was varied by previous special legislation, and could not be changed by any municipality, notwithstanding such obligation would be prohibitive of any future railway construction, and was destructive of the value of many street surface railways. The Legislature recognizes the fact that the street railways in small places can not afford to build and operate a railway and also pave the streets, and has, very wisely, amended Section 93 of the railway law, which now permits the question of paving and percentages in cities of the third class, towns and villages to be adjusted between the street railways and these municipalities by contract. It is the duty of the officials in these municipalities to treat the small roads in their midst with liberality and fairness. The city or town may apparently lose revenue that might be collected, but would it not gain, although indirectly, in allowing the roads to expend their money, otherwise paid to the city, in expanding its system and improving its property and service, thereby increasing the value of real estate by the extension and development of the street railway?

Population and increased valuation will follow the trolley car. Many times the municipal officials are over zealous in their efforts to exact other unjust provisions from street railway companies. Much care should be displayed in accepting new franchises which are unfair and unworkable in their terms. In many instances the propositions and terms suggested in these franchises are not only ridiculous but fatal to the corporations which undertake to build under them.

The result of adopting a 3-cent fare zone in Lorain, O., and its failure to be appreciated by the public, illustrates its impracticability in American cities. If this plan were to be put into operation it would result in crowding the laboring classes into limited quarters near their place of work, preventing them changing homes, and would bring about the same conditions which now exist in European cities.

One of the unlooked for increases in our revenues is the pleasure travel by trolley during the hot summer evenings to keep cool. Many residents of crowded cities find this the cheapest and most convenient way of enduring city life, during the heated term. This is also true of the residents of provincial cities having one or more popular interurban lines, properly conducted, built and operated with a view to comfort and an eye to beautiful scenery with a pleasure resort or resting place along the line. The trolley manager has learned to cater to this class of travel. The development of parks and pleasure resorts still continues to be a strong feature in the operation of the trolley road.

Many bills have been introduced in our Legislature intended to protect the public, but "self preservation is the first law of nature" applies with force to street railway managers in providing against accidents. Every manager should be alert to the responsibility and neglect no opportunity to provide safeguards for the safety and comfort of his passengers and provide against accidents to the public in every possible manner.

It is the duty of every street railway manager to give to his patrons the very best that his road can afford and at the same time keep in advance of what the traffic demands. The successful manager must advance a spirit of loyalty and confidence in himself and his roads; every person connected with the property should have the success of the enterprise at heart. With this spirit existing, results will be surprising. This has been the policy of the street railway of recent years, and the result is noticeable in the class of men in our roads and the spirit of emulation existing among them. The aid societies and social clubs connected with our roads have done much toward fostering this community of interests. Too much attention can not be paid to this department. The good will and co-operation of our employees, the city officials and the public is to be desired.

The chairman of the rules committee will undoubtedly present for your consideration a very complete set of rules for motormen and conductors. Plenty of time and discussion should be devoted to the consideration of these rules. I would suggest that this committee be continued, and the rules applying to other departments of our roads should be taken under consideration.

In 1895 this association recognized the necessity of formulating a standard of accounts; several meetings of the executive committee were held and a standard form was submitted to the Railroad Commissioners and adopted.

Later on the Street Railway Accountants' Association was formed, with the result that its standard form of accounts, with a few changes, has been adopted by the Railway Commissioners' Association of the United States. It is to be hoped that the committee on standardizing of street railway equipment, appointed at the last meeting of the American Street Railway Association, will submit a report and some practical results will be attained. Consolidation of roads and connecting up of different lines make it almost imperative that something tangible be produced in this direction.

I would suggest, if the tread of travel on our streets could be reversed, it would be a saving of many accidents. Nearly all persons, especially the ladies, in alighting from a car use the right hand to steady themselves, and upon alighting they find themselves facing backward. This benefit would also apply to the general public, as the same habit exists in alighting from a carriage. If travel was reversed the left hand would be used as a support in alighting and then the dress or parcel would be carried by the right hand of the passenger, who would face in the direction in which the vehicle was going. This is the custom in England and Canada, and if this radical change could be brought about in this country, I believe it would be of great benefit to our street railways in preventing accidents.

As the population in our large cities increases, a congestion at one or more points has naturally been the result, and this increase of travel has produced a great menace to the street railways. The use of electricity, high speed and large cars has done much to

relieve the situation, but at the same time has added to the burden of traffic on the streets.

The railways in that portion of the city of New York on Manhattan Island have, during the past year, made great advances in their improvements, which I reviewed in my last annual address, and the city is now enjoying the benefit of a thoroughly equipped homogeneous electrical system. The lines on Broadway, Columbus and Lexington Aves. are now operated by an underground current of electricity, resulting in the installation of better methods of traction on 25 miles of the heaviest traffic lines in the city, and an economy in operation of 5 cents per car mile on about 10,000,000 car miles per annum. At present, work is still being carried on in the construction of new terminal extensions for electric roads, which will facilitate handling passengers, from the principal ferries without the existing methods of transfer.

In my address last year I referred to the abuse of the transfer, especially in New York City. A change may be noted in the method of issuing transfer tickets in New York restricting passengers to a continuous ride either north or south, thereby preventing the use of the ticket for a return ride to the territory of the starting point. The increase in traffic should be highly satisfactory. The comparative traffic figures of the combined Metropolitan system with its allied lines, now all under the control of the Metropolitan Street Railway Co., continues to show a marked increase. A total of 508,308,091 passengers have been carried for the year just ended, of which 397,941,318 were cash passengers, and 192,376,773 were transfer passengers. These returns show an increase over the preceding year of 19,566,334 passengers carried, of which 13,303,006 were cash passengers and 6,263,328 were transfer passengers.

The construction of the subway tunnel has been expeditiously carried on. The structure already gives evidence of great thought in design in the completeness of the plan for transportation purposes. While its operation is still distant, the activity in construction is especially cheering to the suburban New Yorker.

When the new East River Bridge, now undergoing construction, is completed and the prospective tunnels are constructed, the congested condition of street car traffic in the city of Brooklyn will be greatly relieved, particularly at the New York terminal of the Brooklyn Bridge. This, with the many important contemplated improvements now under way under the present progressive management of the Brooklyn Rapid Transit Co., will afford the public of the City of Churches an unexcelled street car service.

The manner in which the Buffalo Railway Co. is handling the traffic in connection with the Pan-American Exposition is an illustration of what can be done in transportation of large crowds rapidly and comfortably, and is another example of the trolley development.

I must again call your attention to the unfairness of the law taxing street railways 1 per cent on gross earnings, while other public corporations are taxed one-half of 1 per cent. It is our duty to endeavor to have this unjust tax law corrected.

Your attention has often been called to the benefits to be derived by the interchanging of experiences and ideas at these meetings, and I trust that you will not wait for an invitation to express your opinion on the various subjects as they are presented. In case some subject not on the list should occur to you, I hope you will present the same for consideration of the convention. It is desired that the men connected with the smaller roads, also those in subordinate positions in the larger ones, will give us the benefit of their ideas.

In closing, I wish for the street railways of the state during the forthcoming year the same full measure of prosperity, success and development that has been meted out since last we met.

The program included the following papers:

"Track Bonding." By Alfred Green, master mechanic Rochester Ry.

"Third Rail Interurban Railways." By Maurice Hoopes, of J. G. White & Co.

"Track Construction in Brooklyn." By E. H. Packe, engineer maintenance of way, Brooklyn Rapid Transit Co.

"Brakes for Electric Street Surface Cars." By Charles R. Barnes, electrical expert of the New York Railroad Commission.

"The Claim Department." By D. W. Patterson.



"Steel Tie Construction." By Le Grand Brown, chief engineer, Rochester Ry.

"The Use of Boosters in Street Railway Power Stations." By W. J. Davis, of the General Electric Co.

"Application of Storage Batteries to the System of the Brooklyn Heights Railroad Co." By Franklin E. Morse, superintendent of power, Brooklyn Heights Railroad Co.

"Steam Railroad Crossings." By T. J. Nicholl, vice-president and general manager Rochester Ry.

"The Rochester Railway System." By C. A. Ingle.

At the second day's session the committee on rules, consisting of E. G. Connette, Oren Root, J. C. Brackenridge, Edgar S. Fasset and J. P. E. Clark made its report. After discussion the committee was continued.

On the invitation of J. A. Powers, of the Hudson Valley Railway Co., the association decided to meet next year at Caldwell on Lake George.

Officers were elected as follows: President, G. Tracy Rogers; vice-presidents, E. G. Connette and A. B. Colvin; secretary and treasurer, H. A. Robinson. Executive committee: the president, H. H. Vreeland, T. J. Nicholl, W. Caryl Ely and J. L. Greatsinger.

#### THE EXHIBITS.

Not only was the convention a great success as regards the high character of the technical papers and the large attendance of railway men, but the exhibits were extensive, far surpassing those ever shown at a previous state convention. Much of this success of the convention was due to Mr. F. D. Russell, manager of the street railway department of the Rochester Car Wheel Works, who superintended the placing of the exhibits and took much interest in the convention as a member of the reception committee.

The Corning Brake Shoe Co. was represented by T. H. Mercur, general selling agent, who had an exhibit of brake shoes.

The Atlas Railway Supply Co., of Chicago, was represented by its engineer, C. D. Porterfield, who showed a complete exhibit of Atlas joints, rail guards, etc.

Giles S. Allison showed St. Louis registers and models of electric steel poles.

The Rochester Car Wheel Works was represented by C. T. Chapin, president, Ed Chapin, Frank Russell, and C. Morse, selling agent. This company made an exhibit of a new wrecking device for the replacing of derailed trucks specially adapted for Maxim traction trucks.

The Ramapo Foundry Co. showed a very interesting exhibit in the way of brake shoes, including the "Diamond S" shoe.

The Bierbaum & Merrick Metal Co's. exhibit was in charge of E. P. Sharp, selling agent. The company showed bearings and "Ideal" trolley wheels, both of which are made of specially prepared metal to insure long life in street railway work.

The Gold Car Heating Co. was represented by John E. Ward.

The Electrical Storage Battery Co. was represented by Chas. Blizard, general manager of sales; A. Taylor, manager of the New York office, and Jos. H. Tracy of the engineering department.

The Brady Brass Co., of Jersey City, had a large and interesting exhibit in charge of D. M. Brady, C. P. King.

The J. T. Schaffer Manufacturing Co., of Rochester, had on exhibit a hydraulic wheel press built for the Rochester Car Wheel Co's. New York shops. This company is the largest manufacturer of street railway presses in the United States, and delegates were much interested in the new design shown.

J. C. Baer and G. L. Hall had charge of the exhibit of the Weber Railway Joint Manufacturing Co.

The Naper Saw Co., of Rochester, had an exhibit in charge of F. W. Eddy, who made demonstration of the company's new patent hand saw, which can be used for sawing iron, steel and brass, and should be of much interest to every street railway manager.

The Maltby Lumber Co., Bay City, Mich., was represented by I. A. Maltby and exhibited a number of pole ends, ties, etc., showing this line which it is furnishing to the street railway companies.

Manager Speer, of the Speer Carbon Co., showed samples of its product and interested the delegates in a line of carbons manufactured specially for the street railway service.

The American District Steam Co., of Lockport, N. Y., was represented by Chas. R. Bishop, secretary. He reports 27 heating plants now in the course of construction.

The Hale & Kilburn Manufacturing Co. was represented by S. A. Walker.

The American Vitrifried Conduit Co., of New York, had an exhibit of its conduits for street railway cables.

R. M. Ham was in charge of the exhibits of the Trojan Trolley Tender Co. and the Ham Sand Box Co., of Troy. This exhibit was of special interest to railway managers.

The Heywood Bros. & Wakefield Co. was represented by Bertram Berry, general selling agent.

The exhibit of Geo. W. Lord, chemist and boiler compound manufacturer, of Philadelphia, was very complete. It was in charge of Wm. J. Townsend.

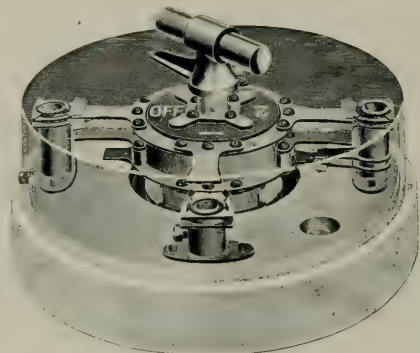
Cornell S. Hawley, general selling agent of the Consolidated Car Heating Co., had charge of a very attractive exhibit of that company showing the new style of heater ordered by the Manhattan Railway Co. of New York. He also showed a heater of the first design which has been in actual operation eight years.

The Chisholm & Moore Manufacturing Co's. exhibit was in charge of Col. W. E. Ludlow, manager of the railway department, who showed a full line of American standard rail joints made by this company.

The Universal Safety Tread Co. of New York was represented by F. H. Works, manager, and H. Kittridge, and showed a complete line of its patent safety treads for street car steps.

#### GOLD HEATING APPARATUS.

The Gold Car Heating Co. has its plant located at the corner of Frankfort and Cliff Sts., Manhattan. It employs in the neighborhood of 150 men continually in the department devoted to the making of electric heaters for street railways, and other purposes. The electric heater industry which has had its origin within the last six or seven years has grown to enormous proportions. At the present time, the Gold company states that over 75,000 of its electric heaters are in use in different parts of the world. The principle of construction followed has been to locate the resistance coils of the heaters so that the air in passing through the casing



GOLD REGULATING SWITCH.

is given free access to, and around the heated coils. By means of a very free circulation, thus established, the largest amount of heat is delivered into the space to be heated. The coils are supported on very ingenious contrivances in the shape of crimped or zigzag rods. These rods are of steel, thoroughly covered with enamel insulation, which is applied to the rod at over 2,500 degrees Fahrenheit. The result is a very perfect insulation which prevents the current from passing into the rod proper. Owing to the high temperature at which this insulation is applied, it is not affected by the heat of the resistance coils. The method of distributing the heat is very simple, the regulation being by a three-point switch located at a central point.

When this switch is turned to point No. 1, one-third of every heater in the car is in service. At point No. 2, two-thirds of every heater in the car is in service, and at point No. 3, which is the

maximum, the full capacity of every heater in the car is utilized. By this means a very even graduation of the heat and a most uniform distribution around the car is insured at all times.

The Gold company has not only improved the design and mechanical construction of its heater to a very great extent, but within the last few months has placed on the market a controlling switch, capable of satisfactorily carrying and breaking 60 amperes at 600 volts. This switch may be operated in either direction. Owing to its very large carrying capacity, this switch is of sufficient strength to control the heating apparatus of the largest cars in use on any street or elevated railway in the United States today. The accompanying engraving shows this improved type of regulating switch.

The Gold Car Heating Co. has furnished about 3,000 equipments for cars in Greater New York. The Manhattan Railway Co. has used Gold heating apparatus for many years, and the satisfactory manner in which the cars have always been heated is the best evidence that can be offered as to the merit of the Gold devices. The Metropolitan Street Railway Co. has had about 600 cars equipped with the Gold systems, and these have given satisfactory service for many years. Within the past few months the Metropolitan Co. has placed orders for several hundred equipments of improved Gold heaters.

The Brooklyn Rapid Transit Co., the Staten Island electric companies, the New York, New Haven & Hartford R. R., and the Jersey traction companies are large users of the improved Gold electric heaters.

In addition the Gold Car Heating Co. has placed its various heating devices on over three hundred other railroads in the United States and foreign countries, and over thirty thousand cars, some of which are operated in as remote territory as China and Japan, are equipped with the Gold system of heating.

#### NEW PLANT OF THE KUHLMAN COMPANY.

We illustrate here a view of the new factory of the G. C. Kuhlman Car Co., at Cleveland, O.

This company is the outgrowth of the G. C. Kuhlman Co. and commenced business under the new name on June 1, 1901, with the following officers and directors: Fayette Brown, president; T. P.

ing a trackage of almost 2,000 ft. on the Lake Shore & Michigan Southern. The Adams Ave. line of the Cleveland Electric Ry. runs along the front of the property and the "Shore" line of the Painesville road is within 150 ft. immediately across the Lake Shore tracks. The buildings are large and commodious and admirably arranged for handling the business in the most economical way. They are built of brick with modern saw tooth roofs which insure plenty of light and ventilation. The wood-working mill is 80 by 300 ft. and the machine room 60 by 300 ft. The storage house is immediately between these two mills and is 40 by 150 ft. Directly back and between the two mills is the boiler and engine room with fuel storage immediately connecting. On the extreme west end are the constructing and finishing rooms, each 180 by 200 ft. These rooms have tracks through them and are in every way admirably adapted to the quick dispatch of work. The dry kiln, which is 50 by 100 ft., and the foundry, which is 75 by 150 ft., are situated at the west end, and thus the entire group of buildings is so arranged that the raw material enters at the east end of the factory and comes out at the west end, painted and finished cars ready to load and ship. Transfer tables between the buildings handle the cars rapidly and easily from one department to another.

Taking it altogether it is a modern, model plant, the intention having been to make it the best that could be built. The plans and specifications for the entire construction were prepared by the well-known architect, J. Milton Dyer, who has been very successful in designing manufacturing plants of every description.

Cleveland is undoubtedly one of the main centers of suburban street railway construction and management and it is fitting and proper that it should be the center of the car building business. The new company is at present busy with the construction of some of the finest suburban cars that were ever ordered.

#### STRIKE ON THE LEXINGTON (KY.) RAILWAY.

The force of the strike on the Lexington Railway System has recently weakened very materially and numbers of the strikers have abandoned the union and attempted to regain their old positions. A delegation of twenty of the strikers recently called upon the general manager, Mr. E. C. Hathaway, of the company, and requested to be reinstated. They stated that they had been



NEW PLANT OF THE G. C. KUHLMAN CAR CO.

Howell, vice-president; Chas. A. Ricks, secretary and treasurer; G. C. Kuhlman, general manager. Directors: Fayette Brown, Frank Rockefeller, R. A. Harmon, J. H. Morley, C. C. Bolton, T. P. Howell, G. C. Kuhlman.

The new plant has a capacity of 500 cars a year and is so constructed that the capacity can easily be doubled or trebled by simply extending the buildings, room for which has been provided in case it is found necessary. The situation is an ideal one, consisting of 31 acres in Collinwood, six miles from the public square and hav-

ing ill-advised and mislead by the leaders of the strike. They were offered places on the extra list, but the management refused to displace any of the new men who had taken the place of the strikers.

The companies operating electric railways in Seattle, Wash., are maturing a project for a union loop in that city, which would give many advantages for the handling of traffic in the more congested district, and would make possible a general transfer system.

### THIRD-RAIL INTERURBAN RAILWAYS.

BY MAURICE HOOPES.

The use of an insulated conductor laid on the ties naturally suggested itself to the engineers who made the earliest investigations in search of the best system of supplying electric power to moving cars, and there were several experimental installations of third-rail conductors. These were followed by commercial developments of the system, and it has now been in everyday use on the tunnel and elevated railroads of the United States and Europe for approximately ten years. That it has not been more generally applied to the operation of surface railways has been due to the fact that not until very recently has there been any considerable amount of work done in the electrical equipment of the class of surface railways that are suitable for third-rail operation. The bulk of the surface railway work previous to the past two or three years was done upon ordinary street railways or upon suburban or interurban roads built entirely or in a large part upon the highways. A road to be suitable for operation by the third-rail system must have very much the greater part of its route located upon its own right of way, in order that the conductor rail may not be exposed in public places. Roads using city railway tracks for terminal purposes are not necessarily barred from this class, but it is desirable that between the termini there be very few places where third-rail construction is impossible.

So far as the writer knows there are today but two systems of surface railways operating with the third rail. The first of these is that of the New York, New Haven & Hartford Railroad Co. This company has one line from Hartford, Conn., through New Britain to Bristol, with a branch from New Britain to Berlin, including approximately 22 miles of single track. The same company operates a second of its lines in this manner, this being the line from Pemberton, Mass., along the south shore of Massachusetts Bay, through Nantasket to a junction with its steam road at Braintree, a distance of about 15 miles. Both of these are reconstructed steam lines. The second system is that of the Albany & Hudson Railway & Power Co., extending from Albany to Hudson, New York, over a road 37 miles long, 35 miles of which are operated by the third-rail system.

The Albany & Hudson road offers a fair example of the conditions under which the third-rail system of operation is preferable to the trolley. It is a high-speed interurban road, running cars weighing approximately 30 tons, at speeds reaching 50 miles per hour, and over sections of track which are necessarily rather crooked. Overhead trolley operation of such a road would be extremely difficult, principally because of the large percentage of curves in the line.

The third rail-system is preferable to the overhead trolley, in the case of roads where its use is possible, for the following reasons:

1. Lower cost of construction.
2. Very greatly lower maintenance cost.
3. More reliable operation due to the absence of delays caused by trolleys leaving the wire and wrecking sections of the line.

The statement that third-rail construction is cheaper than trolley construction is usually doubtfully received. When one considers the fact that with special low carbon rail he can obtain a given conducting capacity for about 60 per cent of the cost of the same capacity in copper, the truth of the assertion is more readily apparent.

Upon a road using street railway tracks for its termini it is, of course, necessary to equip the cars for both trolley and third-rail operation. Upon the Albany & Hudson road the third-rail shoes are hinged upon the trucks, and are folded up when the car enters either city. The cars are provided with trolleys, and operate with them through the city streets. In addition to the third-rail shoes, the only extra equipment required by the ordinary trolley cars consists of a so-called "commutating" switch upon each platform. The shoes upon each side of the car are in separate circuits, and these two, with the third circuit from the trolleys, are led to a special platform switch, leaving it within the power of the motorman to supply his motors from either the right-hand shoes, the left-hand shoes or the trolleys. The third rail is located uniformly upon

the east side of the track, and, so far as is possible, the stations are all upon the west side. The motorman, therefore, draws his power from the shoes on the east side of the car, the shoes on the west side being disconnected, and left folded against the sides of the trucks. It requires, approximately, fifteen seconds at each of the two city limits to remove the shoes and place the trolley upon the wire. It would, of course, be possible to operate through the streets of intermediate villages by making the same change from third rail to trolley and from trolley to third rail in passing through each. This becomes objectionable, however, if it is necessary to do it frequently, and unless a road may contain long unbroken stretches of third rail, the use of the system becomes of questionable value.

In further support of the statement the writer has made as to the lower cost of the third-rail system, he gives the following comparative costs.

#### COMPARATIVE COST OF 80-LB. THIRD RAIL AND EQUIVALENT OVERHEAD TROLLEY CONSTRUCTION FOR 1 MILE OF TRACK

THIRD RAIL	
Extra length 500 ties (9 ft. 3 in., instead of 8 ft.), at 7½ cents.....	\$ 37.50
500 insulators and fastenings, at 50 cents.....	250.00
62.86 tons 80-lb. low carbon rail, at (\$35, \$2 freight).....	2,325.82
Splice-plates and bolts—176 joints, at 60 cents.....	105.60
Bonds—352—425,000 cir. mil bonds in place, at \$1.....	352.00
Cable for crossings—200 ft. 1,000,000 cm. paper, lead and jute, with terminals and installation, at \$1.20.....	240.00
Erecting rail.....	100.00
	\$3,410.92
TROLLEY	
(Span construction and assuming one line of poles chargeable to transmission line.)	
Necessary bare copper trolley and feed-wire to give .04025 ohms per mile, thus equalling 80-lb. rail—1,413,600 cm.—22,774 lb., at 17 cents.....	\$3,671.58
Fifty 30-ft. x 3-in. chestnut poles erected, at \$5.....	250.00
Labor and material for erection of above feeder and trolley wire.....	300.00
Total cost of trolley construction.....	\$4,421.58
Total cost of third-rail construction.....	3,410.92
Saving, third rail over trolley.....	\$1,010.66
Or 23 per cent.	

In explanation of the above comparative statement it should be said that it is based upon the use of a rail having a resistance of 12.9 microhms per cu. cm. giving for an 80-lb. rail .04025 ohm per mile. It also assumes the bonds and cable to have the same resistance per unit of length as does the rail. From the above it will be noted that a mile of third-rail construction costs, approximately, 23 per cent less than a mile of trolley construction of equivalent conducting capacity.

As has been said, it is necessary with any road that practically the whole of the portion operated by third rail be upon private right of way. This right of way should be fenced in with standard railroad fencing, as is that of ordinary steam railroads, and at all crossings cattle guards should be placed. These precautions are necessary upon any railroad, but are more especially so upon one with third-rail equipment.

The danger of the third rail is exaggerated in the minds of every one inexperienced in the actual results had from operation. The railroad manager interested in selecting a system is invariably over cautious in this matter. The experience of the two surface roads to which the writer has referred is sufficient to justify the statement that the third rail introduces an element of danger that is not great as compared to the other dangers that already exist in the operation of every railroad. Upon each of these roads the rail is protected only by being located upon private right of way, which right of way is carefully fenced. At stations, however, the rail is necessarily exposed, and has no other protection than a fence behind, making it impossible for pedestrians to find a way across it. Signs warning against trespassing, stating that the road is operated by an "electrical rail" are conspicuously placed at all stations and highway crossings. The writer considers that no existing system of protection for the rail is desirable. Moreover, he is satisfied that the conditions do not warrant the greatly increased expense of installation and maintenance, and the decreased reliability of operation, introduced by the sectional third-rail system. In these systems the main conductors are entirely insulated, and the third rail divided into sections, only the section from which a car is drawing its power being alive, the remaining sections being automatically disconnected from the main conductor.

\*Paper read at the Rochester meeting, New York State Street Railway Association, Sept. 10-11.



Although it is not the writer's intention to impose upon you a detailed description of construction, it is thought that perhaps a few words on this subject may be of interest.

The location of the third rail, as related to the track rails, is varied in different roads. In some construction the third rail has been placed midway between the two track rails. This position has the advantage of putting it least in the way of both trainmen and trackmen, and the rail thus located is more easily cleaned of sleet and snow. The disadvantages of the location, however, more than outweigh the advantages, and such is the opinion of the engineers operating the systems where the third rail is placed in the middle of the track. These disadvantages are:

1. That it is extremely difficult to disconnect a car from the rail by removing the shoes, which are under the car, in the event that it is desirable to do so.

2. In order to keep the surface of the third rail low enough to avoid the possibility of its being struck by the bottoms of motors oscillating upon their spring suspensions, and to leave sufficient clearance for the purpose of insulation, it is necessary to crowd it down to a point where it is difficult to get suitable insulators underneath, and to where the elevation of its head is so little above that of the rails of intersecting tracks that the third-rail shoes have insufficient clearance in passing over these intersecting tracks. It will be readily seen that if the third-rail shoe on one end of the car touches an intersecting track rail, the third rail will be "grounded" through the medium of the live shoe on the other end of the car, and the car cable which connects the two shoes together. To avoid this the head of the third rail should be several inches above the head of the track rails, thus allowing plenty of vertical play for the shoes, to compensate for the inequalities of the third-rail surface, and ample clearance between the shoe, in its lowest position, and the head of the track rail.

These reasons make it undesirable to install the third rail between the track rails. The best location for the third rail is outside one of the track rails, and elevated several inches. Upon the Albany & Hudson road the third rail is 26 in. outside one track rail, and is elevated by the height of the insulator, which is 6 in. above the track rails. This position was selected as one which would allow the rail to clear the cylinder of steam locomotives, and would leave room for the trackmen to work on the adjacent track rails. The third-rail insulators are most conveniently mounted upon the ties. For this purpose special long ties should be inserted at regular intervals, 10 ft. being a good spacing with heavy rail. For the third-rail location above described, these ties should be 9 ft. 3 in. long. The third-rail ties should have sawed faces, in order to present a plane surface for the insulator, and in order to obtain a uniform height of the insulator seats. The ties should be of a wood that will hold the insulator lag bolts, and it is questionable whether or not cedar is suitable for this purpose. The insulators are of a variety of makes and designs. It is more difficult to secure one that is mechanically strong than one that offers sufficient insulation. The insulating materials most generally used are wood and various forms of vitrified clay and artificial stone. The material is usually worked into large insulating blocks, which are placed upon the ties, either directly or with base castings. The rail is held upon the insulator by a casting of some form or other, and generally this casting is used to petticoat the upper parts of the vertical faces of the insulating block, and thus reduce surface leakage. The rail is allowed to sit very loosely on the insulator, that it may be perfectly free for longitudinal movement, and that the insulator may sink with the tie under the weight of a car without the necessity of pulling the rail down with it, or breaking.

The conductor rail should be of a special mixture, giving the highest possible electrical conductivity. In the writer's experience this has been obtained by a steel giving the following analysis:

Carbon .....	60 per cent.
Manganese .....	44 per cent.
Phosphorus .....	.088 per cent.
Sulphur .....	.08 per cent.

This rail gave a resistance of 12.9 microhms per cu. cm., and was, consequently, of about 7.25 times the resistance of commercial copper. The mixture can, of course, be improved upon by further decreasing the carbon and other alloying elements. An

analysis of a sample of standard 80-lb. track rail resulted as follows:

Carbon .....	.47 per cent.
Manganese .....	.76 per cent.
Sulphur .....	.03 per cent.
Phosphorus .....	.104 per cent.

This rail gave a resistance of 18.2 microhms per cu. cm. or a ratio to copper of 10.17.

As stated, a better mixture than the one first mentioned can be had. The difficulty, however, is to induce the rail manufacturers to do the necessary experimenting. It is usually troublesome to get them to quote fair prices upon the special rail. It will be seen that by the use of the special low carbon rail a saving in weight of, approximately, 30 per cent is obtained over the standard rail. At one time the writer was unable to secure from any mill the special low-carbon mixture he desired, but did induce one to roll him, without increased charge, an 80-lb. rail out of the standard 50-lb. mixture, which contains, approximately, 40 per cent of carbon, and which gave a resistance 16.5 microhms per cu. cm. Within reasonable limits it is desirable to make the third rail of a size sufficient to supply the necessary conducting capacity. As will be noted, an 80-lb. rail of the special low-carbon mixture mentioned above is, approximately, the equivalent of 1,413,000 cu. in. of copper. The writer would advocate varying the size of this rail, within the limits obtainable from the rolling mills, to give the carrying capacity required. On the average high-speed interurban road an 80-lb. rail gives, approximately, the desired conducting capacity with sub-stations at the usual intervals of from 10 miles to 12 miles. This, then, requires no overhead copper, with the exception of the high-tension lines.

Splices in the third rail should be of a nature to preserve the alignment and surfacing of the joints without preventing easy expansion movements. These conditions are best obtained with a four-bolt plate, approximately, 20 in. long, neatly fitting the rail, but not wedged in tight enough to prevent sliding. Unless the plate fits well, and holds the rail in good surface, with high speeds the shoes will jump badly at the joints. In this connection it may be worth while to state that it is desirable to arrange the spacing of shoes so that the two on one car will not strike joints at or near the same time, otherwise bouncing at joints will result in breaking the supply circuit and consequent arcing. Unfortunately, the standard length of interurban cars is such as to throw the king bolts not far from 30 ft. apart, and it becomes difficult to locate the shoes to accomplish the object desired.

Some of the elevated railway engineers have found it necessary to anchor their third rail to prevent its creeping. The Albany & Hudson rail has been laid for some fifteen months, and is anchored at no point, and has made no trouble whatever from creeping. This is somewhat remarkable, in view of the fact that some of the rail is laid upon 3 per cent grades. To obtain this condition, it was necessary that each rail take care of its own expansion, and that the joints be not tight enough to concentrate upon the curves the expansion of the tangents.

The third rail should be bonded to a capacity which will make it impossible for any current that can be supplied the rail to overheat the bonds. The writer has been in the habit of bonding an 80-lb. rail with two 425,000 c. m. copper bonds. These bonds can be put in the base of the third rail, because of the absence of any interference from splice plates, and this is the better location for them.

At highway and farm crossings the continuity of the rail is, of course, broken. The electrical circuit is completed by the use of underground cables. Because of the fact that these cables are not likely to be disturbed by digging in the highway, and because they are easily dug up, it seems unnecessary to provide a conduit for them. They can be laid in a trench and covered with a pipe to avoid the possibility of tools injuring them, in the event that it becomes necessary to move them, and they are thus very cheaply installed. Lead-covered paper cable, with the lead enclosed with a wrapping of jute to avoid abrasion, seems to be satisfactory. Rubber cable is, of course, not so absolutely dependent upon its lead sheath as is the paper, but, on the other hand, it is much more expensive, and more susceptible to damage by extreme overloads. One million circ. mils is a good size of cable to use in connection with an 80-lb. third rail. It is impossible to

connect this cable directly to the rail in a way that will properly care for the expansion movements of the rail and protect the end of the cable. A much better plan is to terminate the cable alongside the end of the third rail upon a post, planted in the ground, leading it up to a brass terminal. From this terminal to the rail connection can then be made by flexible bonds, arranged with U-bends, to admit of at least 12 in. longitudinal movement of the third rail.

Third-rail shoes are usually adjusted to allow, approximately, 2 in. vertical play, 1 in. above and 1 in. below the normal third-rail elevation. It, therefore, becomes necessary to provide the ends of the rail at crossings with inclines to receive the shoe and elevate it to its working height. The inclines upon the Albany & Hudson road are constructed by sloping the end of the rail to a pitch of 1 in. in 20 ft. The lower end of this end rail is supposed to be adjusted to a height that will just receive the shoe. In order to provide a safeguard against the shoe striking the end of this depressed end rail, in the event that the former hangs abnormally low, a cast-iron tip is bolted to the end of the rail. This will lift the shoe, if it is even 3 in. below its normal position. An incline for the end rails of 1 in. in 20 ft. seems to be sufficient for speeds up to 60 miles per hour, and is probably all that would be required for even greater speeds.

Although the operation of the third-rail system seems to be extremely satisfactory under nearly all conditions, it becomes very difficult in a sleet storm. There is as yet no approved method of removing the sleet from the rails. At a time when the temperature of the air has been below freezing long enough for the rail to likewise reach a temperature below 32°, a rise in temperature, with accompanying rain, results in the formation of a film of ice upon the rail which it is a difficult matter to remove with a hammer and cold chisel in anything but extremely small chips. To construct any cutter or scraper to remove this at a reasonable speed has so far proven almost impossible. That the work should be so difficult seems strange to one uninitiated, but he rapidly gains respect for the difficulty when he meets it in a practical way. The scrapers in use last winter were greatly superior to those of the previous winters, and, doubtless, a satisfactory one will be evolved soon; meanwhile third-rail roads are subject to a revision of their schedules in bad sleet storms, and especially is this so with roads operating on long headway. With very frequent service, as exists upon the elevated roads, there is much better opportunity to prevent the formation of ice.

Snow offers practically no greater difficulty than it does upon any other railroad, as it is easily removed from the rail, and there is no trouble about maintaining contact between the shoes and the third rail.

The writer is satisfied that the following years will witness many important installations of the third rail upon existing and new surface railways. That the system is superior to any other for the operation of a large class of roads is, in his mind, unquestionable.

### SPRAGUE MULTIPLE UNIT SYSTEM.

The multiple-unit system of train operation and control by which any number of motor cars and any number of cars without motors can be combined in a train in any order, and operated from as many points as desired, is entitled to rank as one of the important inventions of the last century. The multiple-unit system, which was invented, named and first reduced to practice, by Mr. Frank J. Sprague, a pioneer in electric railway work, has been adopted by several urban and suburban electric roads, where the traffic conditions are particularly severe. Mr. Sprague secured broad United States patents which are now owned by the Sprague Electric Co. The Sprague system is now installed and in successful operation on the South Side Elevated R. R., Chicago, the Brooklyn Rapid Transit Co.'s elevated lines, the Boston Elevated Ry., and the Versailles division of the Western Ry. of France. The service of the Boston Elevated is said to be the most difficult in the world.

In the Sprague multiple-unit system there are two kinds of cars. The first is completely equipped and is called a motor car, and is entirely self-contained and capable of independent operation. The second is called a train line car and is not equipped with motors, but has a train line through which is transmitted a control from one car to another.

The train line is common to all cars in a train and when the train line car has master switches and is joined to fully equipped cars, the train can be controlled from the dead car as well as from the motor car. A great variety of combinations can be made to fit any condition of service.

The essential features of multiple-unit equipments are the master switches, the train line cables, couplers and jumpers, a reverser for determining the direction of movement, and a speed controller, all of which have been reduced to a condition of reliable and standard construction.

Among the advantages claimed for the system are the following features: saving of time, labor and material in operation, economy in cost of maintenance of roadways and structures; the operator by a movement of the hands at any one of the operator's switches can effect definite movements of the train as to acceleration, speed and direction; the system covers the entire range of service, from a single car to a train of any length equipped with as much or as little power as may be required.

The headquarters of the Sprague Electric Co. are at No. 527 West 34th St., Manhattan.

### THIRD RAIL INSULATORS.

The rapid development during the past few years of elevated and interurban electric railway systems has led to corresponding improvements in the design and construction of such devices as are

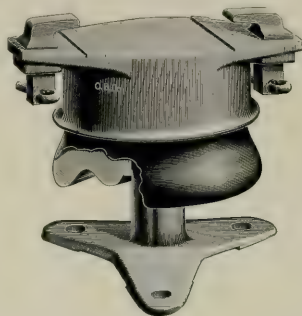


FIG. 1.

required by them. In this work third rail insulators play a very important part and in the accompanying cuts we show two improved types of third rail insulators which are made by the Ohio Brass Co., of Mansfield, Ohio.

In each of these insulators the means of attachment between the third rail and the insulator is such that while the former is held in

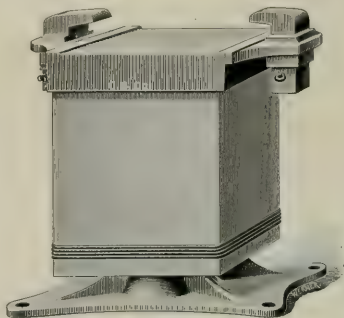


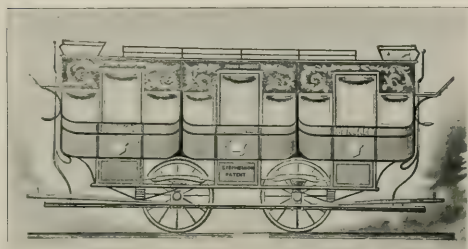
FIG. 2.

proper horizontal alignment, a means is provided for a certain amount of vertical play or motion, which in practice has been found to be necessary. This arrangement obviates the trouble which has been experienced in the past of the insulators breaking on account of the rails being too rigidly attached to them.

In the "Type A" insulator shown in Fig. 1 the insulating body is made of reconstructed granite or some similar material, and is of such size and design as to properly support the third rail with safety, and to also present sufficient surface to prevent leakage of the current over its exterior. In the "Type D" Insulator shown in Fig. 2 the insulating medium consists of a thoroughly seasoned hard wood block which has been specially prepared by thoroughly impregnating with oil so as to exclude all moisture and increase its insulating properties. In addition to the two types here shown the Ohio Brass Co. furnishes several other styles, which, while similar to these in the method of attachment between the rail and the insulating body differ in general construction and are adapted to varying requirements and conditions. A full line of these third rail insulators is illustrated and described in the new Catalog No. 5, recently issued by the company.

### NEW CARS FOR JOHNSTOWN, PA.

The John Stephenson Co. has recently delivered to the Johnstown (Pa.) Passenger Railway Co. a number of handsome double truck vestibuled cars, which are built practically after steam



THE ORIGINAL STREET CAR—JOHN STEPHENSON—1831.

railroad coach pattern. These cars have 32-ft. bodies, 42 ft. over all, and are finished in cherry. They are mounted on Stephenson No. 6 double trucks, with Christensen air brakes, and Beverly vestibule brake wheel. The cars have four end seats and 20 cross seats of the Hale & Kilburn "walkover" type. The curtains are of Pantasote, with the fixtures of the Curtain Supply Co. In each window is a movable wire screen, held in place by a patent clamp, this safeguard preventing possible accident to passengers from obstructions



A MODERN STEPHENSON CAR.

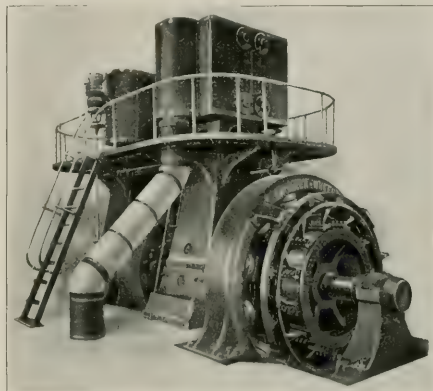
along the track. It is interesting to compare this car with the first street car, that built in 1831 by John Stephenson, which is also shown here.

### NEW INCLINE FOR CINCINNATI.

The Cincinnati Traction Co. is considering the plan of building a new incline plane road on Price Hill. The project is to build a light, but substantial structure by which passengers may be transferred from the bottom of the hill to the top, where they may take the street car line. If this is built, passengers will be given through transfers on all lines of the Traction company good on the incline.

### CROCKER-WHEELER GENERATORS.

The Crocker-Wheeler Co., whose factory and main office are at Amper, N. J., has recently sent out copies of its new bulletin on "Engine Type Generators." In developing this line of machines, especial attention has been paid to the best practice in the design of steam engines, so that speed and rating should be suitable for either lighting or power plants. The direct connected types range



CROCKER-WHEELER ENGINE GENERATOR.

in capacity from 20 to 800 kw. The company is, therefore, in a position to supply any demand for power. The field coils of the size 336, 400-kw. machine and upwards, are of the split type, thus affording proper ventilation and thereby keeping down the rise in temperature. All tests of this character have given most satisfactory results, with respect to the heating of the various parts, after a continuous run under full load for 10 hours, followed by a two hour run under 25 per cent overload, there being an unusually small increase of temperature. Another feature is the field poles, which are cast welded into the magnet frames, giving great permeability, as well as a perfect magnetic joint. The brush rigging is most compact, and is designed to admit of a rotation for adjusting the position of all the brushes as well as the individual adjustment of the brackets which carry each set of brush holders. This last feature is found only on Crocker-Wheeler machines, as it is patented, and by means of it a perfect electric balance can be secured.

### CAST-WELDED JOINTS IN NEW YORK.

The Falk Co., of Milwaukee, has cast-welded practically the entire Third Avenue system on the Island of Manhattan, comprising over 70 miles of track. The joints were made on the main line in 1899-1900, when the road was changed from cable to conduit electric traction. Although cars were passing on a three-minute headway all the time this work was in progress, the cast welding was accomplished without interruption to the running of cars, by utilizing a special mold and clamp. The clamp was made long enough to reach from yoke to yoke, thus taking the weight of passing cars off the joint on which the men were working. The track on this line is laid with 7-in. Trilby rails on yokes 5 ft. between centers.

On the 42d St.-St. Nicholas division of the Third Avenue system, a 9-in. Trilby rail was laid with yokes 5 ft. between centers, all joints welded by the Falk process. All of these joints have stood up with entire satisfaction, a fact worthy of special note when the heavy traffic, together with the vagaries of New York's climate are considered.

The Falk company has also cast welded a number of lines in Brooklyn.



### TAUNTON SNOW PLOWS.

Two new snow plows are being put upon the market for the coming season by the Taunton Locomotive Manufacturing Co., of which our illustrations give a general view. One of these is an 8-wheel nose snow and the other a new standard share plow.

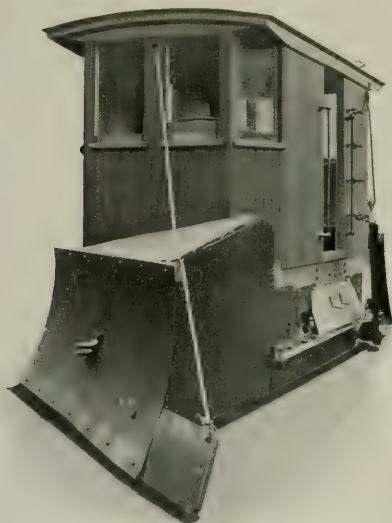
The 8-wheel plow, which is designed for the heaviest class of work, is mounted on Taunton trucks, which are M. C. B. standard throughout. Simplicity and strength have controlled the design



TAUNTON 8-WHEEL PLOW.

of these trucks; the bolster bearings are 18 in. in diameter and no particular dependence is placed on the king pin.

The general dimensions of the plow are as follows: Length, 42 ft. 8 in., height, 11 ft., width, 9 ft. 2 in., lift of nose, 10½ in., spread with wing open, 10 ft. 5 in., weight without motors, 14 tons. The nose frame is of heavy white oak, strengthened by wrought iron braces and guide bars. The main frame of the plow is of hard pine, and the cab of North Carolina sheathing. The nose is operated by hand power exerted through the worm gear mechanism. An 8-in. cylinder is provided, however, for each nose, and compressed air may be employed for lifting the noses and



STANDARD SHARE PLOW.

operating the brake gear. The wing operating mechanism is novel in design, of exceeding simplicity, of great strength and almost wholly of wrought iron. The same remarks apply to the digger mechanism which has received the most careful attention.

The house and body of the standard share plow are so far as possible, exactly like the corresponding parts of the standard nose plow, the end of the body frame being changed to meet the require-

ments of a share rather than a nose. This plow is 28 ft. 11 in. long, 10 ft. 6½ in. high, 8 ft. wide over all. The height at the point of the share is 3 ft. 10¾ in., and at the heel 4 ft. ¾ in. The share has a lift of 8 in., and a spread with the wing open of 14 ft. 2 in. Its weight without motors is 6 tons. The height of the share of this plow is to be especially noted, and the ingenious arrangement which allows the share extension to be both raised and lowered by one rope from the cab will please every practical railroad man. The snow-protecting casing back of the share is fastened in part to the main frame and in part to the share itself and these two parts lap over and slide by each other. This casing gives ample protection to the running gear.

### FROM CAMDEN TO BOSTON BY TROLLEY.

A trip by trolley between Boston and Camden, N. J., has been made by a party of ladies who started from Boston at 8 o'clock on the morning of August 8th, taking the trolley line that runs to Newton, and from the latter place they passed through Natick, South Framingham, Worcester, Springfield, Hartford, Bridgeport and along Long Island Sound to New York City. From New York City they took the ferry to Jersey City, passed Newark, Elizabeth, Plainfield and so on to Camden, making a total distance of 357 miles.

### NEW CARS FOR BROOKLYN.

One of the attractions at Madison Square Garden during convention week will be a new type of car which has recently been developed by the Brooklyn Rapid Transit Co., and will be shown through the courtesy of the officers of that road. The car itself is of the style now known as the "semi-convertible," that is with the window pane and sash so fastened as to be readily removable, but the chief point of interest is the seating arrangement, which is a radical departure in this line. As will be noted from the accompanying engravings, the seats are individual chairs arranged in pairs. These pairs are susceptible of a number of different movements and they can be placed in several different positions. When ordinary cross seating arrangement is desired the seats can be



BROOKLYN CAR—CROSS SEATS.

turned so as to face in either direction, leaving a wide aisle down the center. During the rush hours when more standing room is needed, the seats can be swung up against the sides of the car, and may be turned either to face squarely toward the center or three-quarters forward when the car is going in either direction. With the ordinary longitudinal seating the passengers are often unduly crowded, and their knees and feet project out into the aisle to the annoyance of other passengers, but with the three-quarters forward position, possible with these seats, the feet of the passengers do not project directly into the aisle, but come more or less under the seat in front, leaving considerably greater aisle room. With the pedestal support there is also more space for packages or grips on the floor.

It will be seen that the two chairs comprising each pair are mounted on a swinging arm which is pivoted on a single pedestal. The revolving mechanism is controlled by two foot dogs which hold the chairs in any one of the various positions.

The body of the car is 28 ft. long and with two end seats has seating capacity for 30 persons. The window sill is low and



BROOKLYN CAR—SEATS THREE-QUARTERS FORWARD.

the window sash are held in place by set screws. Two men can change the car from closed to open in a half hour. The seats are largely the design of Mr. E. Chamberlin, superintendent of equipment for the Brooklyn Rapid Transit Co., and are made by the Heywood Brothers & Wakefield Co. The transit company has 155 of these cars built or under order. Five were built in the company's own shops; the LaCade Car Co. had orders for 100; and the Stephenson company is building 50.

### TROLLEY POLICE OFFICERS.

By a recent act of the Pennsylvania legislature any justice of the peace of a township is authorized, upon the application of any street railway company, to swear in any of its employees as policemen with authority to make arrests for violations of the law. Some of the trolley companies in the small places are availing themselves of this privilege, but it is practically of no importance in cities where a regular police force exists. Trouble is frequently caused on the cars by rowdies, who may be handled better by the conductors under the new law.



THE ARMITAGE-HERSCHELL MINIATURE RAILWAY.

### CONSOLIDATION AT SALT LAKE CITY.

The Salt Lake City and the Rapid Transit Railroad companies consolidated August 10th, the new company being known as the Consolidated Railway & Power Co. The capitalization of the new company is \$1,000,000, and the object of the consolidation, as given in the articles of incorporation, are the purchase, owning, operation and extension of the lines heretofore owned by the old companies. The total mileage of the new system in single track is 72.83, all in Salt Lake county. The officers are: C. L. Rood, president; W. P. Read, vice-president; Joseph S. Wells, secretary and treasurer.

### NASHVILLE (TENN.) RAILWAY SOLD.

The majority of the stock in the Nashville Railway and the Cumberland Electric Light & Power Co. has been sold to Frederick M. Colston, of Baltimore, and R. Lancaster Williams, of Richmond, Va., both of whom have large holding of the bonds of the two corporations. Mr. Percy Warner, of Nashville, has been elected president of both corporations to succeed T. Edward Hambleton, of Baltimore, who resigned. The directors contemplate making important improvements and extensions of both systems and a progressive policy will be inaugurated.

### POPULAR PARK ATTRACTIONS.

We believe it is generally conceded by street railway managers that as a permanent park attraction the merry-go-round or riding gallery possesses advantages that have now made it an essential feature of a well-equipped pleasure park. Although it is a very old form of amusement it seems not to have lost any of its charm for the young people, or for some of the older ones for that matter.



RIDING GALLERY.

and this, combined with its comparatively low cost of operation and maintenance will always recommend it to the park manager.

The Armitage-Herschell Co., of North Tonawanda, N. Y., is one of the oldest makers of these machines in the country. As with all other things, the fashion in merry-go-rounds changes and this company in line with its policy of keeping its patterns strictly up-to-date has lately perfected a very fine riding gallery designed especially for permanent locations. The gallery is 42 ft. in diameter and has 36 handsomely carved horses, four chariots and 16 folding chairs, giving a total seating capacity of 76 people. The outfit includes a very fine military band organ with snare and bass drum attachments.

The center of the gallery is composed of 16 panels made in harmony with the carvings on the organ, and artistically painted in

oil with floral and figure designs. Each alternate panel has a plate glass mirror and over every panel is a child's head.

The Armitage-Herschell Co. also makes miniature railways which are coming into extensive favor. As will be seen from one of the engravings this outfit consists of a miniature locomotive and 10 passenger cars, having seating capacity for 40 children or 20 adults. The locomotive is a facsimile of the regular type of passenger steam locomotives. The trains run on a track laid with 8-lb. T-rails spiked to miniature ties.

This company has recently placed one of its best machines at the park of the Oil City Street Railway Co., where it is giving entire satisfaction to the public and to the park managers.

### THE SCHERZER ROLLING LIFT BRIDGE.

The railroads of the United States today aggregate some 200,000 miles, about two-fifths of the total railroad mileage of the world, though the country has less than one-twentieth of the world's population. It is now the policy of some of the largest and most progressive railroad companies to extend their spheres so as to include the operation of connecting steamship lines, and one feature of this co-operation is that the railroad companies are expending large sums in the improvement of harbor, dock and terminal facilities. In this work most serious obstructions are

that it will not occupy too much of the navigable channel when open for the passage of vessels.

But of more importance to street railway companies is the fact that the swing bridge when opened opens a chasm in the roadway which frequently results in disastrous accidents. A notable accident of this character occurred at the Central Viaduct, Cleveland, O., Nov. 16, 1895, where an electric car plunged over 100 ft. into the river, killing 17 persons. Similar accidents only slightly less serious have occurred in other cities; Nov. 1, 1893, a street car ran into an open draw at Portland, Ore., 6 persons being drowned; Feb. 4, 1895, a car ran through a draw bridge at Mil-

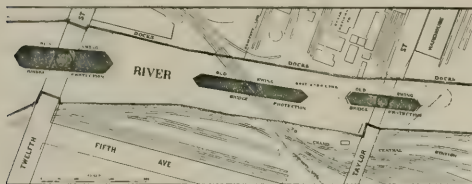


FIG. 1—PIER OBSTRUCTIONS AT TAYLOR ST., CHICAGO.

found in the old type bridges which span and to a great extent block the waterways of our large cities, and before satisfactory results can be expected these bridges will have to be replaced by others of improved design. The Chicago River is an excellent example of a waterway thus obstructed by antiquated bridges, but it also has a number of object lessons in the shape of modern bridges. Figs. 1 and 2 show a typical portion of the Chicago River, near Taylor St., before and after two of the swing bridges were replaced by Scherzer rolling lift bridges. On one occasion a vessel became stuck in the narrow open draw of the swing bridge and passenger trains were delayed for 12 hours.

Street railway companies are in a position similar in many respects to that of the steam railroads and in building bridges should profit by the costly lessons the steam roads are now learning.

The swing bridge is a primitive form of movable bridge and has outlived its usefulness; in fact, there is now no more reason for its use on railroads or street railways than there is for the use of the primitive locomotive of 1830 or horse cars at the present

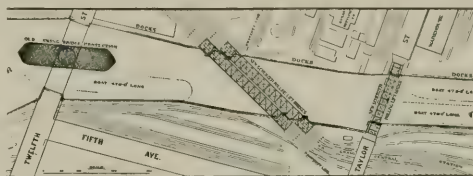
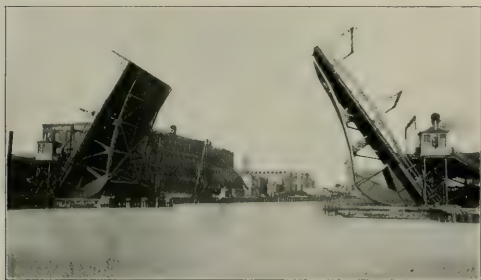


FIG. 2—OBSTRUCTIONS REPLACED BY SCHERZER BRIDGES.

waukee, 3 persons being killed; July 7, 1897, a car of the Inter-Urban Ry., of Saginaw, Mich., met a similar fate and 7 persons were drowned.

This defect of the swing bridge is becoming of greater importance each year, because of increased traffic and increased speed of railroad and street railway traffic. The Harlem River is another stream full of bridges which seriously obstruct both the street railway and boat traffic.

The widespread favor with which the Scherzer rolling lift bridge has been received in the United States and in foreign countries is the result of the superior advantages which the design possesses. The points which we believe are of especial interest to street railway companies, are: With this type of bridge the supporting piers may be on shore in a narrow channel or on the sides of the dredged channel of a wide river. No center pier or protection pier obstruction are necessary. The navigable channel, in a wide or narrow river, may always be clear and unobstructed. When open for the passage of vessels the Scherzer rolling lift bridge acts as a barrier, closing the roadway, and



SCHERZER ROLLING LIFT BRIDGE AT NORTH HALSTED ST., CHICAGO—OPEN AND CLOSED.



time. To build new swing bridges which artificially obstruct the center or best part of dredged and navigable channels, is inexcusable in view of the progress made in the art of designing and constructing movable bridges, and must necessarily cause financial and other losses to railroad and street railway transportation companies and the general public.

The slow movement of vessels through the narrow side openings provided by swing bridges obstructs and delays street railway, railroad, highway and vessel traffic. The swing bridge must span two narrow side channels even though one channel only is required. The swing bridge in opening or closing moves in a horizontal plane and makes useless valuable dock and other property. The swing bridge must always be made as narrow as possible so

thus absolutely preventing the many disastrous accidents common to the swing bridge when opened; without additional cost the bridge itself forms the most perfect, substantial and successful bridge gate and signal ever invented. The bridge moves in a vertical plane within the lines of the roadway, no dock space being wasted, or no extra land or water space being required in moving the bridge. Increasing traffic requiring additional railroad tracks may be accommodated by adding other single or double-track Scherzer bridges to the existing Scherzer bridge; this is impossible with the swing bridge, as it must be discarded and removed whenever increased traffic demands a wider bridge.

The Scherzer rolling lift bridge has been used for the accommodation of the largest street railway, railroad and highway traffic



for the past seven years, and has demonstrated itself to be safe, simple, rigid, rapidly operated, efficient, durable, economical and artistic. These advantages recommend the design as the most suitable to be used when it becomes necessary to divide a roadbed by a movable structure.

### CHICAGO BANKERS AND SECURITIES OF ELECTRIC INTERURBANS.

In reply to an inquiry as to the attitude of his bank towards electric railway securities, Pres. John J. Mitchell, of the Illinois Trust & Savings Bank, recently expressed himself as follows: "This bank has as yet no investment in these electric lines, nor has it made any loans on their securities, but I have no doubt that we soon shall have such investments. The growth of electric interurban railways has been such that we shall soon be compelled to take notice of them. The reasons we have not loaned on these securities is not because I do not think them good, for on the contrary I have great confidence in them and believe that they will constitute the next development of our transportation facilities, but because we feel that we must not lend on any but the quickest assets, and therefore limit our investments to listed securities, and practically none of the electric railroads have their securities listed."

"Money is a drug in Chicago," continued Mr. Mitchell, "and I think it a shame that we should be compelled, as we are, to go to New York, London and Berlin to invest our surplus, when there are so many meritorious enterprises at home in which we might invest if the securities were only listed. I think that the owners of electric railways owe it to themselves and to their properties to furnish the necessary information and have their securities listed on our leading exchanges."

Another Chicago banker answered the same inquiry as follows: "The position of interurban railways as a basis for bonds or loans is a problem which at present is before many of our banks and bankers. Frequently such applications are refused without any consideration whatever, the reason being that far too many of the schemes thus presented are immature and unwise and it is expected that the bond buyer or loaner will advance the entire amount of construction cost, receiving therefore only the benefit of a moderate rate of interest, while the promoter secures all the equity, if any, in the property."

"Interurban electric roads undoubtedly have a very promising field before them. Frequency of transportation service increases largely the amount of travel and the problem of welding together business centers too far apart to be naturally tributary but requiring quick service to make them so, has been solved by the development of these roads. That under favorable conditions they enjoy a steady and rapid growth is proved by the companies that have entered fields where there was a need for such means of transportation, and have been operating for a number of years."

"As soon as the promoters of these companies realize that the bond buyers and bankers demand in making loans; first, a substantial margin in the shape of actual money put into the construction by the stockholder; second, that the road be in actual operation and showing actual, not estimated, earnings before the general public is requested to buy its coupon securities, and third, that a trolley enterprise, as well as a steam road, requires an experienced and competent management and that the ability to write an attractively worded prospectus does not necessarily mean ability to meet the perplexing problems which arise in the conduct of any transportation system; then their enterprise will receive more substantial recognition."

"That the accounts of these companies as well as those of all semi-public corporations should be made public with frequency and accuracy, is certainly the opinion of the conservative thinkers of the day. That such publication of earnings will mean increased demands for franchise compensation may be true, but this should be met by giving the public a service, which can often be done without extra expense, that would guarantee to the people that the company had some interest in serving the public as well as its stockholders."

"All interurban roads to make conservative and attractive securities should undoubtedly be built as far as possible over private right of way, provided it is expected to bond these roads for any

considerable length of time. Transportation of light freight and express is constantly drifting in the hands of these corporations and in the future unless a private right of way be owned such business will hardly be tolerated over public highways. The country is, at present, on a wave of trolley promotion, handled frequently by people thoroughly inexperienced in such lines. When these enterprises get into the hands of careful men, experienced in that particular line, then and not till then will such properties be considered generally by the public as affording conservative investment."

### VICTORIA HOTEL FOR CONVENTION.

For delegates and visitors to the coming street railway convention at Madison Square Garden who desire to be as near as possible to the convention hall and at the same time to secure a most central and accessibly located hotel, the Victoria Hotel presents special advantages, it being located within one block of the Garden on Broadway, New York's principal thoroughfare. The Victoria is one of the well-known and popular hotels of the city and is thoroughly first-class in all its appointments. The management proposes to give every attention possible to the convention visitors to make their stay a pleasant one. Beside being very conveniently situated, both as to the elevated and the surface car lines in all directions, the Victoria is in the heart of the amusement district, and within walking distance of most of the principal theaters. New York hotels are invariably crowded at this season of the year and intending visitors should engage rooms well in advance.



### ACCIDENT FRAUD IN BALTIMORE.

Two men have been placed under arrest at Washington on a charge of attempting to swindle the United Railways & Electric Co., of Baltimore, out of \$800. The men boarded a car in Baltimore recently and one pretended to be thrown off by the premature starting of the car. The other man went to his assistance. Subsequently an offer to compromise with the company for \$800 was made, and on the offer being rejected suit for \$10,000 damages was brought. The suit is still pending.

### NEW POWER PLANT AT LANCASTER, PA.

The Lancaster County Railway & Light Co. has closed contracts for the building and equipment of a large new power plant the cost of which will be over \$300,000. Its equipment will consist of two 1,500-h. p. units, the power from which will be transmitted to seven substations. Two of the substations will furnish power for the electric lighting and the remainder for the electric railway. The generators will be furnished by the Westinghouse company and the boilers by the Babcock & Wilcox Co. The plant is expected to be in operation in about eight months, and the present plants operating the Lancaster railway will then be abandoned.

The Aurora (Ill.), Elgin & Southern Traction Co. desires to put in effect a street railway mail service between Carpentersville and Yorkville. The proposition has the endorsement of the postmasters of every town on the route.

The Lehigh Valley Traction Co., Allentown, Pa., has put in effect a new wage scale whereby employees will receive 16 cents per hour for the first year of service; 17, the second; 18, the third; 19, the fourth, and 20 cents per hour after the fifth year. The fare between Easton and Bethlehem has been reduced from 15 to 10 cents, and transfers are given from the Easton, Palmer & Bethlehem Street Ry. to any point on the old Easton Transit Co.'s system on the west side of the Delaware River.

## WELL-EQUIPPED TESTING LABORATORIES.

A visit to the new laboratories of the Dearborn Drug & Chemical Co. would well repay every street railway president, manager or engineer, for without exception this company has the most complete laboratories for general testing in the United States. The laboratories occupy a quarter floor of the Rialto



GENERAL LABORATORY.

Bldg., 145 Van Buren St., Chicago, and the accompanying engravings may serve to give some idea of their equipment.

As is doubtless well-known to many of our readers the company makes a specialty of analyzing and treating boiler feed waters to reduce and prevent scale formation and to overcome the tendency of waters to foam, prime, pit or corrode, as the case may be. The company's lubricating oil business has also reached immense proportions with high class steam plants, especially in those where high pressure is used. The perfectly equipped laboratories have a corps of chemists who are expert in their



FURNACE ROOM.

different lines, and every attention is given to anything in the line of analytical testing work. That such a technical institution which is largely devoted to the interests of steam users is appreciated by power station managers and is of great assistance to them, is apparent by the growth of this company from a modest beginning 12 years ago to a company representing an investment in Chicago of over \$300,000 in works, laboratories and general offices, with branch offices at No. 120 Liberty St., New York City; Park Building, Pittsburg; Security Building, St. Louis; Boston Building, Denver; Mills Building, San Francisco; No. 1237 Lincoln Ave., St. Paul, and Brewer Block, Honolulu, H. T.

The Dayton, (O.), Springfield & Urbana Electric Ry. has completed and opened a branch line to New Carlisle.

## A HANDSOME 4-WHEEL CAR.

The Houghton County Street Railway Co., Hancock, Mich., has just received from the J. G. Brill Co. a number of 4-wheel cars of somewhat unusual pattern. Externally their leading features are, straight sides with completely enclosed round vestibules with window guards on both sides. The bodies are 20 ft. 8 in. long with 4 ft. 8 in. platforms at each end, making the over all length somewhat more than 30 ft. They are 8 ft. 2 in. wide over the sides and have a 7 ft. 6 in. wheel base. The trucks are of the 21-E pattern, which carry cars of this length with ease and steadiness, the forged frames giving great strength and solidity to the truck. The inside finish of the cars is of quartered oak, with a three-ply decorated head lining.

One detail of construction in connection with the windows is somewhat unusual and worth notice. There is a double inner sash which drops so that both portions are flush with the window rail. In addition to this there is an outer stationary sash, likewise



NEW BRILL CAR.

made in two parts. This use of a double sash is following a practice long common on steam railways, especially those in the northern part of the country, where extreme cold and severe winds are encountered. The double sash makes the car much warmer and more comfortable for the passengers while the heating is much more easily accomplished, and incidentally too the annoyance from frosted windows is avoided, so that there is no difficulty in recognizing localities. For summer service the stationary sash is removed, leaving the car precisely as it would be when constructed in the ordinary manner. The end windows are stationary. Steel sheathing is provided for the vestibule outside. The doors fold at the steps. Brill angle iron bumper, two "Dedenda" gongs and two sand boxes are used. All the posts are fitted with push signal buttons. The seats and backs are upholstered with spring cane and are longitudinal, but the car was so designed that if at any future time cross seats are desired, the longitudinal one can be taken out and the others installed in their places.

## NEW COMPANY AT MADISON, WIS.

The Madison (Wis.) Traction Co., which was recently incorporated with a capital stock of \$200,000 to consummate the project for an interurban electric line between Madison and Janesville and the development of the water powers at Kilbourn, owned by P. L. Spooner, has elected the following officers: P. L. Spooner, president; F. W. Oakley, vice-president and general manager, and Wayne Ramsay, secretary and treasurer. The board of directors includes the officers and C. B. Welton, of Madison, and Oliver C. Fuller, of Milwaukee. It is stated that Major Oakley will assume the active management of the Madison lines, Mr. Spooner devoting his energies in promoting an interurban road to connect Janesville, Madison, Stoughton, and Edgerton and project for the transmission line between Kilbourn and Madison.

The Columbus (O.) Railway Co. recently secured a temporary injunction to restrain the city annual board of equalization from increasing its appraisement from \$6,500 per mile to \$21,161.54 per mile. Every effort will be made by the company to prevent the collection of the amount returned by the board, which is over \$1,600,000 more than last year. The company, in its attack on the board, claims that it is not legally created.

## Street Railway Supply Houses of New York.

THE LORAIN STEEL CO.'S New York office is located in the Battery Park Building, overlooking Battery Park, the North and East Rivers, and New York Harbor. The Lorain Steel Co. is one of the largest manufacturers in the world of girder and high T-rails; also of curves, switches and all kinds of special work. The company also makes the well-known and largely used "Steel" motors for surface and elevated railroads. The New York office of the Lorain Steel Co. is in charge of Maj. H. C. Evans, who has presided over this office for the past 17 years. He is always pleased to see his friends and will do all in his power during the coming convention to make all street railway men glad that they came. The Lorain company has furnished a very large quantity of special work for the street railways of Greater New York. Samples of its products will be on exhibition at Madison Square Garden during convention week.



H. C. EVANS.



WM. WAMPLER.

MR. WILLIAM WAMPLER, who recently resigned as assistant general sales agent for the Peckham Manufacturing Co., to accept a position with the Stuart-Howland Co., of Boston, as traveling salesman in New York, Pennsylvania, New Jersey, Delaware, and Maryland, was born in 1869. He secured a position with street railways in Pittsburgh, at an early age, commencing as water boy for Italians on the track, and worked his way through shops to the position of division superintendent of one line. He came east to New York, and engaged with General Electric Co. to install 90 cars for the Union Railway Co. of New York, after which he became master mechanic of the railway. He resigned from Union Railway Co. to accept a position as master mechanic of the Atlantic Avenue Ry., of Brooklyn, and the Brooklyn, Bath & West End steam road, which was one of the first steam railroads in this country to change from steam to electricity. He resigned from Atlantic Avenue Ry. in 1894 to become superintendent of rolling stock and equipment of the Union Traction Co., Philadelphia, where he had charge of 3,000 complete car equipments and 16 car barns and shops. He resigned from Union Traction Co. in 1898, since which time he has been with the Peckham Manufacturing Co. of New York, as traveling salesman and also superintendent of the Price hydraulic friction brake.

THE NEW YORK SWITCH & CROSSING CO., of Hoboken, N. Y., makes frogs and switches of all descriptions for both steam and electric roads, and is prepared to give quotations on anything in the track line. Mr. W. C. Wood, president of the company, extends to all his many friends and acquaintances in the trade, a cordial invitation to visit the company's headquarters at 13th and Madison Sts., Hoboken.

THE BAKER HOT WATER HEATERS have been used for many years on the tram of the Brooklyn Bridge and the Brooklyn elevated railways. This heater has been employed by steam roads for over 50 years and is coming into extended use on interurban and heavy electric roads. It is claimed to be positively non-freezing, giving at all times, when required, a cheap and

agreeable heat. The headquarters of the company are at 143 Liberty St., Manhattan.

THE NEAL ELECTRIC HEADLIGHT CO. will be pleased to see its friends at its New York office, 716 Broad Exchange Building, where various types of headlights will be on exhibition. This company has placed headlights in all of the principal cities of the United States and has also a very large foreign business. The entire street railway systems of New York, Boston, Brooklyn, Baltimore and Pittsburg are equipped with the Neal electric headlights, which have proven uniformly satisfactory and are highly recommended. This company was one of the pioneers in the electric headlight business and from a very humble beginning in 1894 has built up a large and constantly increasing trade. Mr. F. E. Huntress, general manager of the company, will be glad to welcome his friends at the above address and will also be present at the convention.

THE GENERAL ELECTRIC CO. maintains elaborate New York offices at 44 Broad St., Manhattan, this branch standing second in importance to the main headquarters at Schenectady. Mr. C. T. Hughes is manager of the New York office, and Mr. R. H. Beach looks after the company's railway interests in the New York territory. General Electric apparatus will be found on all the Greater New York roads.

THE CROUSE-HINDS ELECTRIC CO., of Syracuse, N. Y., has offices and stores on the ground floor of the Havemeyer Building, 25 Cortlandt St., Manhattan. The New York office is in charge of Mr. F. M. Hawkins, who will be glad to talk headlights or switchboards with anybody interested. The Crouse-Hinds company has supplied 50 "Changeable" headlights to the Brooklyn Rapid Transit Co.; a large number to neighboring Jersey roads; a complete switchboard to the Union Railway Co.; switches to the Metropolitan Street Railway Co.; and other supplies to the Greater New York roads. Mr. Hawkins reports that the Crouse-Hinds headlight is growing in favor everywhere wherever a strong, steady, efficient light is needed. It is standard on many interurban roads in this country, and is rapidly extending in use abroad, a recent shipment of 50 lights going to Barcelona, Spain.



F. M. HAWKINS.



BERTRAM BERRY.

THE HEYWOOD BROTHERS & WAKEFIELD CO., of Wakefield, Mass., has large stores and offices at 129 Charlton St., Manhattan, where Mr. Bertram Berry has charge of the railway supply department. One of the company's specialties is the Wheeler "Walkover" seat which Mr. Berry states is popular because it is durable, comfortable and handsome. The mechanism is simple, the rockers, which shift the seat cushion, being operated by cams, thereby avoiding any likelihood of the back catching or binding in reversing. It is made with off-set back, which gives three inch additional aisle space, and is furnished with brass grab handle on the corner of back for standing passengers. The seat has pedestal base, which is a convenience when cleaning the car, and a shifting foot rest, which gives room under the seat for



grips and packages. The company at present has orders for 2,400 revolving car seats for the Brooklyn Rapid Transit Co., this seat possessing, as pointed out in another column, a number of important features suggested by Mr. E. Chamberlin, superintendent of equipment for the Brooklyn system. In addition to car seats, the Heywood Brothers & Wakefield Co. handles rattan spring seating, car seat webbing, lined or unlined, broom rattan, etc.

THE STERLING-MEAKER CO. has its factory in the Lexington Bldg., 141-155 East 25th St., New York City, two blocks from Madison Square and it is well equipped with machinery, tools and all necessary apparatus for the manufacture of Sterling and Meaker fare registers, Sterling brakes, sand boxes and fenders. The company makes six different kinds of fare registers, which are known as the Sterling No. 1 of the numerical type, No. 3 of the clock face, the Sterling double, the Meaker 1894, the Meaker 1899 and the portable. The mechanism of these instruments is quite complicated and receives at times hard service, so that the greatest care and accuracy is necessary in designing all of the parts. The Sterling safety brake has met with severe tests

to this increased tonnage the company is installing a heavier hoisting engine of the gearless, direct acting type, which embodies several improvements. The Mead company has also furnished coal handling machinery to the Kent Avenue station in Brooklyn; the new central station of the Manhattan Elevated Ry.; and other large power stations in Greater New York. The plants include several different types of apparatus, comprising two-man towers with hoisting drums, actuated by steam and electricity; one-man tower with electrically operated drums; and mast and gaff apparatus for erection on wharfs and floats.

THE B. F. STURTEVANT CO., of Boston, Mass., has a local New York store at 131 Liberty St. In connection with street railway work this company is making a specialty of the equipment of boiler plants with fans for mechanical draft; also the fitting out of car barns with the Sturtevant system of heating and ventilation and method of rapidly thawing snow and ice from the running gear and motors, thus much reducing the time a car is out of service. The same system is employed for the heating of office buildings, shops and the like. The company is also furnishing



MACHINE SHOP—STERLING-MEAKER CO.

and large competition but has fully sustained its high reputation as a quick, powerful and safe brake, and its use is constantly extending. The company's output of these brakes this year will considerably exceed that of any previous year. The factory facilities for their manufacture have been greatly extended and the same care as to material and work is strictly maintained in its latest products. Specimens of the company's manufacture will be exhibited at Madison Square Garden convention and the Sterling-Meaker Co. extends a cordial invitation to all delegates to pay a visit to its factory nearby.

THE JOHN A. MEAD MANUFACTURING CO., of 11 Broadway, Manhattan, has furnished coal and ash handling equipment for many stations in and near New York. Of these installations, the principal one is in the Metropolitan Street Ry. station at 96th St., where Mead apparatus is used for hoisting the coal from vessels in the river, and conveying it by two lines of McCaslin overlapping gravity bucket conveyors, to the storage bunkers over the boilers. The cost of taking coal from the vessels, crashing and weighing it, and depositing in the bunkers is  $3\frac{1}{2}$  cents per ton. The machinery was designed to handle 75 tons of coal per hour, but as a matter of fact is now handling 125 tons per hour. Owing

to fans for cooling transformers; such fans are built with direct connected electric motors. Standard types of fans for all general purposes, steam traps for heating systems, exhaust heads for power plants, independent engines in sizes from 2 to 250 h. p. and direct current generating sets in sizes from  $1\frac{1}{2}$  kw. to 250 kw. are among the specialties made by this company. Visitors are always welcome at 131 Liberty St., where a corps of engineers fully conversant with all details of the trade will be pleased to give information concerning the installation of Sturtevant products.

THE AMERICAN VITRIFIED CONDUIT CO., 39 Cortlandt St., New York, is among the largest makers of underground conduits in the United States and has done an amount of business in this line in all parts of the world which has taxed its plants to the utmost during the past year. Its deliveries have been very heavy in the direction of Europe and Japan, Buenos Ayres, etc., and those to all parts of the United States have placed it in the foremost rank of conduit manufacturers. The company has supplied about five million feet of conduit to the city of Baltimore; three million feet to the city of Providence, R. I., with heavy deliveries to New Orleans, Savannah, Philadelphia, Boston and other cities during the year of 1900. The amount of business booked this

season will keep all its plants in full blast night and day for months to come. This season it is furnishing upwards of twenty million feet of multiple duct conduit for the Rapid Transit Subway, New York City, and several million feet for the Manhattan Elevated and the Metropolitan Street Ry. in New York City; also the Consolidated Telegraph & Electric Subway. Its conduits are made at various plants throughout the country and embrace every style of conduit known to the trade, such as multiple duct, single duct heavy self centering joint and the common style of single duct. Mr. B. S. Barnard, manager of sales at its New York office, is well known to the trade and is a constant attendant at all electrical conventions. He has charge of its exhibit at the Pan-American and will also be present at the American Street Railway Association convention.

EUGENE MUNSELL & CO., New York and Ottawa, Canada, mica dealers, are first hands in this article. They obtain their supply direct from the miners in India and Canada, and carry at all times a large stock of all grades to fill any orders with which they may be favored. They enjoy the trade of many of the largest street railroads in the United States, and have always been well known for intelligence and liberal dealing. All goods are as represented, and nothing is handled but the very best material. They would be glad to meet any of the delegates to the convention at their New York office, 218 Water St.

WILLIAM S. SILVER & CO., represented by Mr. William S. Silver, who has been attending street railway conventions ever since they were first held, will, as usual, be found at the Madison Square Garden exhibit this year. Mr. Silver is well known to the street railway fraternity, having for the past 30 years sold large numbers of springs for street car work, as well as other railway appliances. The company manufactures all kinds of graduated coil and elliptical springs for cable and electric trucks and other machinery as well as patent ratchet brake handles and reliable sand boxes. Mr. Silver will be pleased to welcome all visiting delegates.



W. S. SILVER.



C. S. HAWLEY.

THE CONSOLIDATED CAR-HEATING CO., of Albany, is represented by Cornell S. Hawley, eastern agent, with headquarters in the Havemeyer Building, Manhattan. This company has complete electric heater equipments installed in 3,500 cars in New York and Jersey City, and orders for 1,300 additional equipments for Manhattan, making a total of 4,800 cars in New York and Jersey City. The Consolidated company was recently awarded the Manhattan Elevated Railway contract for 21,600 electric heaters, which are illustrated elsewhere in this issue. The company is now filling an order for 360 metal cases to replace the wooden ones on its heaters furnished the Union Railway Co., of New York City, in April and May, 1893. This is the first type of heater case put out by the company, and after eight years of service the heaters are in such good condition that it has been decided to replace the wooden cases, making no other change in the heaters. A similar change was last year made in 500 heaters furnished the Albany Railway Co. in 1892 and 1893.

THE ST. LOUIS CAR CO. will be pleased to welcome its friends at its New York office, 716 Broad Exchange Building

Street railway representatives will find the fullest information at hand, and all necessary photographs, blue prints and general details will gladly be furnished. The general officers of the company will be found at the New York office and also the general eastern agent, Mr. F. E. Huntress, who will be assisted by the New York office corps.

HAROLD P. BROWN, of 120 Liberty St., New York, reports that the demand for the various types of plastic bonds has been much larger than ever for the past year and that he has been especially busy rebonding roads where flexible copper bonds have given out. His exhibit will be on the main aisle of the exhibition hall, and will contain a testing plant which can be used without charge by any street railway official for testing the conductivity of rail bonds, switches, fuses, heaters, cables, metal samples, etc. There will be 3,000 amperes capacity.



HAROLD P. BROWN.



E. J. LAWLESS.

MR. E. J. LAWLESS, now in charge of the John Stephenson Co., has been a well known attendant at street railway conventions since the first one held, for a time as a delegate and then as a supply man. He read a paper on cable roads before the Cincinnati convention in 1886. Mr. Lawless commenced his street railway career as assistant superintendent of the Sutter Street R. R. in San Francisco in 1887, and meeting with exceptional success, he was later called to take charge of cable roads in Kansas City, Mo. An interesting account of his early experiences in Kansas City will be found in the "Review" for October 15, 1900. He then left the railroad field for a time but in 1891 he accepted the position of general manager of the Paterson, N. J., electric roads. After some time he became eastern agent for the American Car Co., of St. Louis, which post he held until this year, when he resigned to take charge of the sales department of the John Stephenson Co. Mr. Lawless is one of the most successful salesmen in the East. He modestly attributes his success to his experience as a railway man coupled with that of a salesman, but his friends lay it to his ready wit, rich flow of language, and a happy faculty of taking a rosy view of the world at large.

THE WESTERN ELECTRICAL SUPPLY CO., of St. Louis, owing to the largely increased demand for street railway appliances and supplies, for which it is either general selling agent or manufacturer, has been compelled to open up an eastern office in New York City, at 149 Broadway. This company has been devoting a great deal of attention to the electrical railway business, and is now prepared to furnish anything pertaining to the equipment, operation or maintenance of electric railways. It carries one of the largest stocks of electric railway supplies in the United States, and is in a position to ship promptly anything pertaining to this line. It issues one of the largest and most complete electric railway catalogues in the business, which it will be pleased to mail on application. This company has demonstrated that it can supply the trade at the same price as manufacturers, and also give the advantage of being able to select from a most complete stock. This enables the purchaser to place his orders in one house for a line of goods, which if placed with manufacturers, would probably be distributed between some 10 or 15 different concerns. The



company states that its business along this line, in the last year has increased over 200 per cent.

THE MICA INSULATOR CO., New York, Schenectady and London, reports a very gratifying demand for "Micanite" and "Empire" material. It has long held the reputation of furnishing high grade goods, which are universally accepted as standard. It received the gold medal at the Paris exposition, which was honestly earned in competition with other manufacturers. This company originally built up mica insulators under the name of "Micanite," and is the sole patentee of this article. It uses nothing but the very best of India or amber sheet mica in the construction of this material, which alone is fitted for commutator insulation. It carries in stock at all times mica rings, collars and segments for all the standard makes of street railway motors. These rings, etc., are guaranteed to fit the shells.

H. M. SHAW & CO., of 115 Broadway, New York, have recently acquired a new member in the person of Mr. Curtis J. Harrington, who has taken an interest in the firm. Mr. Harrington is well known in the railway field, having formerly been connected with the Elmer P. Morris Co. and more recently the manager of the electric railway department of H. F. Lovell & Co. Mr. H. M. Shaw, senior member of the firm, has been closely identified with the electrical industries for the past ten years, and is well known through his connections with several appliances used for protection of electrical apparatus from lightning. This firm manufactures overhead insulation, known to the trade as "Medbery," Shaw's non-arcng lightning arrester, and iron and steel fittings for pole construction. The company will be pleased to meet its friends either at Madison Square Garden or at its New York offices which they are invited to make their headquarters.

WM. WHARTON, JR., & CO., INC., have supplied the Metropolitan and Brooklyn and other neighboring systems with a large amount of special track work and other specialties which they manufacture. The first underground conduit construction of the Metropolitan Co. in 1897 was supplied by them and includes sev-



SPECIAL WORK FOR 23D ST. AND SIXTH AVE. WM. WHARTON, JR. & CO.

eral thousand tons of rails, slot rails, conductor bars, etc., comprising about 30 miles of track. Since then they have supplied nearly one hundred different special track layouts, crossovers, and crossings, among which may be mentioned those at the car houses at 96th St. and 2d Ave., 51st. St. and 7th Ave., and 125th St., and the complicated crossing at 23rd and 6th Ave., 86th St. and 2nd Ave., 69th St. and Columbus Ave., Lenox Ave. and 135th St., and a number of others. Practically all of these layouts and switches, frogs and crossings were provided with Wharton's manganese steel hard centers, which are giving excellent service. In the city of Brooklyn there are a number of important layouts, particularly on the Brooklyn Bridge, and at several places on Fulton St., where this company's special work is in use. A number of its unbroken main line crossovers are also in use in Brooklyn. Some of its special work is also to be found in Jersey City, Hoboken and Long Island City. The terminal at the Pennsylvania Railway

ferry, which has been in use over five years, speaks for itself in regard to the wearing qualities of this work under immense traffic.

MR. WILLARD A. COCKLEY, formerly with the Shelby Steel Tube Co., and lately sales agent for the Runkool Metal Co., has accepted a position on the selling staff of the Mayer & England Co., Philadelphia. Mr. Cockley will take charge of sales in New York State and Northern New Jersey, with headquarters at the company's office, 85 Liberty St., Manhattan.



GUS. SUCKOW.



W. A. COCKLEY.

MR. GUSTAVE SUCKOW is the genial general manager of the Vose Spring Co., 25 Murray St., Manhattan, and there is doubtless no one who is better known to the trade. Mr. Suckow has been with this company for nearly 25 years and knows all that is worth knowing about car springs. Among the company's products are the rubber center yoke springs, the Vose patent rubber and iron core springs, the Vose elliptic and coil springs for all the standard electric trucks, trolley springs, brush holder springs, and every other kind of spring that may be needed by a street railway company.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has recently established offices throughout the United States in order to more expeditiously handle its increasing business in localities distant from the home office. The many new installations which are constantly under construction in New York, Rhode Island, Western Connecticut, and Northern New Jersey are handled by the New York office, at 100 Broadway, New York City. During the approaching convention the company will be glad to receive visitors both at its New York office and at its exhibit at Madison Square Garden. Its force of engineers and assistants at the New York office will be glad to show visitors some of the company's large installations in New York and vicinity, and furnish any information regarding problems which can be solved by the aid of storage batteries.

THE CONOVER MANUFACTURING CO. is located in the Havemeyer Building, 26 Cortland St., Manhattan, where Mr. E. K. Conover, president, and Mr. W. S. Montgomery, secretary, will be pleased to welcome all visitors. The Conover company is prepared to build independent belt and steam driven air and circulating pumps and condensers, in from 5 to 25,000-h. p. units.

THE PHOENIX IRON WORKS CO., of Meadville, Pa., maker of the Dick & Church simple, compound and triple expansion engines, has Eastern offices at 15 Cortlandt St., in charge of C. A. White. Mr. White informs us that his company builds self-oiling, direct connected or belted, automatic cut-off engines, ranging in size from 700 h. p. down, and makes a specialty of installing small street railway, electric lighting or independent power plants. As showing the high grade work which the company does, it may be mentioned that the Park Row Building, Manhattan, said to be the highest office building in the world, has over 1,000 h. p. in Phoenix engines for supplying electric lights and electric elevators. The Broad Exchange and other important buildings are similarly equipped. The Phoenix Company also makes



horizontal tubular and Manning vertical boilers, and this business has grown to such proportions as to demand the erection of new boiler shops at the company's Meadville works.

THE STIRLING CO., Chicago, has a handsome suite of rooms at Havemeyer Building, 26 Cortlandt St., Manhattan, where Mr. A. L. Rogers, New York manager, will receive visitors and point out the good qualities of the Stirling water tube safety boiler, one of whose strongest recommendations is that there are over one million horse power of this type in use. Stirling boilers can be seen doing continuous service at several large lighting and power plants in New York and Brooklyn, notably the Kings County Electric Lighting Station, where 3,000 h. p. have been installed, and the New Rochelle lighting and power plant, where boilers aggregating 2,700 h. p. are now going in. The mammoth works of the General Electric Co. at Schenectady, N. Y., use Stirling boilers exclusively, as does also the Schenectady Railway Co. The Stirling company is also shipping many boilers abroad, this export business being in the hands of S. S. Lacs, of the New York office.

THE AJAX METAL CO., of Philadelphia, maintains an agency in the Havemeyer Bldg., 26 Cortlandt St., Manhattan, where Mr. C. W. Ownston, jr., looks after the interests of Ajax trolley wheels and bushings, which are sold under the motto, they "stand at the head." The Ajax metals are endorsed by managers in this country and abroad. The company feels particularly proud of one letter from a prominent electric railway company, reading "that after all our tests we find that the 'Ajax' wheel shows fully 75 per cent better service than any other wheel we have ever used." Mr. Ownston will cheerfully furnish convention delegates with full particulars and samples.

THE C. & G. COOPER CO., builders of corliss engines, Mt. Vernon, O., is represented in the East by Mr. F. W. Iredell, New York manager, and Mr. A. W. Tubbs, with headquarters in Havemeyer Building, 26 Cortlandt St., Manhattan. Cooper engines are installed very generally throughout the New England and Eastern states, and have found a particularly wide application in street railway work. Within the New York Metropolitan area there are five Cooper engines in the 39th St. station of the Brooklyn Rapid Transit Co., eight in the Atlantic Ave. station, and one in the Montague St. cable plant. The Union Railway Co., in the Bronx, also has several. In New England Cooper engines are running the Lynn & Boston, the Lowell & Suburban, and other equally important roads. Mr. F. S. Fairchild, Mt. Vernon, O., is president of the company, and is always glad to give information and tell what his company is doing in high pressure, compound, condensing engine work.

THE PECKHAM MANUFACTURING CO. states that it has the following trucks in use in and about the Metropolis: In Manhattan, on the lines of the Metropolitan and Union Railway companies, about 1,200 single trucks; in Brooklyn, on the lines of the Brooklyn Heights, Coney Island & Brooklyn and Nassau roads, 1,500 single trucks; in Long Island City, on the lines of the New York & Queens County Railroad Co., 200 single trucks; in Jersey City, on the lines of the North Jersey Street Railway Co., 400 single trucks; in Hoboken, on the Jersey City, Hoboken and Paterson street railways, 100 single trucks; in Staten Island, on the lines of the New York & Staten Island Electric Railway Co., 50 single trucks. In addition to these single trucks, there are in use on these lines some 800 of Peckham's short wheel base and maximum traction trucks. The New York headquarters of the Peckham company are in Havemeyer Building, 26 Cortlandt St., Manhattan, where the following staff is located: Edgar Peckham, president and treasurer; Chas. H. Duell, vice-president; Geo. H. Bowers, secretary and assistant treasurer; E. C. Long, general sales agent.

THE STANDARD PAINT CO. extends a cordial invitation to all visitors at the convention to visit its New York headquarters at 100 William St., where a full stock of P & B insulating tape, P & B armature and field coil varnish, and P & B electrical compounds will be on hand. There will also be other compounds.

Mr. Ralph L. Shainwald, president, and E. F. Vandewater, purchasing agent of the Standard Paint Co., with other members of the staff will be on hand to receive old and new friends.

MR. FRANCIS GRANGER, who has his headquarters in the Havemeyer Building, Manhattan, is eastern agent for several A1 specialties, nearly all of which are in general use on the street railways of New York and vicinity. He handles shoes of the Corning Brake Shoe Co., of Corning, N. Y.; sand boxes of the Ham Sand Box Co., of Troy, N. Y.; the Wood platform gate made by the R. Bliss Manufacturing Co., of Pawtucket, R. I.; wheels of Lehigh Car Wheel & Axle Works; registers of the New Haven Register Co.; fenders of the Hipwood Barrett Car & Vehicle Fender Co. The Corning brake shoe is in extended use on the Brooklyn Rapid Transit, the Coney Island & Brooklyn, the Union Ry., the Metropolitan and the Manhattan Elevated. Wood's double folding gates are standard on all the Brooklyn roads, the North Jersey Street Ry., and are used on the suburban trains of the New York Central and New York, New Haven & Hartford roads. The Ham sand boxes at present are made in four styles known as the No. 4, No. 5, No. 7 and No. 8. The No. 4 box is standard on the Brooklyn Rapid Transit, and has recently been adopted on the Coney Island & Brooklyn. It is now being tested with a view to its adoption by several other New York roads. The J. G. Brill Co. has adopted the Ham sand box as standard, and puts it on all cars where other boxes are not specified. Mr. Granger will have an elaborate exhibit at the convention, and will show samples of all his lines.

THE CURTAIN SUPPLY CO. of Chicago has samples of its car curtains, car fixtures and curtain materials on exhibition at room 111 Havemeyer Building, 26 Cortlandt St., Manhattan. The company's goods will be found on many of the Brooklyn and New York roads.

THE FALK CO., of Milwaukee, furnishes all the gears and pinions used on the Metropolitan Street Ry. The company is represented in the East by Wendell & Mac Duffie, Havemeyer Building, 26 Cortlandt St., Manhattan.

THE TAUNTON LOCOMOTIVE MANUFACTURING CO., of Taunton, Mass., has sweepers, sprinklers and snow plows on various lines in and near New York, including the Metropolitan, Brooklyn Rapid Transit and Jersey roads. The company's selling agents are Wendell & Mac Duffie, Havemeyer Building, 26 Cortlandt St., Manhattan.

THE CHASE-SHAWMUT CO., of Boston, is represented in the New York territory by Wendell & Mac Duffie. The company is bringing out a flexible rail bond, which is claimed to be a radical departure in rail bonding, and with which, it is announced, is secured perfect contact, enduring life without deterioration, and no loss of current to cause electrolysis.

THE GREEN FUEL ECONOMIZER CO., of Matteawan, N. Y., wishes to announce that its New York manager, Mr. Downs, with his corps of assistants will be found at its New York office, 74 Cortlandt St., Manhattan, or at Madison Square Garden during the street railway convention, and that he will be very pleased to show any of the delegates the Green economizers that are being erected at the present time for the Manhattan Railway Co.; also those in the Brooklyn Rapid Transit Co.'s plants, the Consolidated Traction Co.'s plant at Jersey City, the Edison Electric Illuminating Co.'s plant in Brooklyn, and a great number of manufacturing plants, which may interest some of the delegates. The Green Fuel Economizer Co. is at the present time fitting economizers to some of the most important plants that are going up, among which are those of the Boston Elevated Railway Co., the Rhode Island Suburban Ry., the Aurora, Elgin & Chicago Railway Co., Manhattan Railway Co., Metropolitan West Side Elevated Railway Co., Chicago; Everett (Wash.) Railway & Electric Co., Galveston (Tex.) City Railway Co., Denver Tramways Power Co., Pennsylvania Railroad Co., Scranton, Pa.; Grand Rapids (Mich.) Railway Co., and the Union Street Railroad Co., New Bedford, Mass.

THE CLING-SURFACE MANUFACTURING CO., of Buffalo, is selling large quantities of its well-known belt dressing through its eastern manager, Mr. Chas. F. Chase, who makes his headquarters at 39 Cortlandt St., Manhattan, and maintains branch offices at 170 Summer St., Boston, and in the Bourse, Philadelphia. Mr. Chase emphasizes the point that Cling-Surface is not only a belt dressing but a filler and preserver as well and must be applied according to the simple directions given with each package to secure perfect results. He adds that it should not be looked upon as merely a remedy to be used only when belts give trouble by slipping, for its greatest advantage lies in the fact that it will enable even a new belt to be run "slack" without the slightest indication of slipping and consequent loss of power. The Cling-Surface Manufacturing Co. solicits the submission to it of belt problems of all kinds, as its experience in reclaiming apparently worn out, oily and slipping belts has given it a fund of information which it believes will enable it to cure the worst cases of belt troubles.



CHARLES F. CHASE.



PAUL H. BRANGS.

THE HEINE SAFETY BOILER CO., of St. Louis, wishes to impress the fact that it is now building a new line of the celebrated Heine boilers, especially constructed and proportioned for burning low grades of anthracite coal, culm, rice, etc., in which field it has met with wide success. The company has two moderately equipped works, one at St. Louis and one at Phoenixville, Pa. Its Eastern department is in the hands of Paul H. Brangs, of 11 Broadway, Manhattan, who reports a number of important contracts lately closed. One with the Keystone Improvement Co., of Hazelton, Pa., is for the new electric railway to be built between Hazelton and Wilkesbarre; one of 1,000 h. p. for the Philadelphia & Lehigh Valley Traction Co., and one of 1,500 h. p. for the Lackawana R. R. Mr. Brangs is one of the earliest comers into the street railway field and was associated in the 80's with Maxim, Edward Weston, of Weston instrument fame, and others. He was with the United States Electric Lighting Co. before its merger with the Westinghouse interests. He is a member of several engineering societies and knows all there is worth knowing about boilers.

THE STOW MANUFACTURING CO., of Binghamton, N. Y., has its track drills and new multi-speed motors on exhibit at 126 Liberty St., Manhattan.

J. G. WHITE CO., 29 Broadway, Manhattan, will have practically its entire engineering staff on hand at the Garden to welcome old friends and new. Mr. White is planning to return from Europe in time to attend the convention.

THE AMERICAN STEEL & WIRE branch offices in New York occupy the 20th floor of the Empire Building, Broadway and Rector St., Manhattan. The company will have a large force of representatives at the Garden.

THE HOOVER, OWENS, RENTSCHLER CO. of Hamilton, O., builder of Hamilton-Corliss engines, announces that owing to the increase in its business, the company has recently reorganized and the capital stock raised to \$2,000,000, a large portion of which

is to be expended in doubling the present capacity of the works at Hamilton. The new facilities will enable the company to bid upon and handle with dispatch and skill the larger engine units, for which the past year or two has brought a greatly increased demand. In fact the company proposes to enter a new field, and is about to bring out a new line of vertical engines especially adapted for heavy direct-connected railway work. The plant at Hamilton is now running day and night in the effort to keep pace with orders in hand. The Eastern headquarters of the Hoover, Owens, Rentschler Co. are at 39 Cortlandt St., Manhattan, with Mr. W. B. Mayo in charge as Eastern manager. Mr. Mayo will be in daily attendance at the convention and will be pleased to meet all friends at the Garden, or at his offices, and give any information that may be wanted regarding the "Hamilton-Corliss." The company's engines will be found running in the Edison station in Brooklyn, or in the new station of the North Hudson County railway, where a 750-cross-compound engine is driving one generator from which both direct and alternating current is taken for railway work, the direct current at 550 volts leading from the commutators in the usual way, while a 300-volt alternating current is taken from collector rings, passed through step up transformers and transmitted to distant sub-stations equipped with rotary converters and step down transformers.

THE ALBERT & J. M. ANDERSON MANUFACTURING CO., of Boston, handles the New York and adjacent territory from branch offices at 135 Broadway, Manhattan, in charge of Ernst Woltmann. Anderson line material is standard on the Brooklyn Rapid Transit, and is used on the Metropolitan, the Jersey and Staten Island roads. The company's switches and switchboards are also in general use on all the Greater New York systems. In addition to these practical exhibits, the Anderson company is planning to make an elaborate display at the Garden during the convention, where it will show its regulation line of hangers, insulators, cars, switchboards, etc. An important feature of the exhibit will be a heavy, outside-pole, positive bus and starting switch, for 1,000-kw. rotary converter, which the company has made for the Edison station in New York.

THE HEADQUARTERS OF THE WESTINGHOUSE COMPANIES in New York are at 120 Broadway, Manhattan, where elaborate offices are maintained. Open house will be kept there during the convention and also at the Murry Hill parlors and at the Garden. The Westinghouse exhibits will comprise the magnetic brake, axle driven compressors, and the company's storage air brake system for traction cars; also motor, transforming and generating apparatus illustrating the latest developments in the art. The braking apparatus for street railway purposes is made by the Westinghouse Air Brake Co., but the sales department is conducted by the Standard Traction Brake Co., of 120 Liberty St., Manhattan.

THE PANTASOTE CO. is located at 29 Broadway, Manhattan, where Mr. John M. High, New York manager, will be delighted to receive visitors. Pantasote has been almost universally adopted in New York and Brooklyn for curtains, and largely for car seats. A complete line of samples will be presented at the Garden.

THE SAFETY CAR HEATING & LIGHTING CO.'S main offices are at 160 Broadway, Manhattan. The Pintsch system of lighting, which this company controls, has been adopted by the Manhattan Elevated and all the steam roads entering New York. It was also used exclusively on the Third avenue and Broadway cable lines before their conversion to electricity. The "Safety" car heating systems include hot water circulation, and return and regulating direct steam systems for buildings and steam and street railway cars.

THE WEBER RAILWAY JOINT MANUFACTURING CO. occupies a suite of rooms at 71 Broadway, Manhattan. Weber joints are standard on the Brooklyn Rapid Transit system and have been installed on the Manhattan and the Jersey roads. The Weber company is prepared to furnish rail joints for T and girder sections, and for every class of service, from the lightest to the

most severe. It will be glad to hear from roads that have special track problems to solve. The company will be well represented at the Garden next month.

THE SALES ORGANIZATION of the Bullock Electric Manufacturing Co., of Cincinnati, and the Wagner Electric Manufacturing Co., of St. Louis, has headquarters in the St. Paul Building, Manhattan. These two companies, while retaining their separate identities, have combined their sales departments and are now able to take contracts for installing complete direct or alternating apparatus up to the largest sizes sanctioned by practical use. The companies are giving especial attention to high tension transforming and converting work, and have recently developed a new line of high voltage, air and water cooled transformers in large sizes. Wagner and Bullock apparatus will be shown at the Garden, where George Bullock, Eugene H. Abadie, Robert T. Lozier and others will be in attendance. Mr. Lozier, district manager, handles the eastern territory, making his headquarters at the St. Paul Building. He is well and favorably known in the trade.



R. T. LOZIER.



D. W. PHELAN.

D. W. PHELAN, 277 Broadway, Manhattan, dealer in trolley poles and ties, reports good business during the past year, the list of roads for which he has supplied poles and ties including the following: Westfield (N. J.) & Elizabeth Electric Ry.; Union Ry., New York; Trenton (N. J.), Lawrenceville & Princeton Electric Ry.; Albany & Hudson (third-rail) road, which owns a complete line of heavy poles for feeders and telephone wires; Southfield Beach Ry., of Staten Island; Oneonta, Cooperstown & Richfield Springs Electric Ry.; the Edison companies of Manhattan and Brooklyn, and many others. Mr. Phelan will make an exhibit of poles at the Garden in connection with materials of the Creaghead Engineering Co. and the Pittsburg Reduction Co.

THE MORRIS ELECTRIC CO. can be found at 15 Cortlandt St., Manhattan, and at the Garden during convention week. The company announces that it sells everything for street railways, but is making a big bid for the bond and register business. It has its own factory at East Orange, N. J., which was described in the last issue of the "Review," and the personal attention of one member of the firm is given to every detail of the factory work. In addition to its own goods, the company is agent for many leading specialties, including the following: Instruments of the Keystone Electrical Instrument Co., Hunter street car signs; McGuire trucks and sweepers; gears and pinions of the Simonds Manufacturing Co., Pittsburg; Garton lightning arresters; line material of the Albert & J. M. Anderson Manufacturing Co., Boston; Wood's platform gates; "Monarch" single and double fare registers, and other supplies and specialties.

ARTHUR KOPPEL, 66 Broad St., Manhattan, maker of light railways, cars, etc., for power houses and boiler plants, is represented by Ernst Wiener. This firm undertakes to reduce operating expenses by lessening the cost of labor for handling coal, ashes, waste and other materials in street railway and electric lighting plants, mills and industrial establishments.

THE WELLS LIGHT headquarters are at 46 Washington St., Manhattan. Edward Robinson is sole proprietor.

THE ALLIS-CHALMERS CO. has New York offices in the Broad Exchange Building, Manhattan. "Allis" engines in Manhattan and Brooklyn are described elsewhere in this issue.

FORD, BACON & DAVIS, engineers, have offices in the Singer Building, 149 Broadway, Manhattan. This firm, in addition to other engineering work in the vicinity of New York, built complete the electric railway system of the old Bergen County Traction Co., now the New Jersey & Hudson River line, running from Edgewater, N. J., opposite West 130th St., Manhattan, over the Palisades to Hackensack, Englewood and other Jersey towns. The road has been fully described in past issues of the "Review."

KINNEAR ROLLING DOORS, made by the Kinnear Manufacturing Co., of Columbus, O., will be found in all the modern car shops of the Metropolitan, Brooklyn Rapid Transit and other New York roads. The New York agents are Wm. H. Brodie & Co., 45 Vesey St., Manhattan.

THE CONTINUOUS RAIL JOINT CO. of America has its factory and headquarters at 142 Market St., Newark, N. J., where information concerning rail joints will be cheerfully given, or the company's representatives can be found at the Garden during the convention. The "Continuous" joint has been used for years on steam roads and has also come into extensive favor with street railway builders and managers, owing to its strength, efficiency and general wearing qualities. Joints of this make will be found on the Metropolitan and other of the Greater New York roads.

DIXON products, than which there are none better made, will be found in endless variety at the works of the Joseph Dixon Crucible Co., in Jersey City, or at the company's exhibit space in Madison Square Garden.

THE HAZARD MANUFACTURING CO., of Wilkesbarre, Pa., has New York stores and offices at 50 Dey St. The Hazard trade mark on a reel of insulated wire or cable is a guarantee of quality. Hazard ropes are being utilized extensively in handling excavated material in the New York rapid transit subway work.

THE CHRISTENSEN ENGINEERING CO., of Milwaukee, is preparing an elaborate exhibit which will occupy space on the main aisle of Madison Square Garden. The company's New York office is at 135 Broadway, Manhattan, in charge of Mr. F. C. Randall, manager of the eastern department, who is one of the best known and most popular supply men in the business. Mr. Randall states that Christensen air brakes are increasing rapidly in favor in the East and cites in proof two large recent orders, one from Buffalo Ry., and one from the Boston Elevated Railway Co. The company will be represented at the convention by the following staff: N. A. Christensen, S. W. Watkins, F. C. Randall, J. T. Cunningham and J. H. Denton.

THE RECONSTRUCTED GRANITE CO., 14 Dey St., Manhattan, can interest anyone desiring information relative to third-rail insulators for elevated, third-rail surface, or surface-contact work. The company has recently made great progress in developing the material called "reconstructed granite," and it is now in a position to supply a first-class insulator for heavy work. Reconstructed granite consists of natural granite pulverized, molded into shape and fused. It is remarkable for its strength, high insulating properties and resistance to sudden changes of temperature, as well as its insolubility in all acids and alkalis at any temperature. Mr. William Courtenay, president of the company, states that "reconstructed granite" insulators are used exclusively on the Brooklyn Elevated lines.

THE AMERICAN ELECTRICAL WORKS, of Providence, is represented in New York by Mr. W. J. Watson, 30 Cortlandt St., Manhattan. Mr. Watson wishes all the company's best of



friends to make themselves at home at his offices during the convention, and all who accept this invitation may be assured that nothing will be left undone to make their comfort complete, for the American Electrical Works enjoys a reputation for hospitality second to none in the trade.

THE AMERICAN BRAKE SHOE CO., of Chicago, is represented in the East by the Ramapo Foundry Co., of Mahwah, N. J., with New York offices in Havemeyer Building, 26 Cortlandt St., Manhattan, this company being one of the regular licensees to make the "Diamond S" and "U" brake shoes under patents owned by the American Brake Shoe Co. The company especially recommends its "Diamond S" brake shoe for use on chilled wheels under electric railway equipment. The "U" brake shoe consists of a body of special metal, of a nature midway between mild steel and hard cast iron, having its two ends hardened from the back by chilling, leaving the main body of the shoe unhardened metal. Mr. F. W. Sargent, managing engineer of the American Brake Shoe Co., is an expert in this particular field, and that he has succeeded in developing a thoroughly satisfactory brake shoe is evidenced by the fact that the shoes made under these patents are standard on leading roads both East and West. The general manager of the Ramapo Foundry Co. is O. H. Cutler.



F. W. SARGENT.



B. S. HARRISON.

THE ARNOLD ELECTRIC POWER STATION CO., of Chicago, which has done an extensive engineering and contracting business in the West, has opened offices at Room 711 Transit Building, No. 7 East 42d St., Manhattan, in order to better take care of its increasing business. This company, acting as engineer and contractor, has built many large works from its own designs, among which may be mentioned the Chicago & Milwaukee Electric Ry. complete, exclusive of track; the power plant of the Chicago Electric Traction Co.; the power station of the Imperial Electric Light, Heat & Power Co., St. Louis, Mo., and many other smaller installations. It is now constructing as engineer and contractor the power station and sub-stations complete for the Grand Rapids, Holland and Lake Michigan Rapid Railway Co.; the complete railroad, from location to equipment, of the Lansing, St. Johns & St. Louis R. R. (60 miles), and the complete shop equipment of the St. Louis, Iron Mountain & Southern Ry. at Little Rock, Ark. It is also acting as consulting engineers for the Union Pacific Railway Co.; the Oregon Short Line Railroad Co. and the Chicago & Alton Railway Co. on complete shop equipments. The company's Eastern office is in charge of Mr. B. S. Harrison, a graduate of the Boston Institute of Technology, formerly with the B. F. Sturtevant Co. For the past two years he has had charge of the mechanical engineering work on the new New York Customs House and the State Capitol at St. Paul, Minn., now being built from the designs of M. Cass Gilbert, the government architect of these structures.

MR. WALTER J. FLOYD, with offices at 716 Broad Exchange Building, Manhattan, represents F. E. Huntress of Boston, who is general Eastern agent for the St. Louis Car Co. Mr. Floyd will be on hand at the convention to do his share toward making everybody have a good time. The St. Louis Car Co. will have two parlors at the Waldorf-Astoria, where Messrs. Huntress and Floyd will keep open house.

THE BABCOCK & WILCOX CO. feels that it need make no other statement than to say that Babcock & Wilcox boilers are used exclusively in the three big street railway power stations in Manhattan, those of the Manhattan Ry., the Metropolitan Street Ry. and the Third Avenue R. R. The B. & W. headquarters are now in the Singer Building, Broadway and Liberty St., Manhattan, where open house will be kept during the convention.

THE BRIDGEPORT BRASS CO., 19 Murray St., Manhattan, continues to talk the good qualities of "Phono-Electric" wire, and is ready to submit samples and data from tests to prove the four strong claims urged in favor of this wire; namely its high tensile strength, its high elastic limit, its toughness or ductility, and its wearing qualities. "Phono-Electric" wire is said to be giving good service in Brooklyn and the Bronx.

THE CONSOLIDATED CAR FENDER CO., 39 Cortlandt St., Manhattan, will have space at the Garden, 70 ft. long, where will be shown full sized Providence fenders in four different styles: Style A, for ordinary open cars; style B, for low closed cars; style C for either high or low cars, and style D which is extra strong and heavy for interurban and suburban cars. The company will also be able to make a practical exhibit of its fender, inasmuch as there are 3,000 Providence equipments on the cars of the Metropolitan Street Ry. Col. Woodworth states that over 10,000 of these life-saving devices are now in practical operation in all parts of the globe, and prospects are bright for a continuance of the heavy demand. In addition to fenders the company will show at the Garden, the Millen car step lifter for raising the running step of open cars from either platform, and the Campbell snow broom, both of which devices it makes and sells.

THE OKONITE CO., whose trade mark is known the world over, has its main offices in the Postal Telegraph Building, 253 Broadway, Manhattan. Okonite wires, tapes, weather proofing and rubber insulation are used whenever there is electricity to be transmitted. The officers of the company are as follows: Managers, W. L. Candee and H. Durant Cheever; general superintendent, Geo. S. Manson; secretary, W. H. Hodgins.

COLUMBIA INCANDESCENT LAMPS, made by the Columbia Incandescent Lamp Co., of St. Louis, are handled by R. B. Corey, Havemeyer Building, 26 Cortlandt St., Manhattan. He speaks of them as "Columbia, the Gem of the Land." They are widely used in New York.

THE PENNSYLVANIA STEEL CO., of Steelton, Pa., has furnished a large proportion of all the rails and special work in the streets of Manhattan, the Bronx and Brooklyn. The New York headquarters for Pennsylvania Steel interests are in Empire Building, Manhattan, where Stephen W. Baldwin, New York manager, has his offices.

THE ELECTRICAL ENGINEERING & DEVELOPMENT CO., 29 Broadway, Manhattan, will be represented at the convention by H. S. Cooper, president, B. Y. Frost, vice-president, and W. S. Gurnee, 3d, secretary and treasurer. This company does a general commercial engineering business, acting as advisory, constructing, supervising and operating engineer for electric railways, lighting and power plants.

THE JOHN A. ROEBLING'S SONS CO., of Trenton, N. J., offers as its principal exhibit in New York, the Brooklyn Bridge and the new East River Bridge, for both of which the Roebling company furnished all the wires, cables and ropes used in their construction. In recent street railway work in Manhattan and Brooklyn, Roebling wires have played an important part. At the present time the company is under contract to deliver 2,000,000 ft. of 500,000 and 1,000,000-cm. paper insulated lead covered high tension feeder cables for the Metropolitan; large quantities of three-phase, high-tension cables for Third Avenue R. R.; and trolley and feeder wire for the Brooklyn Rapid Transit Co. The Roebling company will have a good exhibit at Madison Square

Garden, where H. L. Shippy, New York manager, M. R. Cockey, G. W. Swan, and other representatives will be in daily attendance.

THE OHIO BRASS CO., of Mansfield, O., assures a hearty welcome to all visiting members of the street railway fraternity at its New York office in the Commercial Cable Building, No. 20 Broad St. The office is in charge of Messrs. R. A. Byrnes and Alfred B. Edes, who represent the company in eastern territory. Both of these gentlemen are well and favorably known to the trade and they cordially invite visiting delegates to call and make themselves at home during their sojourn in the city.

THE GOULD STORAGE BATTERY CO., of 25 West 33rd St., Manhattan, will have on exhibition at Madison Square Garden a full line of its central station and railway battery plates. Mr. W. W. Donaldson will have charge of the exhibit and will explain the construction and peculiar features of the Gould battery. Mr. Donaldson is one of the pioneers in the battery business, having entered the field in Baltimore as far back as 1884, and is well known among the battery and electric men of the country. Mr. W. S. Gould is the vice-president and general manager of the company and Mr. Donaldson is sales-engineer. The Gould battery is attracting a large amount of notice among managers of railway and power plants on account of its high rate of discharge and its high efficiency.

THE ALBANY COMPOUND & CUP CO., of which Adam Cook's Sons, 313 West St., Manhattan, are the proprietors, wishes to emphasize the fact that for thirty years it has been the sole maker of the original Albany grease, which is unlike any other lubricating compound made and which it is claimed has become the standard of excellence and the best lubricating compound ever introduced for general machinery. Referring to the matter the company says: "The country is full of bogus compounds that are claimed to be 'similar in looks to Albany', a 'fac simile of the Albany', and 'the same as Albany', etc. We boldly declare there is no lubricating compound made the same as the Albany, that none will do the same amount of work, that there is only one Albany grease, and we are the only manufacturers of it. If there is any way by which we can make this fact more plain so the consumer and jobber will not be deceived, we would kindly ask one and all of our patrons to tell us what it is, and we will give it immediate consideration." Adam Cook's Sons will gladly send samples of the Albany compounds, free for testing.

THE STANDARD UNDERGROUND CABLE CO. is now furnishing the Manhattan Railway Co. all of the cables to be used by it for transmitting power from its generating station on the Eats River to the sub-stations along the line of the elevated railway. These are three-conductor paper insulated, lead covered cables, to be operated at a pressure of 11,000 volts alternating current. Considerably more than half of the 350,000 ft. of cable involved in this order has been shipped, and a large portion of that installed in the company's subways in New York. All of these cables have been and are being manufactured at the company's Perth Amboy factory. The company is also at present at work on a 100,000-ft. order of three-conductor 250,000-c. m. cable for 6,600 volts service for the Brooklyn Heights Railroad Co., and in addition to the cable furnished on that order, has supplied this same company since the first of the year with nearly 100,000 ft. of No. 4-0, 500,000 C. M. and 1,000,000 C. M. cable. This company will be represented at the street railway convention by T. E. Hughes, Southeastern sales department manager, located in Philadelphia; A. B. Saurman, Northeastern sales department manager, located in Boston; G. L. Wiley, manager of the Eastern sales department, and by Chas. J. Marsh, general manager, Eastern and Northeastern sales department, located in New York. It is also possible that J. R. Wiley, manager of the Western sales department, located in Chicago, will be present, and possibly a representative from the home office at Pittsburgh.

THE PITTSBURG REDUCTION CO., of Pittsburgh, Pa., states that although the commercial use of aluminum as an electrical conductor for street railway wire and high tension power trans-

mission wire dates back but two or three years, its success in this field has been very gratifying. The New York office of this company is in charge of Mr. Safford K. Colby at 99 John St., Manhattan. Mr. Colby is a graduate of the Rensselaer Polytechnic Institute and has been connected with his company for six years in various capacities. The product of the Pittsburgh Reduction Co. is favorably known among local street railways notwithstanding the comparatively short time it has been on the market.

THE WHEELER CONDENSER & ENGINEERING CO., of 120 Liberty St., Manhattan, has placed its cooling towers, condensers, and feed water heaters in a large number of plants in and about New York, two of the largest installation being a 2,000-h. p. tower for the Hoboken station of the North Hudson County Electric Ry., and apparatus for the 26th St. station of the Edison company in New York.

BERRY BROTHERS, LTD., varnish makers, whose factory and main offices are located at Detroit, maintains a flourishing branch office at 252 Pearl St., Manhattan, where all delegates will be made welcome. Berry Brothers have made varnishes for fifty years and there is probably hardly a finisher in the country who is not more or less familiar with these goods.

### NEW JONES OPEN CAR.

The works of J. M. Jones' Sons, of West Troy, N. Y., which are among the oldest establishments of this kind, are constantly busy with orders from the company's regular customers, many of whom have used Jones cars for the last 50 years. The illustration herewith shows one of this company's new open cars which have been recently introduced and are meeting with much favor.

The car is 40 ft. long over all and contains 15 benches. It has enclosed ends and double steps, the lower one of which folds up.



40-FT. OPEN CAR J. M. JONES' SONS.

There are steel plates on the sides and ends of the car, the end plates running around the buffer and lapping over the side plates, making it impossible to telescope the car. There are gutters on each side of the roof running the full length of the car and having outlets on the corners. There are end supports to the bonnets and guard poles on each side of the car.

Its equipment includes electric bells, a double row of spindle back seats and curtains which fall to the sills.

### THE HALLE-MERSEBURG ELECTRIC RAILWAY.

Work has been begun on the electric railway between Halle and Merseburg, Germany, for which permission was granted several months ago. Consul Warner reports from Leipzig that the Halle-Ammendorf section will be completed before winter. The total length will be ten miles, and power will be obtained from the River Saale. The projected road between Leipzig and Halle has been abandoned, the necessary franchises having been refused by the government.

The Steubenville (O.) Traction & Light Co. will locate a summer resort at Alikanna, to be known as Park Dehewahmis, and elaborate improvements of the place will be made next season. The park site contains 82 acres of wooded land and is picturesquely situated on the cliffs overlooking the Ohio River.

## PERSONAL.

DR. W. BURNELL WEAVER, formerly of Miamisburg and Dayton, has been appointed surgeon of the Cincinnati Traction Co., and will remove to that city.

MR. F. J. STOUT, general manager of the Toledo, Fremont & Norwalk Railroad Co., has been appointed general superintendent of the Lake Shore Electric Railway Co.

MR. JOHN B. ALLAN, who has the management of the engine sales department of the Allis-Chalmers Co., was born in Day-



J. B. ALLAN.

enport, Ia., Jan. 14, 1860. He was graduated from Worcester Polytechnic Institute in 1880, and the following spring went to work for the Edward P. Allis Co.; after spending four years in the drafting room, machine shop and on the road erecting engines, he came to Chicago Jan. 1, 1885, as manager of the Chicago office of the Edward P. Allis Co. At this time the electric railways were just beginning to be developed and he sold engines to some of the first roads to be equipped with electricity, and ever since he has been in close touch with the development of the electric railway field and has secured the orders for a large number of the railway engines now used in the Chicago power houses. The Edward P. Allis Co. is now merged into the Allis-Chalmers Co., which has its main offices on the tenth floor of the Home Insurance Building, Chicago, where Mr. Allan now has his headquarters as manager of the engine sales department.

MR. M. J. KINCH, superintendent of the Holland & Lake Michigan Electric Railway Co., has been appointed superintendent of the Grand Rapids, Holland & Lake Michigan Rapid Ry., which controls the former company.

MR. JOHN G. HONECKER, who has been supervising the construction of an electric railway in Trenton, N. J., will accept a position as superintendent of the Eastern branch of the Lehigh Valley Traction Co.'s system.

MR. GEORGE W. HOUCK, of Worcester, Mass., has been appointed receiver of the Buffalo (N. Y.), Hamburg & Aurora Railway Co. The road, it is stated, will continue operation under receivership until plans for its reorganization are perfected.

THE BUFFALO (N. Y.) & WILLIAMSVILLE ELECTRIC RAILWAY CO. has elected the following directors: L. L. Lewis, jr., James Chalmers, L. L. Grove, E. C. Longnecker, J. S. Youngs, G. L. Lewis, John Otto, jr., W. C. Carroll, H. B. Lee and D. T. Perry.

MR. FREDERICK SARGENT, of the firm of Sargent & Lundy, Chicago, returned home last month after a two months' absence in Europe where he was accompanied for the greater part of the time by Mr. L. A. Ferguson, general superintendent of the Chicago Edison Co.

MR. THOMAS S. NOLAN, of Janesville, has been elected vice-president of the Janesville (Wis.), Beloit & Delavan Lake Railway Co., which was incorporated in March to build an electric line from Janesville to Rockford via Beloit, with a branch from the latter city to Delavan Lake.

MR. FRED J. GREEN, general manager of the Dayton, Springfield & Urbana Electric Railway Co., of Springfield, O., has been appointed general manager of the Great Northern Construction Co. Mr. Green will continue his connection with the former company in addition to his new duties.

MR. WALTER D. CROSMAN, who for several years has been prominent in the railroad field as editor of the Railway Review and the Railway Master Mechanic, was on July 15th appointed Western representative of the Gold Car Heating Co., with headquarters at 614 the Rookery, Chicago.

THE MYERSVILLE (MD.) & CATOCTIN RAILROAD CO. held its annual meeting at Myersville, August 13th, at which John T. Hilderbrand, George D. Gaver and William M. Bittle resigned as directors. Clarence and John M. Lane and Christian Lynch, of Hagerstown, were elected in their places.

MR. C. P. COGSWELL, JR., has resigned as western representative of the Weber Railway Joint Manufacturing Co. in order to accept a position in the engineering department of the Chicago Great Western Ry.; Mr. Cogswell will have his office in St. Paul.

MR. L. ERBECK has resigned as master mechanic of the Jersey City, Hoboken & Paterson Street Ry., which office he has held for nine years. On the day of his departure he was visited by all his employes in a body and presented with a diamond ring as a token of their regard.

MR. E. H. LONGACRE, formerly superintendent of the Akron city lighting department of the Northern Ohio Traction Co., has accepted a position with the Cleveland Construction Co. in connection with the construction of the Western Ohio Ry. Mr. Longacre will be temporarily located at St. Mary's, O.

THE CHERRY HILL, ELKTON & CHESAPEAKE CITY ELECTRIC RAILWAY CO., of Elkton, Md., has elected the following directors: M. P. O'Brien, John F. Cahill and W. J. McGregory, of Philadelphia, and James F. Powers, John T. Wilson and Ricketts Nelson, of Elkton. M. P. O'Brien was elected president.

THE WINDSOR LOCKS (CONN.) & RAINBOW STREET RAILWAY CO. has elected the following officers: Henry A. Huntington, of Windsor, president; Frank E. Healy, of Windsor Locks, secretary and treasurer; F. E. Healy, H. A. Huntington, Lester C. Seymour, Horace H. Ellsworth and T. L. Healy, directors.

MR. C. O. SIMPSON, auditor of the Augusta (Ga.) Railway & Electric Co., has accepted the position of secretary-treasurer of the Birmingham (Ala.) Railway, Light & Power Co., and will assume the duties of his new position September 22d. Mr. Simpson is a native of Troy, N. Y., where he was born in 1865. He removed to Kansas City in 1885, and served for several years in the auditing department of the Metropolitan Street Railway Co. His connection with the street railways in Augusta is of three years' standing. During his residence in the latter city Mr. Simpson has performed invaluable services for the company which employed him, and has filled a position of prominence in other business and social circles. He was secretary of the Dyer Insurance Co. and of the Augusta Gas Light Co., and chairman of the subscription committee which succeeded in raising funds for the memorable spring festival in Augusta, last year. Mr. Simpson was the organizer of the Augusta Railway Athletic & Benefit Association, which is now in a flourishing condition and comprises 115 members, all employes of the Augusta Railway & Electric Co. His departure for Birmingham is much regretted in the city he leaves, but it is a progressive step in the career of one of the most promising street railway men in America.



C. O. SIMPSON.

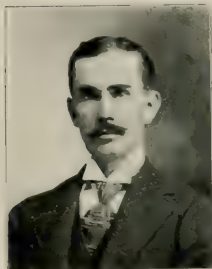
MR. R. E. DANFORTH has been appointed general manager of the Lake Shore Electric Railway Co., of Cleveland, which con-



trols the Lorain & Cleveland Railway Co.; the Sandusky & Interurban Electric Railway Co.; and the Sandusky, Norwalk & Southern Electric Railway Co., of which roads Mr. Danforth has been manager since April, last.

MR. W. P. PALMER, of Moberly, Mo., was recently appointed general claim agent of the St. Louis Transit Co., and Mr. C. B. Hardin was appointed as his assistant in that office. Mr. Palmer has been assistant claim agent for the Wabash R. R. for the past 22 years, having charge of claims on all the lines of that system west of St. Louis. Mr. Hardin has been his assistant for 12 years.

MR. GEORGE W. CHANCE, formerly of Philadelphia, has been appointed by the Consolidated Lake Superior Power Cos. as chief engineer of the International Transit Co., and will assume the duties of this position in addition to those of chief engineer of the Tagona Water & Light Co. Mr. Chance's headquarters will be for the present in Sault Ste. Marie, Ont., where he will have charge of installing 6,000 h. p. in motors and generators and the designing of the systems of wiring, etc. Mr. Chance was born in 1864. He was educated at the University of Pennsylvania, and has later had an extended experience in the electrical field.



G. W. CHANCE.

MR. ROBERT T. IVORY has resumed the active management of the Youngstown, Park & Falls Street Ry., he having been prevailed upon to withdraw his resignation by the owners of the line, and Mr. Ivory returned to work August 12th. Mr. Ivory's return was the cause of much satisfaction to the employes of the road, with whom he is popular and by whom he is held in the highest regard.

MR. S. B. FORTENBAUGH has severed his connection with the English Electric Manufacturing Co., of Preston, England, and has engaged with the engineering staff of the Metropolitan District Electric Traction Co., of London, the company which was recently organized by Mr. Charles T. Yerkes. Mr. Fortenbaugh was formerly connected with the Walker Co., of Cleveland, O.

THE PITTSBURG & BIRMINGHAM TRACTION CO., at its annual meeting August 15th, re-elected officers as follows: W. L. Mellon, president; A. W. Melton, vice-president; R. B. Melton, treasurer; George S. Davison, secretary and general manager, and Weaver H. Rogers, assistant secretary. The directors elected were: W. L. A. W. and R. B. Mellon, G. S. Davison, W. S. Mitchell, J. H. Gross and C. F. Farren.

THE BOONSBORO & HAGERSTOWN (MD.) RAILWAY CO., whose proposed line between the cities named is under construction, has elected the following officers: Christian Lynch, president; Clarence Lane, vice-president; William Jennings, treasurer; W. C. Hepperle, secretary, and Christian Lynch, Clarence Lane, William Jennings, W. C. Hepperle, H. S. Eavy, H. H. Keedy, jr., and John M. Lane, directors.

THE TOLEDO, COLUMBUS, SPRINGFIELD & CINCINNATI RAILWAY CO. perfected its organization at Toledo, August 14th, electing Ellis Bartholomew, of Youngstown, president and general manager; C. H. Wells, of Milwaukee, Wis., first vice-president; A. F. McCormick, of Columbus, second vice-president; I. N. Coward, of Sidney, secretary; William P. Heston, of Toledo, treasurer, and Claud Wyant, of Toledo, general counsel.

PROF. WILLIAM S. ALDRICH, has been appointed to the directorship of the Thomas S. Clarkson School of Technology, Pots-

dam, N. Y., and will relinquish his interests in Toronto, Can., where he recently located in consulting engineering practice. The school has been thoroughly provided for in the appointment of new instructors, additional equipment and reorganization of courses. There are regular four year courses in civil, mechanical and electrical engineering.

MR. GEORGE F. McCULLOCH, president and general manager of the Union Traction Company of Indiana, recently purchased the News, a morning paper of Muncie, Ind., at private receiver's sale. Mr. McCulloch is the owner of the Star, also published in Muncie, which has the largest circulation in Indiana outside of Indianapolis, though Muncie is the sixth city in the state in point of population. The News will be combined with the Star under the title of the Star-News.

MR. R. T. GUNN, who has been superintendent of the Lexington (Ky.) Railway Co., resigned that position and left Lexington on July 27th to assume the office of superintendent of the station and light department of the Norfolk (Va.) Railway Co., which is owned by the same interests that control the Lexington road. Mr. Gunn was one of the most thoroughly capable electric railway men in Kentucky and had many warm friends who, while regretting his departure at the same time congratulated him on a merited promotion.

MR. W. H. DOUGLASS, superintendent of the Montreal Park & Island Railway Co., has severed his connection with that company, and goes to Cleveland to fill an important position on the Northern Ohio Traction Co. Mr. Douglass, who has been with the Montreal company two years, made his first start in railroading with Mr. Everett in London, Ont., some 12 years ago, and now returns to the employ of the Everett syndicate, bearing with him the best wishes of the officials and employes of the Montreal Park & Island company.

MR. W. W. WHEATLEY, general superintendent surface lines of the Brooklyn Rapid Transit Co., is a railroad man of wide experience. He was for some time chief train dispatcher for the Chicago & Northwestern Ry., and afterwards held responsible positions with the West Shore R. R. He went with the Brooklyn system in 1896, first as division superintendent, then assistant superintendent, and now general superintendent of surface lines. Mr. Wheatley is a vice-president of the New York Railroad club, and was for many years its secretary.



W. W. WHEATLEY.

MR. RICHARD EMORY, who has been connected with the Nashville Ry. and the Cumberland Electric Light & Power Co. for more than two years as superintendent and general manager, resigned August 17th, to accept a position with the street railway and electric light system of that city. Mr. Emory is a man of large experience in the management of street railway systems, having been connected with the Baltimore system for eight years before going to Nashville. In Baltimore he began at the bottom, received an early practical mechanical education and at the end of eight years when he left to come to Nashville he was general manager of both the railway and the light companies. He went to Nashville as superintendent and was soon placed in charge as general manager. During his service in this capacity he demonstrated his thorough knowledge of the business and his ability to conduct it properly.

MR. ALBION E. LANG has been elected president of the Toledo Railways & Light Co., which is the successor to the Toledo Traction Co., of which he was president. The new company has elected other officers as follows: L. E. Beilstein, vice-president and general manager; F. S. Borton, secretary and treasurer, and E. W. Moore,

chairman of the board of directors. The board includes: E. W. Moore, H. A. Everett, A. E. Lang, L. E. Beilstein and F. S. Barton. Mr. Barton Smith, formerly counsel for the Toledo Traction Co., will fill a similar position with the Toledo Railways & Light Co.



E. H. PACKE.

MR. E. H. PACKE, engineer maintenance of way, of the Brooklyn Rapid Transit Co., was born in England in 1864 and received his education at Oxford University. After moving to this country he was engaged on a number of engineering works, serving for two years as surveyor for the new East River Bridge; two years with the New York elevated lines; and two years with the Brooklyn elevated lines. He has been with the Brooklyn systems for over seven years, and now has full charge of track maintenance and construction for the Brooklyn Rapid Transit Co.

MR. JOHN HAMLIN, superintendent of the Union Traction Co. of Indiana, on September 4th, most pleasantly entertained a party of friends in President McCulloch's private car "Martha." The party, which included F. J. J. Sloat, general manager of the Southern Ohio Traction Co.; Charles Remelius, master mechanic Indianapolis Railway Co.; A. B. Hogue, superintendent Indianapolis, Greenwood & Franklin R. R.; F. A. Poor, of the Weber Railway Joint Manufacturing Co., and W. H. Gray, of Hanna & Gray, left Indianapolis early in the morning and was taken over the entire system, lunch being served in the car. At Anderson Mr. McCulloch joined the party.

MR. GEORGE D. YEOMANS has been appointed general attorney of the Brooklyn Rapid Transit Co. and all the subsidiary lines controlled by it. The office is a new one, created on the advice of Sheehan & Collin, general counsel of the company. He will have charge of all court actions and negligence cases, and his name will appear as the representative of the company on all court papers. Mr. Yeomans is a graduate of Yale University, of the class of 1890. Later, he was for seven years junior partner of the firm of Lockwood, Hayt & Yeomans, Buffalo, N. Y. Mr. Yeomans removed to Brooklyn in October of last year, and has since that time been connected with the firm of Sheehan & Collin.

THE FIRM OF HANNA & GRAY, of Chicago, has been dissolved, the junior partner, Mr. W. H. Gray, retiring. The business will be continued by Mr. J. A. Hanna, who will remove to Cleveland, and take offices in the Electric Bldg.

MR. WILLIAM A. HOUSE, general manager of the United Railways & Electric Co., of Baltimore, has been appointed assistant to the president of that company in addition to his former duties. This gives Mr. House full supervision over all the business of the company.

MR. S. ROY WRIGHT, formerly superintendent of the West End road at Denver, Col., previous to the consolidation there, has been appointed general manager of the Colorado Springs Rapid Transit Co., of which he will supervise the reconstruction. The rapid growth and prosperity of Colorado Springs has necessitated the rebuilding and extending of the street railway system.

MR. M. F. BURKE, superintendent of railway department of the Terre Haute Electric Co., has resigned that position to become general manager of the El Paso & Jaurez Avenue Street Railway Co., of El Paso, Tex. This property has recently been purchased by Messrs. Stone & Webster, of Boston, for whom Mr. Burke will take charge of it on his arrival in El Paso.

MR. ASA H. MOORE, formerly the owner of the street railway system of Bloomington, Ill., died at his home at 4115 Lake Ave., Chicago, August 13th, of softening of the brain. Mr. Moore was born in Worcester County, Mass., in 1820, and at the age of 19 entered the service of the Western R. R., as a conductor, on the run between Boston and Springfield, a position which he held for 11 years. He removed to Bloomington in 1854, and was appointed superintendent of the Chicago & Mississippi R. R. In 1869 he purchased the street railway at Bloomington, of which he retained possession until 1885.

MR. JOSEPH DEE, who for years has been connected with the Boston street railways, died at his home in North Cambridge, Mass., August 14th, of hemorrhage of the brain. Mr. Dee was 48 years of age, and had served in different capacities with the street railway companies of New England for 23 years. In 1892 he was appointed superintendent of the Cambridge division of the West End Street Railway Co., and continued with the Boston Elevated when the West End system was leased.

Surveys have been completed for the proposed line from Lake Bluff to Libertyville, which will be built by the Chicago & Milwaukee Electric Railway Co.

Eight hundred feet of copper feed wire was stolen from the lines of the Schuylkill Valley Traction Co., between Trooper and Collegeville, Pa., on the night of August 17th.

The Columbian Montour Electric R. R., between Lime Ridge and Bloomsburg, Pa., has been put in operation. The Berwick-Lime Ridge division will soon be opened for traffic.

The Elizabeth (N. J.), Plainfield & Central Jersey Railway Co. is considering abandoning Recreation Park as an amusement resort. Band concerts and vaudeville will probably be discontinued there another season.

The Michigan Traction Co. on August 19th put in operation an express car over its lines between Kalamazoo and Battle Creek. Superintendent Rand is arranging a permanent schedule for express traffic between the cities.

The Haverhill, Plaistow & Newton Electric Railway Co. is erecting a car house at Plaistow, N. H., to be 150 x 90 ft. in dimensions and two stories high. Brick will be used in the erection of the building. An ornamental clock tower will surmount its north-east corner.

The Burlington (Ia.) Railway & Light Co. adopted a new wage scale, September 1st, whereby conductors and motormen formerly receiving \$1.30 per day are advanced to \$1.40; and all conductors and motormen who have served the company for two years will receive \$1.50 per day.

The York (Pa.) & Dallastown Electric Ry., a seven-mile line which was opened for traffic July 27th by the York County Traction Co., is the first of a number of trolley lines which the company projects operating to every important point in York County. Satisfactory progress is being made on the lines which will complete the system. William H. Lannis is president of the company.

The Grand Rapids (Mich.) Railway Co. has removed its engines and two 200-h. p. boilers from the old power house to the new one; with the installation of the 500-h. p. engine now being built for lighting purposes and the running of special cars, the new plant will be complete. Since August 4th the new Green economizer has been used for heating the feed water of the new boiler.

Two hundred and fifty laborers and 100 iron workers, employed by J. J. Hart & Co. in the construction of the new electric line on the King's Bridge Road from 161st St. New York, to King's Bridge, struck for higher wages, August 17th. The laborers became tired of their strike after being out for two hours, and returned to work. The iron workers followed their example the next day.

## CONSOLIDATION AT NEW ORLEANS.

The New Orleans City Railroad Co., formerly the New Orleans Traction Co., has accepted the offer of H. H. Pearson, jr., acting for Brown & Co., of Philadelphia, for the purchase of all its lines, which are 13 in number, including all its cars, machinery, power plants, etc. A large number of the stockholders have registered their stock in consent of the purchase, and as soon as two-thirds of the stock has been secured Mr. Pearson will take charge of the road. A similar offer has been extended to all the other railway companies operating in the city, and Mr. Pearson believes there will be no trouble in inducing the other companies to accept the offers, now that the company with much the largest mileage has done so. If this is accomplished, the new company will control 186 miles of road.

The interests represented by Mr. Pearson have already taken all the bonds of the Alchafalaya Levee district, \$5,000,000 of the new drainage and sewerage bonds of the city of New Orleans, and has purchased control of the New Orleans Gas Co. at a cost of \$3,500,000, thus securing a monopoly of supplying New Orleans with gas. They have also made an offer for the purchase of the New Orleans Water Works.

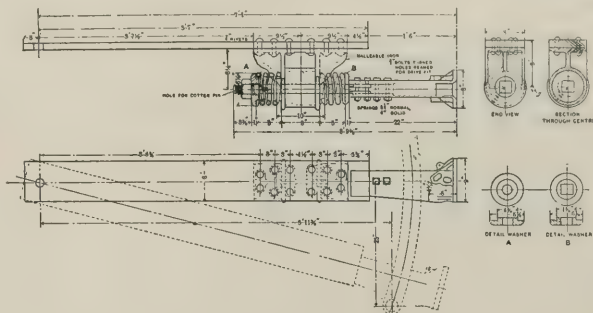
## NEW VAN DORN COUPLERS.

The W. T. Van Dorn Co., of Chicago, has designed two new types of couplers for the elevated railroads of New York, which are shown in the accompanying illustration. One of these couplers has a long flat arm with helical springs placed near the coupler head. This is for use on the motor end of a car, and is arranged so as to allow the drawbar to clear the motor and at the same time to give a direct pull. This is known as the Van Dorn No. 16, and the other, which is known as the No. 15, is for trail cars and the ends of motor cars not equipped with motors. The two motor equipments of the Manhattan will carry both motors on one truck to get the greatest tractive effect. These are used in connection with the Barnes patent swivel on the body bolster, which secures very smooth running of trains with the least possible jerking motion. It is claimed that with this apparatus there will be no slack in the rigging during the lifetime of a car.

The Van Dorn company now makes sixteen sizes of couplers, suited for any service from the lightest to the heaviest. The automatic head makes these devices among the most efficient on the market, and in the past eight years this company has supplied over 50,000 for use in city and suburban service. The use of these

couplers on both the New York and Boston elevated systems is a guarantee of their merits.

The order for the Manhattan Ry. includes draft rigging for 100 new cars being built and coupler equipments for 1,000 cars now in



NO. 16 VAN DORN COUPLER.

service. The automatic heads for this order are of an entirely new design with extra heavy links to meet the severe service on the elevated lines.

## NEW WORK OF JOHN BLAIR MacAFEE.

John Blair MacAfee, of Philadelphia, who does a large contracting and construction business in electric railways, has a large amount of work on hand, particularly in the South, where he is interested in a number of new enterprises. Among these may be mentioned a 36-mile transmission line for the Cape Fear Power Co., of Fayetteville, N. C., and the complete construction and equipment of Augusta (Ga.)-Aiken Ry. The latter line will be 23 miles long.

The Orleans & Jefferson Ry., on which work was suspended some time ago, has been purchased by Mr. MacAfee, and a new company is being organized, to be called the New Orleans & Ponchartrain Ry. Work on this road will be resumed and it will be completed by May, 1902.

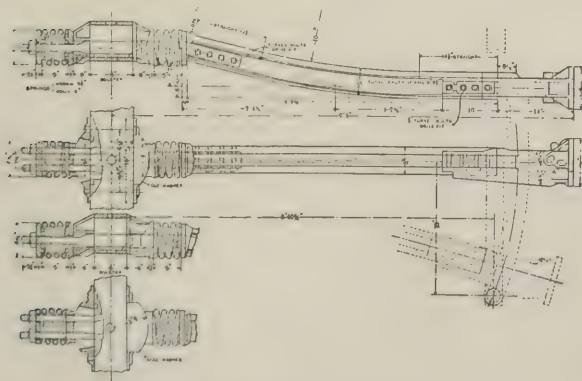
Plans and specifications have been completed by Mr. MacAfee for the Baltimore, Hazelthorpe & St. Denis Ry. and the Sparrows Point & North Point Ry. Work on both of these roads will be begun this fall.

The Augusta (Ga.) Railway & Electric Co. is equipping all its winter cars with vestibules.

The Pittsfield (Mass.) Electric Street Railroad Co. has installed a new 500 h. p. engine, which will furnish sufficient power to operate the proposed extension to Cheshire.

The Pere Marquette R. R., which was recently awarded damages to the amount of \$200 for the opening of Center St., at Lansing, Mich., for an electric railway, demands damages to the amount of \$8,000, and will appeal.

The Toledo, Columbus, Springfield & Cincinnati Railway Co. has perfected its organization with Ellis Bartholomew, president and general manager; C. H. Wells, first vice-president; A. F. McCormick, second vice-president; I. N. Covault, secretary; William P. Heston, treasurer, and Claude Wyant, general counsel. The construction of the road between Columbus and Lima is progressing rapidly, and the work will soon be commenced between Lima and Toledo.



NO. 15 VAN DORN COUPLER.



## DURABILITY OF GEARS AND PINIONS.

Among the manufacturers who have made rapid progress in street railway supply lines since the last convention is the United States Projectile Co., of Brooklyn, N. Y., who make the well-known "Projectile Brand" cast steel cut gears and patent pressed pinions for all electric systems. The durability of life of gears and pinions is a most important matter with every master mechanic, and to this problem the United States Projectile Co. has given much attention, its experience of the past ten years in working up steel of varying hardness for the severest tests, for the United States Government, having aided materially in this work. The result of the company's experiments is the .30 per cent carbon special steel pinion, solidified under a pressure of over 1,000,000 pounds, which is claimed to be the most durable pinion produced. The United States Projectile Co. is authority for the statement that the carbon in the average cut pinion is .12, and very seldom, if ever, over .15 per cent, as it is too costly to cut a higher carbon, and thus harder, steel; and hence the "Projectile Brand" pinions have 100 per cent more carbon than cut pinions, which, with the great compression to which the steel is subjected, ensures the increased mileage. This company also makes cut pinions, but strongly recommends the pressed pinions as being more durable.

The "Projectile Brand" motor gears are made of the best open



PLANT OF THE UNITED STATES PROJECTILE CO.

hearth steel castings, cut on the latest and most improved gear cutters, and every effort is made to have their construction of the very best.

The accompanying engraving shows a view of the works of this company, which are located on New York Bay; the buildings aggregate a quarter of a mile in length.

We are advised that many large contracts have been closed during the past few weeks, and the present output of the works is more than double that of any time in its history. The Brooklyn Rapid Transit Co. is a large user of these gears and pinions. Special attention is also given to export trade.

## NEW CAR SHEDS FOR WINNIPEG.

Work has been commenced on the new car sheds for the Winnipeg Street Railway Co. The new structure will cost \$55,000 and will be 291x134 ft. in area and one story high. It is to occupy the site of the old building, which has been entirely removed. It will accommodate one hundred cars and will be ready for occupancy in October.

Fifteen new cars were recently added to the service of the Toledo (O.) & Monroe Ry., owing to greatly increased traffic. The running time between Toledo and Monroe has been cut from 50 minutes to 35.

## NEW PUBLICATIONS.

**REPORT, CRERAR LIBRARY.** The sixth annual report of the John Crerar library for the year 1900 has recently been issued. The last year has been a prosperous one for the library, the surplus funds, after fitting up new quarters at a cost of \$9,000, being greater than for any previous year since the first. The number of visitors was 41,500 for the year and 10,422 volumes have been added.

**PROCEEDINGS, American Railway Engineering and Maintenance-of-Way Association.** The proceedings cover the second annual convention of this association, held in Chicago, March 12-14, 1901. The volume comprises nearly 500 pages devoted to the discussions of various railroad topics, reports of committees, list of members and roads represented in the association. A section is also devoted to the state laws relating to grade crossings.

**KOGYO SOWA** is the title of an engineering and trade journal which is about to be published in Japan. The contents of this paper are to consist chiefly of translations from the leading European and American journals. The first number of the paper will appear Nov. 1, 1901, and it will be the only journal of that class in Japan, as, while other engineering papers are published there

relating to the home industry, this journal will be devoted almost entirely to the developments of foreign countries.

**STATISTICS OF MANUFACTURES, 1899-1900.** Part II of this work covering the report for 1900 has recently been issued by the Bureau of Statistics of Labor of the Commonwealth of Massachusetts. The report is based on the returns of 4,645 representative manufacturing establishments. The capital invested in all industries shows an increase of 1.78 per cent in 1900 over that of 1899. There was an increase of materials used for the past year of 8.57 per cent and an increase of product of 8.51 per cent over 1899. The increase in the number of persons employed for the same period was 3.77 per cent, and the average yearly earnings per individual without regard to age or sex was \$427.60 in 1899 and \$439.57 in 1900.

**ELEMENTS OF ELECTRICAL ENGINEERING.** By C. P. Steinmetz. Published by the Electrical World and Engineer, 320 pp.; price \$2.50. The first part of this book can be considered in part as an introduction to the author's work on Theory and Calculation of Alternating Current Phenomena and originated from a series of University lectures which he promised to deliver at some time. The present work comprises the fundamental principles of both alternating and direct currents. The second portion is a series of monographs on the most important electrical apparatus, and is less theoretical and more descriptive

than the first part. Like all of Mr. Steinmetz's writings this book is a valuable addition to electrical literature.

ARMOUR INSTITUTE YEAR BOOK for 1901-1902 has recently been published and gives a description of the technical courses pursued in that institution. Four years courses in mechanical, electrical, civil and chemical engineering and architecture are included in the scope of the college, all of which lead to the degree of Bachelor of Science in each department. The institution was founded for the purpose of giving young men an opportunity to secure a liberal education and its charges for instruction are such as to make it available to all classes. Its theoretical instruction is also supplemented by a great deal of practical work, for which the institute is well equipped. The Armour Scientific Academy is an auxiliary school of preparatory courses to the technical college.

STATISTICS OF RAILWAYS IN THE UNITED STATES. The 13th annual report of the Interstate Commerce Commission for the year ending June 30, 1900, has been issued in an advance copy. The report is similar to those previously issued as to the data contained. The aggregate length of railways in the United States on June 30, 1900, was 193,345 miles, being an increase of 4,051 miles over the previous year. The number of railways in the hands of receivers on June 30, 1900, was 52. The number removed from receiverships during the year was 35, and the number placed under receivership was 16, showing a decrease of 19 compared with the previous year. The increase of railroad mileage in the United States has increased in practically at the same rate as the population for the last ten years.

THE GENERAL ELECTRIC CO. has recently issued the following publications: Bulletin No. 4240 (superseding No. 4210), Rheostats for Generators, Motors and Projectors. Bulletin No. 4255, Four Motor Equipments. Bulletin No. 4256, Three-way Sockets and Three-way Snap Switches. Bulletin No. 4257, Fuse Plug Cabinet Panels. Bulletin No. 4258, Compensated Revolving Field Alternators. Bulletin No. 4259, Form D Lever Switches. Bulletin No. 4260, Electric Blowers and Exhausters. Bulletin No. 4261, Electrically Driven House Pumps. Catalog and Price List No. 7543, Parts of R-22 Controller. Catalog and Price List No. 7546, Parts of Magnetic Blow-out Automatic Circuit Breakers. Flyer No. 2072, Insulator Type Porcelain Cut-out. Flyer No. 2073, Electric Power for Machine Tools. Flyer No. 2074, Improved Regulator for Brush Arc Generators. Flyer No. 2075, Edison Porcelain Plug Cut-outs. Descriptive Catalog No. 1034, Lightning Arresters, with an introductory article on "Thunderstorms." Bulletin No. 4262, Motor Controllers for Power and Mining Machinery. Bulletin No. 4263, Round Pattern Indicators. Catalog and Price Lists No. 7547, Repair Parts of G E 53-A Railway Motor; No. 7458, Standard Fuses. Price List No. 5085, Lightning Arresters. Flyers Nos. 2076, 2077, 2078, 2079, 2080, 2081, 2083, various electrical supplies.

### COLLISION IN ATLANTA, GA.

A head-on collision on the River line of the Atlanta Rapid Transit Co. occurred on August 23d, in which one man was killed and several seriously wounded. The collision occurred on a sharp curve near Simeville between two suburban cars, both of which were crowded. Both cars were running at full speed and came together on a curve, there being no opportunity for the motormen to see the tracks ahead of them. One of the cars was behind time and was attempting to make a switch which it should have reached had it maintained the schedule.

Surveys for the proposed electric railway from Independence, Kan., to Cherraville and Coffeyville have been made by L. B. Wallace and his corps of engineers.

The Toledo, Eastern & Findlay Electric Railway Co. now operate cars on an hourly schedule between Findlay and Findlay. The company proposes, when the road is fully dedicated, to make an average speed of 15 miles an hour with its fast trains, which will make but few stops between Findlay and Toledo.

### NEW PORCELAIN CABLE INSULATOR.

In response to a demand for a strong and efficient cable insulator suitable for extra heavy work, Fred M. Locke, of Victor, N. Y., has brought out the new form presented herewith, which he calls his No. 5 cable insulator. This is  $4\frac{1}{4}$  in. in diameter and  $4\frac{1}{4}$  in. high, with a top groove for wire  $1\frac{1}{2}$  in. in diameter. The



NO. 5 LOCKE CABLE INSULATOR.

Locke No. 5 steel pin, with porcelain base, is especially fitted for the No. 5 cable insulator, and the two make a very strong combination. These new forms are furnished, either in brown or white, and are of the same thoroughly vitrified porcelain always used by Mr. Locke in his insulator work.

### RAILWAY TRACK BROOMS.

The accompanying illustration shows a new pattern of railway track brooms which are manufactured by H. Thompson, of Concord, N. H. These are being extensively introduced on street railways in all parts of the country and filling the requirements



for a strong, light but durable tool. The broom is supplied with a patent cleaning and setting tool for track curves and switches. The chisel is of hardened steel and is easily changed from one broom handle to another as the brooms wear out. Circulars and price lists will be mailed upon application.

Satisfactory progress is being made on the new electric road across Jamaica Bay from Brooklyn to the beach. Two miles of meadow land along the route has been filled in to a height of 8 ft., and a width of from 80 to 100 ft.

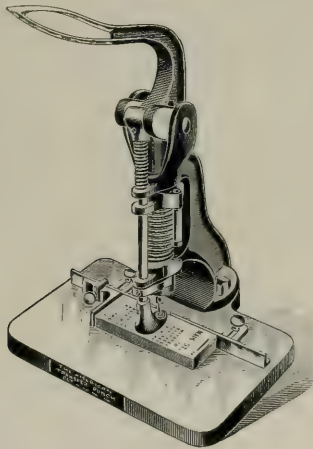
The Miami & Erie Canal Transportation Co. has no other purpose in view than the towing of freight boats by means of the electric lines which it is building along the banks of the canal. The absurdity of press reports to the effect that the company would operate passenger cars along this road is obvious from the fact that the principal promoters of the canal syndicate are also interested in the Southern Ohio Traction Co. and the Western Ohio Railway Co., whose partially completed system of electric railways between Cincinnati and Toledo parallels the canal for a greater part of the distance.

### NEW NILES CAR FACTORY.

The Niles Car & Manufacturing Co., of Niles, O., plans to open its extensive new factory to operation on Nov. 15, 1901. The new works are located directly on the lines of the Erie, B. & O. and Pennsylvania railroads, all of which have sidings running directly into the company's yards. The floor space of the erecting shops covers nearly seven acres. All of the buildings have been designed and located with a view to the easy handling of the work and the plant will have a capacity of about two cars per day. The shops are provided with overhead electric cranes for handling heavy work and there is also a compressed air plant which furnishes power for loading and unloading materials and various other purposes. Modern machinery and appliances have been provided throughout in order to enable the company to turn out the very best equipments possible. Cars will be built complete and tested before being sent from the factory, which will enable the customer to put them immediately into service as soon as received. A specially strong construction is to be adopted for suburban and interurban cars in which steel and iron will enter largely into the framing. Specifications as to quality and material will be strictly adhered to in all of the company's products. All business pertaining to contracts will be under the personal supervision of Mr. George E. Pratt, assistant general manager and contracting agent of the company.

### AMERICAN TRANSFER PUNCH.

We illustrate herewith a new transfer punch known as the "American," which is used for punching pads of 100 transfers in one operation. It is made by Southworth Bros., of Portland, Me., and is an exceedingly durable machine. When many transfers are used it saves a large amount of time by punching out the day and



the month of a pad of transfers and leaving only the street and hour for the conductor to punch.

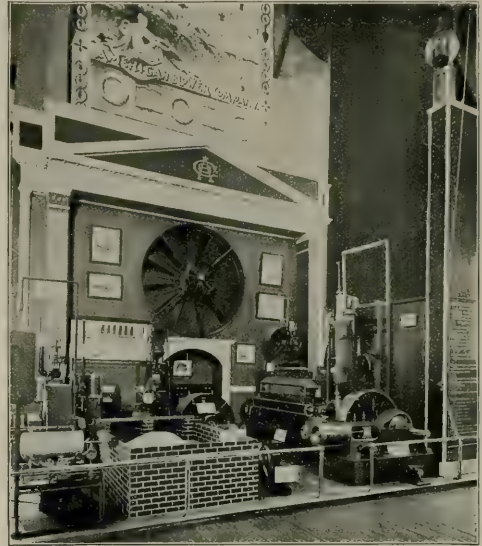
Besides the time saved, a great many less conductors' punches are found broken on roads where this has been adopted. The machine is substantially built with a fine finish and the advantage in its use will be readily apparent to any street railway man.

The Northern Ohio Traction Co. will erect an arch bridge to replace the present slanting trestle over the gorge at Cuyahoga Falls, where several accidents have occurred.

The Mansfield, Crestline & Galvin Ry., which is projected by the Pomeroy-Mandelbaum syndicate, of Cleveland, to form part of the proposed system between Cleveland and Columbus, is nearing completion. Several bridges have been built along this route, all of them heavy enough for the accommodation of steam traffic.

### AMERICAN BLOWER CO.'S PAN-AMERICAN EXHIBIT.

The accompanying illustration shows the exhibit of the American Blower Co. at the Pan-American Exposition, which is situated in block No. 26 of machinery hall, and contains an assortment of heaters, fans, engines, blowers, dry kilns, trucks and other kindred machinery which is of general interest to almost everyone, as



some of these devices enter into almost all lines of manufacture in one way or another. The booth is handsomely designed, the decorations being rendered in ivory white and deep green. The booth is about 20 ft. in height and is surmounted by a gable end resting on some prominent columns. Above this is a large painting nearly 60 ft. high which is emblematical of the American blower.

One of the most noticeable exhibits is a large 140-in. full housed steel plate fan which is in operation, being driven by an 8 x 8 in. marine type vertical engine which is coupled direct to the fan. From the discharge which points upwards myriads of yellow and blue ribbons stream up into the air.

In the wall back of the exhibit is fitted a 108-in. disc fan, which though a large one is by no means the largest made by this company. There are also exhibited a Moorehead automatic return steam trap in operation, a large pressure blower mounted on a Z iron base on the other end of which is the vertical automatic high speed engine for driving; also a horizontal automatic high speed engine and a vertical low pressure engine, besides the company's A B C exhaust fans, the adjustable features of which have made it well known. Most of the machinery being in operation makes the exhibit a very interesting one.

Mr. H. C. Lang, of the Pomeroy-Mandelbaum syndicate, is quoted as confirming current reports that the syndicate had arranged to operate through parlor and sleeping cars over its electric lines from Cincinnati to Columbus. These cars will run from Cincinnati to Dayton over the lines of the Southern Ohio Traction Co.; from Dayton to Springfield over the Dayton, Springfield & Urbana Ry., and from Springfield to Columbus over the Columbus, London & Springfield Ry. It is stated that contracts have been awarded the Barney & Smith Manufacturing Co., of Dayton, for both the parlor and sleeping cars to be used for this service. They will be the first of their kind ever operated on interurban lines.



### A PROSPEROUS CONCERN.

The Falk Co. of Milwaukee, which was organized in 1895, under the name of the Falk Manufacturing Co., brought out and introduced the Falk patented cast welded rail joint, and while it met with much opposition at the beginning, by engineers and railroad men generally on account of old theories concerning contraction and expansion, the company succeeded in overcoming all difficulties, and has made this joint standard construction over the entire world where street railways are built and operated.

With this business well in hand, the company took up the building of special work and the manufacture of gears and pinions, and next added an open hearth steel foundry, which has a capacity of fifty tons per day, and enlarged its plant so that its shops now cover an area of about eight acres, giving ample facilities to furnish customers the best the market affords from all departments. The cast welding department reports business very brisk this year at home and abroad, work in this line being on at present in many cities in America, and also throughout Europe.

### KNOXVILLE TRACTION CO. NON-UNION.

The strike of the employees of the Knoxville Traction Co. which occurred August 11th resulted in all the cars being run with non-union men after the lapse of a week. None of the old employees who were discharged for belonging to the organization has been taken back to work, though the company has offered to aid the old employees with good records in securing positions elsewhere.

### WABASH SPECIAL TO NEW YORK.

The Wabash Railroad is making extra provision for the accommodation of those who will attend the convention of the American Street Railway Association in New York. For this occasion the Wabash will make a rate of \$23.70 for the round trip from Chicago, on the certificate plan. A special train, consisting of Pullman sleepers, will leave Chicago at 3 p. m. Monday, October 7th, from the Dearborn station, Dearborn and Polk Sts., Chicago, to run



NEW PLANT OF THE FALK CO.

The gear and pinion department is busy, day and night shifts being employed, and the goods, because of the excellent quality, find ready sale in all markets. This department is also doing a heavy export business with England, France, Germany, Italy, Australia and Japan. The special work department has inaugurated during the past year many improvements over the old style of work, especially in its steel construction. This work, which is specially hardened at the wearing points, is cast so that several frogs are made in one piece without any joints, which is a particularly valuable feature in complicated layouts.

The Falk Co. has also during the past year continued its very large construction business, taking contracts for the complete construction of electric railroads, including the building of track and overhead work, and the construction and equipment of electric power stations. The growth of the company's business proves conclusively that its customers are well served.

through via the Detroit, Buffalo & West Shore R. R. A special sleeper will be held for ladies, and gentlemen and their wives. For those who shall not find it convenient to take the special, the Wabash has trains as follows: the Continental limited, leaving Chicago at 11 a. m., arriving in New York at 3:30 p. m. next day; and the Eastern Express, leaving Chicago at 11 p. m., arriving in New York at 7:30 a. m., second morning. Stop-overs at Buffalo, either going or coming, or both, will be allowed, to visit the Pan-American Exposition. The party will be personally conducted by Mr. N. C. Keeran, whose success in managing similar expeditions to the street railway conventions at Montreal, St. Louis, Niagara Falls and Boston is well remembered. Application for reservations should be made to Mr. Keeran, at the Wabash city ticket office, 97 Adams St., Chicago. A large number of supply men and their families have already taken advantage of the special rate and accommodations offered by the Wabash to engage their passage well in advance.

The Waterloo (Ia.) & Cedar Falls Rapid Transit Co. recently advanced the wages of motormen and conductors on city lines nine tenths of a cent per hour.

Owl cars are to be put in operation on the interurban line between Rockford, Ill., and Belvidere.

# ECHOES FROM THE TRADE

THE SARGENT CO., Chicago, is preparing to erect an additional pattern shop for its plant at Chicago Heights. The extension is necessitated by the increasing volume of business.

THE UNITED STATES STEEL CORPORATION, the billion dollar concern, are using in its mills over one hundred "Cross" oil filters installed by the Burt Manufacturing Co., of Akron, O.

THE UNITED STATES ELECTRIC SIGNAL CO., Watertown, Mass., has received orders for signals to be supplied to street railways in Brazil. The product of the factory has been nearly exhausted by the season's exceptional demand.

THE CHARLES MUNSON BELTING CO. is making the well-known "Dermaglutine" raw hide pinions. The factory is equipped with the latest improved machinery and is turning out the finest gears and pinions that can be produced.

THE CHARLES SCOTT SPRING CO., of Philadelphia, will be represented at the convention, and will show samples of its goods. It makes springs of all descriptions, of the best selected material, constructed and tempered with the greatest care.

THE RELIANCE MANUFACTURING CO., 56 Wilder St., Brockton, Mass., has issued an attractive pamphlet describing the Valentine automatic electro-mechanical block signal system for electric railways. The system was described in detail in the "Review" for April, 1901, page 252.

THE HAM SAND BOX CO., of Troy, N. Y., will have an exhibit of its various types of sand boxes at the A. S. R. A. convention, which will be located in the space assigned to Francis Granger, the company's New York agent. This space is No. 84 on the diagram on page 515 of our August issue.

THE CHASE-SHAWMUT CO., 390 Atlantic Ave., Boston, Mass., has been awarded the contract for bonding the entire system of the Seattle-Tacoma (Wash.) Interurban R. R., which is to be a 30-mile line operated with third-rail system. The bonds used will be the Chase-Shawmut new flexible rail bond, which embodies several new and improved features.

F. E. HUNTRESS, general eastern agent for the St. Louis Car Co., has just closed a contract with Mr. H. E. Huntington, president of the Los Angeles Railway Co. and the Los Angeles & Pasadena Electric Railway Co., of Los Angeles, Cal., for 50 car bodies and trucks. The New York office of Mr. Huntress is at 716 Broad Exchange Building, New York.

THE JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J., is mailing to patrons a circular concerning graphite for automobiles. The advantage of graphite over other lubricants for this purpose is shown, and a number of letters from automobile users, attesting the same, are given. The Dixon company's periodical entitled "Graphite" for September contains its usual quota of good technical and humorous articles.

THE TAUNTON LOCOMOTIVE MANUFACTURING CO., of Taunton, Mass., has published a catalog on the Dean reheater, of which it is sole maker. This is a double shell heater, the outer one being of cast iron and the inner one, which contains steam of boiler pressure, of boiler plate. It is made in both vertical and horizontal designs and can be adapted for attachment to any engine frame or to rest on the floor.

THE WASON MANUFACTURING CO., Springfield, Mass., reports that it is busy building street cars and snow plows. The company is making a specialty of 8-wheel snow plows and has

taken several large orders for this type. The new 8-wheel plow weighs about 44,000 lb. and is built for either single or double track, and equipped with either nose or share. One of the specifications is that they are to be provided with pneumatic lifts, so that the share can be easily handled.

THE CHISHOLM & MOORE MANUFACTURING CO., of Cleveland, O., has a large exhibit at the Pan-American Exposition of various supplies that are used by all railroads. The exhibit contains pneumatic and hand power traveling cranes, pneumatic and hand power chain hoists from 1/2 to 15 tons capacity, about 35 rail joints fitted to different sections of rail, rail bonds, tie plates, chairs, etc. All railroad men will be interested in this exhibit, which is located on block 4, Machinery Building.

THE CENTRAL ELECTRIC CO., of Chicago, has published a new discount sheet on general catalog dated September 1st, which has been distributed to the general trade. Anyone having a Central Electric Co. general catalog who has not received a discount sheet should notify this company, and a copy will be sent them by return mail. This discount sheet not only covers everything listed in the general catalog, but contains much new material which has been placed on the market since the publication of the general catalog.

THE BILLINGS & SPENCER CO., Hartford, Conn., has issued for July, 1901, a list of its drop-forged commutator segments for electric railway motors. The company has greatly improved its method of manufacturing drop-forged commutator segments, and is prepared to furnish segments of perfect uniformity and accuracy of gage. For the convenience of customers desiring to order by telegraph, the company has established code words which will be found printed above the cut of each segment contained in the list.

THE HAZARD MANUFACTURING CO., of Wilkes-Barre, Pa., has issued two Pan-American souvenir catalogs on insulated wire and wire rope. This company has recently extended its works, established since 1848, to include the manufacture of insulated electric conductors. This department will make all description of insulated wires and all kinds of special conductors to meet the requirements of every line of engineering practice. The company's well known products in wire ropes are in extensive use for a large number of purposes.

THE PETER SMITH HEATER CO., of Detroit, Mich., maker of hot water heaters for street railway and other cars, has equipped a large number of cars for the coming season and reports the following orders among its most recent sales: Grad Rapids, Holland & Lake Michigan Railway Co., 10 cars; Detroit & Pontiac Railway Co., 6 cars; Mahoning Valley Railway Co., 38 cars; Cleveland & Eastern Electric Railroad Co., 10 cars Sandusky & Interurban Electric Railway Co., 2 cars; Toledo & Maumee Valley Railway Co., 2 cars Detroit & Chicago Traction Co., 10 cars.

THE PHOENIX IRON WORKS CO., of Meadville, Pa., has found its business increasing to such an extent as to necessitate the enlargement of its facilities. A contract has been given to the Penn Bridge Co., of Beaver Falls, Pa., for the structural work of a new boiler shop, which will more than double the present capacity. The new shop will be equipped with the most approved modern machinery, and thoroughly up to date. The company is also building an addition to its foundry, which will give a large increase in capacity, and the capacity of the engine department is also to be increased.

THE DUFF MANUFACTURING CO., of Pittsburg, sends us the following copy of the decision rendered by the United States Circuit Court of Appeals in the case of the Duff Manufac-

turing Co. against the Kalamazoo Axle Velocipede Co. for infringement of Barrett lifting jack patents by the defendant company: "The decree of the Circuit Court upholding the validity of the three patents to Josiah Barrett for improvements in lifting jacks, and being patents Nos. 455,993, 455,994 and 455,995, and finding infringement, is affirmed upon the opinion of District Judge Wauty."

THE WESTERN ELECTRICAL SUPPLY CO., of St. Louis, has recently taken the exclusive territorial selling agency for the new type "Peerless" incandescent lamp, and is making a specialty of a lamp for street railway circuits. The company states that it has made a number of improvements on this lamp lately, and now considers that it has the very highest grade incandescent lamp on the market for series work. The company is offering special inducements for yearly contracts, and is always glad to send out lamps for tests. These lamps are sold under the strongest guarantee, as to life, efficiency, current consumption and sustained candle power.

THE UNITED STATES ELECTRIC SIGNAL CO., of Watertown, Mass., reports that its signals for single track electric roads are meeting with great favor. The management of the company has kept in close touch with the requirements of the trade and has made numerous improvements in its signal system by adding a number of parts that seemed to be desirable. The signals are usually fitted with lights, but may be arranged to act with alarm bell, and are applicable to overhead, third rail or surface contact systems. The United States electric signals are widely used in this country and have been sent to Canada, Mexico, South America, France, Germany, Switzerland and Italy.

THE CRANE CO., Chicago, has completed the erection of a foundry in addition to its works at Jefferson, Van Buren and Desplaines Sts., which will increase the company's capacity for heavy work by about 50 per cent. The foundry will be devoted exclusively to very heavy work—flanged fittings and large valves. It is a one-story building with a slate roof and is equipped with two cupolas, an electric traveling crane and every modern convenience. Its erection was necessitated by the fact that the space devoted to floor molding had been entirely inadequate to the demands of the business. The works at Canal and Judd Sts. will be relieved of much of the heavy work, which will now be performed in the new foundry.

THE FAMOUS OIL REFINER AND PURIFIER embodies the same process employed in the large oil refineries and makes the waste oil always a smooth and high grade lubricant. The regular oil microscope is furnished with every "Famous," to demonstrate by frequent tests that it regularly delivers a perfectly bright and clean quality of pure oil, no matter how often the oil is being reused. The engineer who uses this filter reduces the wear and friction in the bearing to a minimum. He need never watch the oil feed, and feels perfectly safe against hot boxes all the year around. For full particulars of the various sizes and styles address The Chicago Boiler Cleaner Co., Chicago, St. Louis and Pittsburg.

THE WESTINGHOUSE COMPANIES have published a booklet descriptive of the Westinghouse exhibits at Pan-American Exposition, at Buffalo, which is intended for distribution from the exhibits, and is most appropriately designed as a souvenir. Full page, halftone cuts of the companies' machines and manufacturing, and illustrations of the exhibits at Buffalo, afford a comprehensive idea of the industrial enterprises with which the name of Westinghouse is associated, and refer to some of the notable work accomplished by the companies. The book is most artistically designed and printed its pages are illuminated in black and red, and the heavy paper cover bears a decoration which would alone suffice to distinguish the publication for artistic excellence.

THE NEW YORK & FRANKLIN AIR COMPRESSOR CO., whose works are at Franklin, Pa., and sales office at 95 Liberty St., New York, have just issued their new catalog B on air compressors of all kinds. This catalog announces the commencement of operations in the companies' new works at Franklin, which

have been designed and equipped exclusively for the manufacture of air compressors. The variety of these machines made by these companies is very large and comprises all grades from a compound condensing corliss engine driven compressor to a single belt driven one of the smallest size. A number of the details of these machines are described and illustrated, such as the steam and discharge valves, governors, unloading devices, etc. The catalog is handsomely printed and illustrated and contains much valuable information.

THE WESTERN ELECTRICAL SUPPLY CO., of St. Louis, is introducing a new trolley wheel which is made especially for the company under its own brand, called "Wesco." This wheel is made of the best lake copper, which is specially treated before being made up into wheels. The company guarantees this wheel to outlast two of the usual kind, that it runs very smooth, is self-oiling and works with the minimum of injury to the overhead lines. It is made to fit any standard harp and will be sent out on trial to anyone wanting a good wheel at a reasonable price. The company reports that its railway department is crowded with orders and the prospect is good for a large fall trade. Its stock of railway supplies is one of the largest in the United States and anything in this line can be shipped promptly from St. Louis. It also issues one of the most complete catalogues ever published which will be sent on application.

THE MICA INSULATOR CO. announces that its selling agency in Europe, hitherto entrusted to Messrs. Berghel & Young, 12 Canonille St. London has ceased, and that an English company has been formed named the MICA INSULATOR CO., LIMITED, for the purpose of carrying on the European business. The principal office of the new company will be at its factory at Stansted, Essex. By uniting the selling department with the factory, the company believes that business will be facilitated by bringing it into closer touch with the market and enabling it to serve customers more promptly. The manufacture of the well and favorably known "Micanite," "Empire" insulating cloth and paper, and "M. I. C. Compound," of which this company is the inventor and originator, will be continued in America, as heretofore, by the Mica Insulator Co., with offices at 218 Water St., New York, and 117 Lake St., Chicago, and factories at Schenectady, N. Y.

THE KINNEAR MANUFACTURING CO., Columbus, O., has issued its catalog K. descriptive of Kinnear's steel rolling doors, shutters and partitions which are in general use by street railway companies. The catalog contains 25 full-page halftone cuts showing the car houses of the Worcester (Mass.) Consolidated Street Ry., the Boston Elevated Ry., the Chicago Union Traction Co. and other buildings for widely different purposes, inclusive even of the Art Institute of Chicago, equipped with Kinnear rolling doors. An interesting series of cuts illustrates the fire tests which have been made with invariable success to prove that the Kinnear shutters will retain a fire within a building or in case of exposure from outside will protect the building on which they are installed. The steel curtain is composed of a series of narrow slats, wide, hinged together their entire length, which allows each slot to expand with the grooves under the most intense heat, without buckling or warping. The catalog contains the usual complement of sectional elevations, diagrams, etc.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has recently closed several contracts for the installation of batteries of "Chloride" accumulators in lighting and railway power houses. Among these are noted the installation of the St. Paul Gas Light Co. of St. Paul, Minn., which is to consist of 166 elements having a capacity at normal rate of discharge of about 1,300 kw. h., but capable of a much higher discharge rate for the peak work for which it is principally required. The power for the Gas Light company is obtained from a water power plant 27 miles from the city, from which place it is transferred at 25,000 volts to a rotary substation in St. Paul and thence distributed at 120 volts on each side of the three wire system. The battery located at the St. Paul station is for the purpose of obtaining additional capacity, increasing the reliability of service and as a reserve in any emergency that may arise. The Laeelle Power Co. of St. Louis, is in



stalling a battery of "Chloride" accumulators consisting of 336 elements having a discharge rate for one hour of 500 amperes on each side of the three wire system. The Minneola, Homestead & Freeport Traction Co. has contracted for the installation of a battery consisting of 270 elements having a discharge rate of 120 amperes, for regulating the rapid fluctuations on the railway circuit; the containing jars are of sufficient size to allow of 50 per cent increase in capacity.

THE GREEN ENGINEERING CO., of Chicago, Ill., maker of the well-known Green traveling link grates, reports, besides the sale of Green traveling link grates for 12,000 h. p. of boilers to the Metropolitan Street Railway Co., Kansas City, which was the third order from this company, and was mentioned in our columns some time ago, sales to the following companies: Cleveland City Ry.; Steubenville Traction Co.; East St. Louis & Belleville Suburban Ry.; Michigan Construction Co.; Arnold Electric Power Station Co.; Danville Street Ry.; Cudahy Packing Co.; Anglo-American Provision Co.; La Belle Iron Works; C. A. Pope & Co., Steubenville, O.; Lake Superior Power Co.; Waukesha Sheet Steel Co. The Green traveling link grate is recognized by steam power users as a most economical automatic stoker, and has been particularly successful in railway power stations. The officers of the company are P. Albert Poppenhusen, president, and Herman A. Poppenhusen, secretary and treasurer, while the office force and correspondence are in charge of J. Wm. Helm, formerly secretary and treasurer of the North Chicago Street Railway Co.

THE NORTH AMERICA RAILWAY CONSTRUCTION CO., Monadnock Building, Chicago, reports that it has more than enough work to keep it very busy until May 1st, there being a large number of contracts about ready to close. Among those now in hand are work for the Chicago & Milwaukee Electric Ry., the Metropolitan Street Railway Co., of Kansas City, and the Cincinnati Traction Co.

THE OFFICIALS of the American Improved Rail Joint Co. who are also interested in the North American Railway Construction Co., report that they have been so busy with construction work the past season that they have given little attention to joint work. They have, however, welded all the joints on the new track construction put in at Kansas City and are now at work upon a large contract of welding at Indianapolis. They had a number of contracts in the past season in each of these cities, which speaks well for the quality of their work.

#### LAKE SHORE SPECIAL FOR CONVENTION.

For the New York convention of the A. S. R. A., the Lake Shore & Michigan Southern Ry. is arranging for a special party to leave Chicago on "The Lake Shore Limited" at 5:30 p. m., Monday, October 7th, arriving Buffalo 6:50 a. m. Tuesday, where the day will be spent visiting the Pan-American Exposition and Niagara Falls, leaving for New York on the Pan-American Express at 7:30 p. m., arriving at the Grand Central Station 7:27 a. m. Wednesday, in time for the opening of the convention.

The appointments of "The Lake Shore Limited" are well known and appreciated by the traveling public. Its equipment comprises standard sleepers, buffet, library, dining and compartment observation cars. Special sleepers will be provided on each of the above trains for the accommodation of this party.

A rate of one and one-third fare on the certificate plan has been authorized for this meeting, and will be available leaving Chicago as early as Saturday, October 5th, returning good leaving New York not later than October 15th. For further information, sleeping car reservations, etc., address L. F. Vosburgh, C. P. A., No. 180 Clark St., Chicago.

The new four-mile electric line of the Junction City (Kan.) Electric Railroad, Light & Ice Co., between Junction City and Fort Riley, was opened for regular traffic, August 12th. The plant, which includes the lighting plant and ice manufactory, represents an expenditure of about \$114,000. The overhead work on the electric railway was done by Overton & Co., of Topeka.

#### BIG FORGERY OF RAILROAD TICKETS.

The Public Again Warned by Swindle Unearthed at St. Louis.

As a result of the arrest on Thursday, August 15th, of a ticket broker's concern at St. Louis charged with swindling a customer, a gigantic railroad ticket counterfeiting scheme was uncovered. After the arrest of the brokers their office was ransacked and an immense number of tickets and passes found. It was almost impossible to place an estimate on the value of the tickets recovered, but it is stated by railroad authorities that \$50,000 would be a conservative figure. It is believed that many of the tickets and passes were forged.

At Buffalo many of the ticket scalpers have already been lodged in jail on account of fraudulent manipulation and forgery of railroad tickets. These instances are so numerous the public should take pains to see that their tickets are purchased only at the authorized offices of transportation lines. This avoids all complication and trouble to the passenger and assures him that the railroad tickets purchased are valid and will be honored as printed.

The Columbus, London & Springfield Railway Co. began operating cars over the Springfield division of its system so far as Alton, August 25th.

The office of the Suburban Railroad Co. at 22d St. and Harlem Ave., Chicago, was looted by four robbers on the morning of August 6th, who bound and gagged the two watchmen, blew open the safe and escaped with \$700.

The New Jersey & Hudson Railway & Ferry Co. projects extending its lines to Paterson, and has obtained rights for this purpose through Maywood and Arcola. The company will also open a ferry line between New York and the Palisades; and a direct route from New York to Paterson will thus be afforded.

## Their Own Best Advertisement.

The Sharon Steel Co., Sharon, Pa., have just sent us their third order for

## Cross Oil Filters.

They are their own best advertisement. No trouble to sell the Filter that saves 50% of your oil bills where they have once been sold.

Shall we send you one on 30 days' trial, to be returned at our expense if not satisfactory?



THE  
**Burt Mfg. Co.**  
Akron, Ohio, U. S. A.

Largest  
Mfrs. of  
Oil Filters  
in the  
World.

We also make  
the  
**BURT  
EXHAUST  
HEAD.**

## DAILY STREET RAILWAY REVIEW

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324 DEARBORN STREET

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VOL. XI.

WEDNESDAY, OCTOBER 9, 1901.

No. I.

President Holmes of the American Street Railway Association requests us to announce that the first meeting of the Association will be called to order promptly at 11 o'clock Wednesday morning, and all delegates are urged to be on hand.

The "Street Railway Review" extends a cordial invitation to all supply men in attendance at the convention who are not connected with firms or companies having exhibits, to make our space in Madison Square Garden their headquarters.

Our readers will note that this issue begins with page 629, making the paging consecutive with our regular monthly issue of the "Review," and all the "Daily Reviews" should be preserved in order to have the file complete. The convention reports given in the four "Daily" issues will not be reprinted in our monthly issue.

No doubt your company subscribes regularly for the STREET RAILWAY REVIEW. Are you personally a subscriber? This is the only monthly street railway magazine in America. Each copy is a history of the street railway news for its current month. In no other way can you get this news in such a concise and complete form. Every interested operator should have a copy each month. Our subscription manager will be glad to receive you at our booth and take your order.

## PENNSYLVANIA STATE MEETING POSTPONED.

President John A. Rigg, of the Pennsylvania Street Railway Association, has advised us that owing to the fact that the American Street Railway Association meets in New York City, the annual meeting of the Pennsylvania Street Railway Association which was to have been held in York, this year, has been indefinitely postponed.

## NEED OF A SUPPLYMEN'S ASSOCIATION.

In the last issue of the "Daily Review," published at Kansas City in 1900, we gave considerable space to discussion of the desirability of organizing an association of street railway supplymen which could undertake the arrangement and supervision of the installation of the exhibits. A great many of the supplymen, and the street railway men as well, were interviewed, and they all expressed themselves as heartily in favor of such an association which could work in harmony with the local committees and take a great mass of detail work off the latter's hands.

If any demonstration of the advantages of having an experienced man to manage the exhibits were needed, the New York convention has already given it. Under the direction of Mr. Marcus Nathan all matters in connection with the Exhibit Hall in Madison Square Garden have proceeded with a rapidity, smoothness and precision that have been wellnigh astonishing. Needless to say, in thus according well-deserved praise to Mr. Nathan, no reflection on the superintendents of exhibits at former conventions is intended. Mr. Nathan is a specialist in this line, and naturally the results are vastly more satisfactory to all parties interested than is possible when such a mass of detail work is thrown on an already overburdened street railway man.

We hope that one matter of business to be taken up and acted upon to-morrow—supplymen's day—will be the organization of a supplymen's association.

## PROGRAM.

## American Street Railway Association.

WEDNESDAY, OCTOBER 9TH, 10:30 a. m.

Meeting called to order by Walton H. Holmes, President.

Address of Welcome.

Calling of the roll.

Invitation extended to join the Association.

Address of the President.

Report of the Executive Committee.

Report of the Secretary and Treasurer.

Appointment of Committee on Nomination of Officers and selection of next place of meeting.

Papers will be presented on Wednesday and Friday on the following subjects, and it is hoped that there will be a general and free discussion of each:

"Street Railways: A Review of the Past and a Forecast of the Future." By Robert McCulloch, general manager, Chicago City Railway Co., Chicago, Ill.

"The Adoption of Electric Signals on Suburban and Interurban Railways, Single or Double Track, and Their Economy of Operation." By William Pestell, superintendent of motive power, Worcester Consolidated Street Railway Co., Worcester, Mass.

"The Values of Storage Batteries as Auxiliaries to Power Plants." By W. E. Harrington, vice-president and general manager, Camden & Suburban Railway Co., Camden, N. J.

"The Public, the Operator and the Company." By C. S. Sergeant, vice-president, Boston Elevated Railway Co., Boston, Mass.

"The Best Manner and Mode of Conducting the Return Circuit to the Power House." By E. G. Connet, vice-president and general manager, Syracuse Rapid Transit Railway Co., Syracuse, N. Y.

"The American Street Railway Association: The Purpose of its Organization and the Benefits Accruing to Investors in, and Operators of Street Railway Properties by Membership Therein." By G. W. Baumhoff, St. Louis, Mo.

"The Economies Resulting from the Use of Four Motors Instead of Two on Double Motor Equipments."

"The Best Form of Car for City Service: A Consideration of the Various Types of Car as to Size of Car and Arrangement of Seats, Including Best Types of Brakes and Wheels." By Eugene Chamberlain, superintendent of equipment, Brooklyn Rapid Transit Co., Brooklyn, N. Y.

"Practical Results Obtained from Three-Phase Transmission and Rotary Transformers or Motor Generators in Transmitting Power on Railway Lines."

"Relations of Interurban and City Railways." By Ira A. McCormack, general manager, Cleveland Electric Railway Co., Cleveland, O.

"The Modern Power House, Including the Use of Cooling Towers for Condensing Purposes." By J. H. Vail, Philadelphia.

"Alternating and Direct Current Distribution." By M. S. Hopkins, general manager, Columbus Railway Co., Columbus, O.

Concert and reception for the ladies in the parlors of the Murray Hill Hotel at 11:30 a. m. All ladies in attendance are requested to attend the concert and meet the ladies of the local entertainment committee. Music by the Seventh Regiment band.

THURSDAY, OCTOBER 10TH.

This is Supply Men's Day. The entire day has been set aside for the examination of Exhibits at Madison Square Garden.

FRIDAY, OCTOBER 11TH.

Convene at 10 a. m. Election of officers for ensuing year.

11:30 a. m. Automobile ride for the ladies. Automobiles will leave Madison Square Garden at 11:30 a. m. sharp for a trip about the city. All ladies in attendance and gentlemen accompanied by ladies are cordially invited to attend this ride. The trip is made through the courtesy of Mr. Henry Sanderson, president of the New York Vehicle Transportation Co.

7:30 p. m. Annual dinner at Sherry's, 44th St. and Fifth Ave., New York City.

Installation of officers-elect, at the dinner.

## SATURDAY, OCTOBER 12TH.

Through the kindness of the Bethlehem Steel Co., the Association offers to members in attendance a delightful trip to the works of the Bethlehem Steel Co., at South Bethlehem, Pa. Special private cars will be provided for the members, and will be attached to the regular train, leaving Jersey City at 8 a. m., with which the ferry from New York connects from the foot of West 23d St. at 7.40 a. m., and from the foot of Cortlandt and Desbrosses Sts., at 7.50 a. m.

## Accountants Association.

## WEDNESDAY, OCTOBER 9TH.

Madison Square Garden—10.00 a. m.

Address of Welcome by Hon. Bird S. Coler, Comptroller, City of New York.

Annual Address of the President.

Annual Report of the Executive Committee.

Annual Report of Convention Committees; Resolutions and Nominations.

Paper: "Car Mileage and How to Arrive at it Easily." By J. M. Smith, comptroller, Toronto Railway, Toronto, Canada.

2.30 p. m.

Paper: "Capital Accounts from the Viewpoint of the Investor and the Public." By Col. T. S. Williams, vice-president, Brooklyn Rapid Transit Co., Brooklyn, N. Y.

Report: "Standard Blanks and accounting for Material and Supplies." By F. E. Smith, auditor, Chicago Union Traction Co., Chicago, Ill., chairman.

## THURSDAY, OCTOBER 10TH.

Supply men's day.

## FRIDAY, OCTOBER 11TH.

Madison Square Garden—10.00 a. m.

Paper: "Consumers' Accounts, Electric Lighting Companies." By S. E. Moore, comptroller, United Traction Co., Pittsburg, Pa.

Report: "Standard System of Accounting for Electric Light Companies." By G. E. Tripp, general auditor, Stone & Webster's Cos., Boston, Mass., chairman.

Annual Report: "Standard System of Street Railway Accounting." By C. N. Duffy, auditor, Chicago City Railway, Chicago, Ill., chairman.

2.30 p. m.

Paper: "Conductor's Accounts." By Elmer M. White, cashier, Hartford Street Railway, Hartford, Conn.

Report: "Standard Unit of Comparison." By H. C. Mackay, comptroller Milwaukee Electric Railway and Light Co., Milwaukee, Wis., chairman.

Reports of Convention Committees.

Election of Officers.

## LOCAL COMMITTEES.

## GENERAL COMMITTEE.

1. H. H. Vreeland, President Metropolitan Street Railway Co.
2. J. L. Greatsinger, President Brooklyn Rapid Transit Co.
3. David Young, Vice-President North Jersey Street R. R.
4. Col. N. H. Heft, New York, New Haven & Hartford, R. R.
5. Edward A. Maher, President Union Railway Co.
6. D. B. Hasbrouck, Vice-President Metropolitan Street Ry. Co.
7. A. M. Young, President Bridgeport Traction Co.
8. John R. Beetem, Vice-President N. Y. & Queens County Ry.
9. E. P. Bryan, General Manager Subway.
10. Alfred Skitt, Vice-President Manhattan Railway Co.
11. James H. McGraw, Street Railway Journal.
12. Gen. Eugene Griffin, General Electric Co.
13. B. H. Warren, Westinghouse Co.
14. Henry Sanderson, President N. Y. Elec. Transportation Co.
15. Frank J. Sprague, Sprague Electric Co.
16. Henry L. Shippy, Treasurer John A. Roebling Sons Co.

17. John L. Heins, President Coney Island & Brooklyn R. R. Co.
18. Clinton L. Rossiter, Rossiter, MacGovern & Co.

## ENTERTAINMENT COMMITTEE.

1. J. L. Greatsinger, President Brooklyn Rapid Transit Co.
2. H. D. Cooke, Compressed Air Co.
3. Ralph H. Beach, General Electric Co.
4. Edward E. Higgins, Success.
5. W. Boardman Reed, Eng. Maintenance of Way, Met. St. Ry.
6. Major H. C. Evans, Lorain Steel Co.
7. F. N. Taylor, Westinghouse Co.
8. E. A. Merrill, McIntosh & Seymour Eng. Co.
9. Thomas C. Wood, The Ball & Wood Co.
10. James C. Barr, Weber Rail Joint Co.
11. H. Webster, Babcock & Wilcox Co.
12. H. M. Littell, New York.
13. D. M. Brady, President Brady Brass Co.
14. Charles F. Brocker, President Coe Brass Co.
15. C. B. Fairchild, Jr., Street Railway Review.
16. Col. H. G. Prout, Editor Railroad Gazette.
17. Henry Sanderson, N. Y. Electric Vehicle Transportation Co.
18. T. C. Martin, Electrical World and Engineer.
19. James H. McGraw.
20. H. F. J. Porter, Bethlehem Steel Co.

## SUB-COMMITTEE OF THE ENTERTAINMENT COMMITTEE.

Henry Sanderson, New York Electric Vehicle Transportation Co.  
James H. McGraw.  
H. D. Cooke, New York Compressed Air Co.  
Charles D. Meneely, Brooklyn Heights Railroad Co.  
T. C. Martin, Electrical World and Engineer.

## ENTERTAINMENT COMMITTEE OF LADIES.

- |                             |                                |
|-----------------------------|--------------------------------|
| 1. Mrs. H. H. Vreeland.     | 14. Mrs. H. F. J. Porter.      |
| 2. Mrs. James H. McGraw.    | 15. Mrs. Frank B. Jackson.     |
| 3. Mrs. Henry Sanderson.    | 16. Mrs. J. C. Breckenridge.   |
| 4. Mrs. Henry A. Robinson.  | 17. Mrs. Clinton L. Rossiter.  |
| 5. Mrs. Charles E. Warren.  | 18. Mrs. R. L. MacDuffie.      |
| 6. Mrs. Malton G. Starrett. | 19. Mrs. Walter A. Pearson.    |
| 7. Mrs. John T. Little.     | 20. Mrs. Eugene Griffin.       |
| 8. Mrs. D. M. Brady.        | 21. Mrs. Thomas Millen.        |
| 9. Mrs. W. W. Wheatley.     | 22. Mrs. Marvin W. Wynne.      |
| 10. Mrs. John R. Beetem.    | 23. Mrs. Daniel W. Patterson.  |
| 11. Mrs. T. S. Williams.    | 24. Mrs. Frederick G. Garrick. |
| 12. Mrs. D. C. Moorehead.   | 25. Mrs. Sharon Graham.        |
| 13. Mrs. Ralph H. Beach.    | 26. Mrs. Theodore H. Lord.     |

## EXHIBIT COMMITTEE.

1. Milton G. Starrett, Chief Engineer Met. St. Ry. Co.
2. Oren Root, Jr., Assistant General Manager, Met. St. Ry. Co.
3. C. D. Meneely, Secretary Brooklyn Rapid Transit Co.
4. Eugene Chamberlain, Supt. of Equipment Brooklyn R. T. Co.
5. Calvert Townly, Westinghouse Co.
6. Charles N. Jarvis, Vice-President American Bridge Works.
7. J. R. Lovejoy, General Electric Co.
8. Capt. L. Candee, Okonite Co.
9. E. E. Gold, Gold Car Heating Co.
10. Peter H. Kling, General Manager John Stephenson Co.
11. Frank MacGovern, Rossiter, MacGovern & Co.
12. A. H. Berry, H. W. Johns Manufacturing Co.
13. R. L. MacDuffie, Wendell & MacDuffie.
14. L. G. Read, Abendroth & Root Manufacturing Co.
15. Thomas Millen, Master Mechanic Met. St. R. Co.
16. Col. A. C. Woodworth, Gen. Manager Con. Car. Fender Co.
17. John T. McRoy, McRoy Clay Works.

## SUB-COMMITTEES OF THE EXHIBIT COMMITTEE.

## CLASSIFICATION COMMITTEE.

Oren Root, Jr., Asst. Gen. Mgr. Met. St. Ry. Co.  
Eugene Chamberlain, Supt. of Equipment, B. R. T. Co.  
Thomas Millen, Master Mechanic, Met. St. Ry. Co.  
R. L. MacDuffie, Wendell & MacDuffie.  
A. N. Berry, H. W. Johns Mfg. Co.  
Oren Root, Jr., Asst. Gen. Mgr., Met. St. Ry. Co.  
Eugene Chamberlain, Supt. Equipment, B. R. T. Co.  
R. L. MacDuffie, Wendell & MacDuffie.



## COMMITTEE ON RULES GOVERNING EXHIBITS.

Thomas Millen, Master Mechanic, Met. St. Ry. Co.  
A. N. Berry, H. W. Johns Mfg. Co.

## PRESS COMMITTEE.

1. St. Clair McKelway, Brooklyn Eagle.
2. Adolph S. Cohn, New York Times.
3. Colin Armstrong, New York Sun.
4. Charles E. Miller, New York Times.
5. William Van Bethusen, New York World.
6. John Burke, New York Herald.
7. H. B. Cosgrove, New York Tribune.
8. Henry L. Stoddard, Mail & Express.

## RECEPTION COMMITTEE.

1. Col. T. S. Williams, Vice President B. R. T. Co.
2. A. S. Tulley, General Purchasing Agt., Met. St. Ry. Co.
3. Charles E. Warren, Secretary, Metropolitan St. Ry. Co.
4. E. H. Mullen, General Electric Co.
5. James H. Wakeman, McGraw Publishing Co.
6. Henry W. Blake, Street Railway Journal.
7. E. C. Long, Peckham Manufacturing Co.
8. L. B. Stillwell, Electrical Engineer Manhattan Ry.
9. Harold P. Brown, Plastic Rail Bond Co.
10. Giles S. Allison, New York.
11. Jacob Wendell, Jr., Wendell & MacDuffie.
12. Charles W. Price, Electrical Review.
13. H. A. Robinson, Solicitor Metropolitan St. Ry. Co.

## DIRECTOR OF EXHIBITS.

Marcus Nathan, Madison Square Garden.

## ANNOUNCEMENTS.

Information Bureaus have been established at the Murray Hill Hotel and in Madison Square Garden for the use of persons in attendance upon this Convention.

## MUSIC.

The Seventh Regiment band will give concerts in Madison Square Garden on the following dates:

- October 9th, afternoon and evening.  
October 10th, evening.  
October 11th, afternoon and evening.

## TELEPHONE, TELEGRAPH AND MESSENGER SERVICE.

The American Telephone & Telegraph Company has tendered to the delegates the free use of their services during the term of the Convention the following hours, namely: before 9 a. m. and after 6 p. m.

The New York Telephone Co. has installed in different parts of the hall about 55 desk phones, for the use of persons in attendance upon this Convention. To call the Garden ask for 2620 Madison Square; then give operator name of exhibitor wanted.

The Western Union Telegraph Co. has established an office in Madison Square Garden for the use of patrons in attendance upon this Convention.

The American District Telegraph Co. has furnished six messengers for the use of the delegates and persons in attendance upon this Convention.

The New York Edison Co. has given the electric current needed by the exhibitors free of charge.

## BADGES.

Through the kindness of the officers, the badges of the Association will be honored for passage upon all the surface and elevated lines in Greater New York.

## CARRIAGE RATES IN NEW YORK.

Rates are fixed by law and are as follows:

**Cabs—By the Mile.**—50 cents for the first mile, and 25 cents for each additional half-mile. For stops over five minutes and not exceeding fifteen, 25 cents; for longer stops, 25 cents for each fifteen minutes. **By the Hour.**—With the privilege of going and stopping to suit yourself, \$1 for the first hour, or part thereof, and 50 cents for each additional half-hour. This tariff includes hansom cabs.

**Coaches—By the Mile.**—One dollar for the first mile, or part thereof; and each additional half-mile or part thereof, 40 cents. By distance for "stops" 38 cents for each fifteen minutes. For brief stops, not over five minutes, no charge. **By the Hour.**—\$1.50 first hour or part thereof, and each succeeding half-hour or part

thereof, 75 cents. From "line balls" one or two passengers, to any point south of 59th street, \$2; each additional passenger, 50 cents; north of 59th street each additional mile 50 cents. The legal fares are for one or two persons in a cab, or for one, two, three, or four persons in a carriage; while children under 8 years are to be carried free when accompanied by adults. It also includes the carrying of one piece of baggage; for all pieces over one special bargain must be made.

## POWER HOUSES IN GREATER NEW YORK.

The following stations of the Metropolitan Street Railway Co. will be open for inspection to persons in attendance upon the American Street Railway Association, on October 9th, 10th and 11th, as follows, and persons will be in attendance to answer inquiries and direct visitors:

1. The Ninety-sixth Street Station (96th Street and First Avenue), 8 a. m. to 12 m.; 1 p. m. to 4 p. m.; 8 p. m. to 10 p. m.
2. One hundred and forty-sixth Street Sub-station (146th Street and Lenox Avenue), 8 a. m. to 12 m.; 1 p. m. to 4 p. m.
3. Fiftieth Street Sub-station (50th Street and Sixth Avenue), 8 a. m. to 12 m.; 1 p. m. to 4 p. m.

Visitors must present the badge of the association before they will be admitted.

The Brooklyn Heights Railroad Company has arranged to open the following stations on each of the three days of the Convention, from 9 a. m. to 4 p. m.

1. Kent Avenue power station. (Reached from New York via Broadway ferry and Greenpoint line.)
2. The Third Avenue and Third Street power station. (Reached by Third Avenue surface line.)
3. The Southern power station at 52d Street (Reached by Third Avenue Elevated and surface lines).

There will be gentlemen in attendance to answer inquiries of visitors and show them about these power houses. The badge of the Association must be presented before visitors will be admitted.

The Central Station of the New York Electric Vehicle Transportation Company, at 8th Avenue and 49th Street, will be open to visitors on October 9th, 10th and 11th, from 8 a. m. to 12 m., and 1 p. m. to 4 p. m. Persons will be in attendance to show visitors about the station, and the badge of the Association must be presented before admission will be granted.

A section of the four-track subway on Elm Street, near Bleecker Street, and the subway and station at 59th Street and Broadway, will be open to inspection by visitors on October 9th, 10th and 11th, at all hours. Persons will be in attendance to show visitors about the work, and the badge of the Association must be presented before admission will be granted.

## TELEPHONES AT THE CONVENTION.

Telephone service during the Convention will be furnished by the New York Telephone Company and will consist of what is known as The Private Branch Exchange, which means that there will be a trunk line of 14 wires to the nearest Central office, with local wires to the different booths and departments in the building.

In an interview with Mr. Frank H. Bethell, who is contract agent for the New York Telephone Company, Mr. Bethell said: "The private Branch Exchange is one of the special features recently introduced into our service and it has proved a great success. This is practically an extension of the exchange principle to the subscribers' station because the subscriber has a switchboard connected by trunk lines to one of the central offices and local lines to the different offices in the building. This method of service does away with the inconvenient delay caused when the wire is held for someone to 'come to the phone,' or other reasons that arise to block service on a single wire. In an apartment house where there are many connections with a single wire such delays are frequent and annoying, but where the Private Branch Exchange is in use each subscriber has all the advantages of a large trunk line.

"This system is one that is especially valuable in connection with street railway work and it has already been installed in the Rapid Transit system of Brooklyn and a chart showing how the different offices and switches are controlled from the office in Montague street will be hung in the telephone exchange at Madison Square during convention week."

## NOTICE TO THE LADIES.

Secretary Pennington says that the ladies who accompany the delegates are expected to go to headquarters at Murray Hill Hotel and introduce themselves to the ladies on the committee, in order that their comfort may be better conserved and their acquaintance extended.

Plans have been made for the ladies who attend the banquet Friday night to afterward enter the galleries and listen to the speechmaking by the men. The ladies' banquet will be served in a separate apartment.

## AMUSEMENTS TO-DAY AND EVENING.

ACADEMY OF MUSIC—Arizona.

AMERICAN—Siberia.

BIJOU—Dave Warfield in The Auctioneer.

BROADWAY—Castle Sq. Opera Co. in Cav. Rusticana and I Pagliacci.

CASINO—Florodora.

CRITERION—William Faversham in A Royal Rival.

DEWEY—Burlesque, "A Wise Guy Co."

DALY'S—James T. Powers in The Messenger Boy.

EDEN MUSEE—Wax Works, etc.

EMPIRE—John Drew in Second in Command.

FOURTEENTH ST. THEATRE—John E. Kellard in The Cipher Code.

GARDEN—E. H. Sothorn in Richard Lovelace.

GARRICK—Charles Hawtrey in Message from Mars.

GERMANIA—The Land of the Free.

GRAND OPERA HOUSE—Heart of Maryland.

HAMMERSTEIN'S VICTORIA—(Beginning Thursday evening), Russell Bros., in Sweet Marie.

HARLEM OPERA HOUSE—Agnes Burroughs in East Lynne.

HERALD SQUARE—Dan Daly in The New Yorkers.

HURTIG & SEAMAN'S—Vaudeville.

HUBER'S—Curiosities and Vaudeville.

IRVING PLACE THEATRE—Maria Stuart.

KEITH'S—Continuous performance, Cinquevalli and 30 others.

KNICKERBOCKER—Rogers Bros. in Washington.

LYCEUM—Bertha Galland in The Forest Lovers.

MADISON SQUARE—Liberty Belles.

MANHATTAN—Mrs. Fiske in Miranda of the Banquy.

METROPOLIS—Rose Coghlan in Peg Woffington.

MURRAY HILL—A Trip to Chinatown.

NEW YORK—The King's Carnival, etc.

PASTOR'S—Continuous performance.

PROCTOR'S THEATRES—Comedy, variety.

REPUBLIC—J. H. Stoddart in The Bonnie Brier Bush.

SAVOY—Louis Mann and Clara Lipman in The Red Kloof.

THIRD AVENUE—A Royal Prisoner.

WALLACK'S—James K. Hackett in Don Caesar's Return.

WEBER & FIELDS—Hoity Toity and Diplomacy.

## PHOTOGRAPHS OF EXHIBITS.

Exhibitors at Madison Square Garden who desire to have photographs of their exhibits taken will find Mr. P. P. Pullis, of 108 Fulton street thoroughly competent to take these with satisfaction. Mr. Pullis is the official photographer of the New York Rapid Transit Commission. In addition to other work he is taking all the photographs at the Garden which will appear in the Daily Street Railway Review. Orders for Mr. Pullis may be left at the "Review" booth at the head of the main aisle.

President W. P. Engel, of the People's Gas and Electric Company of Defiance, Ohio, writes us that he had hoped to attend the convention, but that it is simply out of the question, because of work at home. The company is increasing its generator capacity, and putting in machinery for a new coal gas plant. There are also about 4,000 feet of 8-inch mains to lay.

## PRESIDENT HOLMES.

Mr. Walton H. Holmes, who was elected president of the American Street Railway Association at its meeting in Kansas City, last year, has been connected with the Kansas City street railway system in the west since its incipency. The present Metropolitan Street Railway Co., of Kansas City, of which Mr. Holmes is president, was organized in 1886 by his father, Nehemiah Holmes, who was most prominently identified with the growth and progress of the metropolis of the Central West. The line was known as the Kansas City & Westport Railway. At the age of 12, Walton Holmes entered the employ of this company in a subordinate capacity. His brother Conway, three years his junior, was employed at the same time, as a driver of the company's mule cars. The two brothers thus began a career which has since distinguished them among the successful men of the street railway world. Before he was 21 years old, Walton Holmes was made vice president of the road. A



W. H. HOLMES.

few years later, the brothers organized the Grand Avenue Cable Co., of which Walton Holmes was president and Conway Holmes, general manager. In 1894, this company absorbed the Kansas City Cable Co., and was, the following year, consolidated with the Metropolitan Street Railway Co. Thus developed the great street railway system of Kansas City, which now operates 122 miles of electric and 40 miles of cable railways. At the time of the merger, Walton Holmes was made vice president and general manager, and Conway Holmes, general superintendent of the system. In 1899, Walton became president and his brother, general manager of the Metropolitan company, offices which they now hold.

As has been said, Mr. Holmes' father was one of the founders of the rough frontier town, and the leading spirit of its progressive enterprise. Walton Holmes, as his successor, fills a place of recognized importance and responsibility in the modern city.

## ST. LOUIS CAR CO.

This company which is represented in the East by Mr. F. E. Huntress, of Boston and New York, will keep open house on Wednesday in the Astor dining room, and Parlor 141, at the Waldorf-Astoria Hotel. On Thursday and Friday the company's reception rooms will be changed to Parlors 116 and 117, in the same hotel. The St. Louis Car Co. extends to its host of friends an earnest invitation to call and enjoy a social chat with each other and with the representatives of the company who will be on hand to see that everybody has a good time. Mr. W. J. Floyd, of the New York office, will assist Mr. Huntress in doing the honors.

## PRESIDENT HAM.

Mr. William F. Ham, well known to readers of the Review as one of the organizers of the Street Railway Accountants' Association, of which he was last year elected president for 1900-'01, has made street railway accounts his particular study, and is recognized as an expert. Mr. Ham was born in Lewiston, Me., Mar. 15, 1870. He entered Bates College in 1887, but his course at that institution was interrupted by serious illness, and at the end of the year he withdrew. In 1889 Mr. Ham engaged with the Equitable Life Assurance Society, in New York City, and was with that company for four years in various capacities, among them chief bookkeeper for one of the large subordinate corporations. Later he was appointed as private secretary to the second vice president. In 1893



W. F. HAM.

he resigned his position with the Equitable company to accept that of assistant accountant in the New York office of the Johnson Co. In the latter capacity he began his extensive acquaintance with prominent men of the street railway world. When the Nassau company had under consideration the lease of the Atlantic Avenue lines, Mr. Ham was offered the position of cashier and accountant, which he accepted. In April, 1897, he was made secretary of the Nassau Electric Railroad Co., of Brooklyn. Subsequently, he became auditor of the entire Brooklyn Rapid Transit system, but severed that connection in January, 1900, to accept the office of comptroller of the Washington (D. C.), Traction & Electric Co., a position which he now fills with exceptional efficiency. Mr. Ham's work in connection with the Accountants' Association has placed him prominently before the fraternity, and has gained for him a host of friends.

The Marion, (Ind.), Transit Railway Co., whose lines were recently purchased by the Marion City Railway Co., controlled by the Union Traction Co., of Indiana, has been reorganized with the following officers elected: E. H. Ferree, president; C. W. McGuire, vice president and general manager; J. A. Van Osdol, secretary, and W. C. Sampson, treasurer.

During the week of the state fair in Minneapolis, the Twin City Rapid Transit Co., did a record-breaking business, the number of fares collected being 2,265,000. The company's cars made 350,000 miles, a distance equal to 107 trips from New York to San Francisco. There were no accidents or mishaps of any kind during the week.

## "I REMEMBER, I REMEMBER"—Tom Hood.

In a recent letter, Mr. D. B. Hasbrouck, vice-president of the Metropolitan Street Railway Co., of New York, gives us a number of personal reminiscences of "early" days in New York. The following extract will appeal particularly to the "younger" generation.

"Man and boy, for nearly seventy years, I have watched the progress of New York. I remember when Broadway from Fourteenth street to the Battery was almost entirely lined by the residences of the oldest and best citizens, as were all the cross streets below Canal St.

"I remember when Washington Square was 'Potter's Field,' when Anson G. Phelps, of Phelps, Dodge & Co., had his country seat on the bank of the East River at the foot of East Twenty-ninth St., and James Brown, of Brown Brothers & Co., lived in Leonard St., between Broadway and Church St.; and Philip Howe, Mayor, lived at the corner of Broadway and Great Jones St. I remember when there were twenty-five churches below Chambers St. All of these save Trinity, St. Paul's, and St. Peter's have now gone 'up-town.'

"Of course, there were no street railroads. Omnibusses were tearing and their drivers swearing all over the roadway of Broadway. A quaint old gentleman who lived on Broadway near Broome St., gave vent to his feelings in a newspaper card, forbidding the drivers from swirling into his gutter and throwing mud on his sidewalk. He gave notice that the Knickerbocker Line of stages, in which he rode, were alone allowed the privilege of approaching his curb.

"No stages ran on Sunday and it was indeed a 'Sabbath Day's journey', if one were obliged to walk across the Island up-town.

"After numerous roads had been constructed and it was proposed to put a track on Broadway, the property owners vigorously opposed the effort, honestly believing it would ruin their property. The omnibusses were at last abolished and the land owners lived to acknowledge their mistake."

## ANNUAL REPORT AMERICAN RAILWAYS.

The second annual report of the American Railways Co. for the fiscal year ending June 30, 1901, has recently been issued. The properties owned or controlled by this company and the mileage of each are as follows:

	Miles.
Bridgeton & Millville Traction Co., Bridgeton, N. J. ....	23.2
People's Railway Co., Dayton, Ohio .....	22
Chicago & Joliet Electric Railway Co. ....	41
Chicago & Des Plaines Valley Electric Railway Co. ....	23.5
Altoona & Logan Valley Electric Railway, Altoona, Pa. . .	18.07
City Passenger Railway Co., Altoona, Pa. ....	7.5

This gives a total of 162.9 miles of railway, computed as single track, which the company owned June 30, 1901, 71.9 miles having been added since the report of the previous year. In addition to these railway properties the company also controls the Springfield Light and Power Co., of Springfield, O., and the Bridgeton Electric Co., of Bridgeton, N. J. The net income for the current year was \$226,106 and there were three dividends declared during the year each of 1 per cent., amounting to \$112,530, leaving a surplus of \$113,576. The net income for the year was equal to over 6 per cent. on the capital stock of the American Railways Co. In addition to the dividends declared by the subsidiary companies, amounting to \$160,124, they earned an undivided income fully equal to an additional 1 per cent., which showed a considerable increase in the gross earnings. The gross earnings for 1901 were \$844,297, as against \$778,042 in 1900. An increase in operating expenses was shown, due principally to the increase in the cost of fuel, the substitution of coal for gas, owing to the failure of the supply of gas, the increased price of labor and materials and the employment of conductors on a number of the lines where none had previously been employed. On March 1st of this year the American Railways Co. came into control, through the purchase of the large majority of the out-standing stock, of the Altoona & Logan Valley Electric Railway Co., also of the City Passenger Railway Co., of Altoona. As these companies were only controlled for four months of the fiscal year, only a small part of their earnings inured to the American Railways Co.



## THE CONVENTION IN NEW YORK, IN '84.

It is seventeen years since the American Street Railway Association first enjoyed the hospitality of New York. On the occasion of its first meeting in the American metropolis, the fraternity may be said to have been in its incipency, only two previous conventions having been held,—the one in Boston in 1882, at which organization was perfected, and the one in Chicago in 1883. The Association convened in the Fifth Avenue Hotel, New York City,

the investigations of science, and have asked myself the question: 'What is it to be, and what is to come of it?' . . . When the Creator desires to confer a new blessing on the world it is never done at once. Compare it, if you please, with our human lives. We come into the world helpless, poor and naked; but there are tender hands to lead us on. They care for us, and as life goes on we are educated, until we arrive at perfect manhood; so the Creator presents this power of electricity to us. When we say that this or that invention is in its infancy, go with me in my thoughts as I have



C. C. WOODWORTH.



J. E. RUGG.



H. M. WATSON.

at 10.25 a. m., on Wednesday, Oct. 15, 1884, William H. Hazzard, of Brooklyn, presiding. Seventy-six delegates from member-companies were present, and at the first session 34 applicants were admitted to membership.

In the light of subsequent developments, many of the problems then earnestly discussed may now be reviewed with a degree of amusement though with no less appreciation of the material difficulties they presented at the time. It was before the era of electricity had revolutionized the service, policy and operation of

gone to the infancy of manhood. I stand aghast when I see some car or engine running on a track and am told that its motive power is electricity. I know nothing of this strange power, but I see one thing—that a step is being taken toward its manhood. I firmly believe that this idea was born and given by the Creator to the world; and now all the scientific men and all the scientific intelligence and knowledge of the world is at work upon it. Not with the brain of Morse, who conceived it; not with the energy of Bell, who used it; but each and all bending their aid to its grand de-



CHAS. HATHAWAY.



G. HILTON SCRIBNER.



CHAS. CLEMSHAW.

street railways, although many of its benefits were anticipated in the memorable speech of Mr. Calvin A. Richards, president of the Metropolitan Railroad Co., of Boston. A part of Mr. Richards' address before the convention, which was greatly appreciated by the association, is quoted:

"I know nothing about the machinery necessary for the application of electricity as a power. I have followed, as far as I could,

development. And now, sir, who shall dare tell me when I walk at night under its light, which almost equals the sun at noonday; when I can speak to my friend so many miles away, that he shall not have a motor impelled by that power? . . . A step has been taken with steam, and that with the cable. The next step, gentlemen, as sure as God reigns, is going to be electricity!"

Since Mr. Richards' prophecy was uttered, the "car or engine

propelled by a strange power at which he stood aghast," has become a familiar thing in every corner of the world. The problem of the scientist is solved, and the superstitions of the ignorant allayed. There are none to marvel at the "flight of the broomstick train," and the fear "the gleam of the witch's eye and the sound of her black cat's purr." The prophecy has been fulfilled, and, in the words of Mr. Richards, electricity has taken a long step towards perfected manhood.

The reports of the special committees at the first meeting in New York comprised many subjects which have in most cities long been relegated to the dust-heap. For instance, the report of the committee on stables and the care of horses, from which the following observations are extracted, has now but little interest to the American street railway man outside of New York:

"A buyer of street railway horses should always insist upon the necessary qualities in the horse he buys, without too much regard to the price. A good disposition and an easy gait should be considered as absolutely necessary. The head and general appearance of the countenance will show the disposition. . . . Color should have nothing to do in the selection, except to cheapen the price, as is the case with white, gray, buckskin and bald-faced horses. A flat-footed horse should never be accepted.

"Fitty and low-bred horses and those that cannot stand the sun are assigned early and late trips.

"In the care of horses, the principal and it might be said, the whole trouble met with, proceeds from strains from slipping, affecting the hind legs, back and kidneys, producing, in many cases, paralysis, from which they rarely recover."

Special interest was awakened by the discussion of the report of the committee on repairs of track; and the question whether salt were necessary for the removal of snow and ice, and if so, if its use were detrimental to the public health, and, especially, if it were injurious to horses, was warmly debated. In Philadelphia there had existed a greater prejudice to the use of salt for this purpose than in any other city. The board of health had exerted its influence to have the use of salt abolished. In July, previous to the third annual meeting of the Association, President Hazzard addressed a circular letter to the presidents and superintendents of all the street railways in America, comprising a series of questions in relation to the propriety of using salt for cleansing tracks from snow and ice. The answers received were decidedly in favor of the free use of salt even to a greater extent than had before been practiced, and were read and commented upon in the convention. Other topics reported by special committees were: "Completed Construction of New Road;" "The Cable System of Motive Power;" "A Uniform System of Accounts;" "Labor and the Graduating System of Compensation;" "Ventilation, Lighting and Care of Cars;" "Taxation and License."

The discussion of these reports, and the many pleasures incidental to the business of the convention occupied three days. At the last session on the afternoon of October 17th, officers for the ensuing year were elected as follows: Mr. Calvin A. Richards, president; Mr. Julius S. Walsh, first vice president; Mr. Henry M. Watson, second vice president; Mr. Edward Lusher, third vice president, and Mr. William J. Richardson, secretary and treasurer.

On the night of the 17th there was a memorable banquet at Delmonico's. Over 100 gentlemen were present at the feast, representing the street railway companies of 23 states and of Canada. Mr. Richardson gave thanks. At the conclusion of the dinner, Mr. William White, who presided, addressed the assembly, and then followed toasts, which were grave or gay, practical or poetic as the subject demanded. Even the horses and mules in the street railway service came in for their share of eulogy, and much laughter was elicited by the toast-master's proposing:

"The mules of Kentucky, though without pride of ancestry or hope of posterity; the success of their trainer in giving them a stable education gives an emphatic contradiction to the idea that 'a little learning is a dangerous thing.'"

We give herewith portraits of several of the delegates who were prominent at the first New York convention.

Mr. George P. Heckel has severed his connection with the Mississippi Valley Transit Co., of St. Louis, Mo., and therefore he will not be with us.

#### IN THE OLD DAYS—NEW YORK'S FIRST MEETING. AN INTERESTING LETTER FROM MR. C. B. HOLMES, PAST PRESIDENT OF THE ASSOCIATION.

Editor "Street Railway Review": Replying to your request for a few reminiscences of the American Street Railway Association meeting, held in the city of New York, in October, 1884, while I fear that anything I might say would hardly be worth your publication, I am very willing to give you my impressions, as they now stand out in my memory after a lapse of seventeen years.

First of all is the recollection of the superb manner in which the association was entertained by the street railway gentlemen of New York and Brooklyn, and the almost infinite pains which they took to make the visit a most pleasant one. This applies not alone to the lavish expenditure of money on their part, covering every feature which could render the session and banquet complete and agreeable, but especially by the great tact which was shown by these gentlemen in the successful endeavor to make every member feel at home, and enable every one to derive the largest measure of satisfaction. This was not altogether an easy task, because of the immature condition of the association, it having been organized at Boston in December, 1882, and its first meeting thereafter having



C. B. HOLMES.

been held in Chicago in October, 1883, which gathered up the street railway men of the West and carried them in force to the New York meeting, in October, 1884. The association was really in its formative state, and had not yet come into that condition of cohesion, strength and self-reliance which was essential to its highest operations, and the association owes a great debt of gratitude to our friends in New York for the skill and affable courtesy with which they helped the members of the association to mutual helpfulness. That meeting did an immense amount of good in creating a strong bond of friendship between all the members of the association, which has strengthened with age.

It is almost impossible for those who have lately come into this line of business, after the developments of the last few years, to go back to 1884 and realize the conditions which then existed, and how the future appeared to the men at that convention. At that time electricity had scarcely been heard of as a motive power, little experiments had been made in one place and another, but the results were insignificant and the cost prodigious, so that with the exception of an individual here and there, nobody in America regarded it as a possible universal force for this line of work. Across the Rocky Mountains had come from time to time bits of information regarding the cable system, which had been adopted on the steep hills of

San Francisco, but hardly anywhere had the system been regarded as more than a contrivance adapted to the peculiar conditions of that city, and suited to the handling only of a very moderate traffic in a region where frost and snow are unknown.

A company in Chicago had installed in that city a few months before twenty miles of cable system, and had its plans prepared for twelve or fifteen more miles; this had created considerable comment through the public press and was regarded by many as an experiment possessing some interest and some possibilities, but by no means a demonstration which should command the interest and the capital of the country. There were far-sighted men in that convention who knew the power of public opinion and realized also that the public press, often unreasonable and unreasoning, had already begun to call attention to the experiment in such a way as to create uneasiness on their part, and with reason, for many of them had expended their fortunes in building, equipping and bringing to a high state of perfection, street railways in many cities, using only animal power for moving their cars; and anything which should carry the people in half the time and with far more comfort of seats and conveniences could hardly be expected to be long hid under a bushel, when the press is always so eager to demand for each town the best that can be found in any. The enormous expenditure involved in the construction of a proper cable system was appalling to these men, and naturally caused them to draw back while they waited and wondered to what this thing should grow. There were men in that convention who did not dream that a few years would render a horse car a novelty, and they entered into the discussion of what affected the animals with all the interest and energy to which the subject would be entitled were it to last forever; while there were others who could throw but little enthusiasm into this department, so sure were they that a crisis was approaching, if it were not already at hand, when something must take the place of the horse and the mule. I do not believe that any of these men dreamed that so complete and widespread a revolution in the motive power of street railways could come in so short a time.

The cable system received considerable discussion and those who had the feeling that something new must come, made careful study of its features, its benefits, its expense and the cost of installation. To some it was simply a matter of curiosity, but in no wise of personal interest to themselves, and there were others who felt that this twenty miles of cable road might prove an entering wedge and break down the barriers which held back the forces of the press and public opinion and prove as disastrous to their interests as the breaking of the dam in the Johnstown flood proved to the property below it.

One of the ever-to-be remembered persons in that convention was Mr. Richards, of Boston, whose magnetic speech on electricity thrilled every member of that association, but whose stirring address closed with the sage advice to his brethren, to "wait"; but there was no disguising the element of turmoil in his mind over the feeling that something must come. The writer had been through that anxious sort of state, and had made his investigations, and his company had invested its millions, whether for weal or woe, and he was assured on his part that they had made no mistake, but his sympathy for a large number of thoughtful, far-seeing men, who were deeply exercised over the then condition and outlook as it affected their own properties was almost painful, and he will never forget the solicitous and somewhat bewildered condition in which many of them viewed the outlook for themselves.

The banquet was a most enjoyable affair. It was simply perfect in all its arrangements, and did more than all else to weld into an enduring friendship the acquaintances made in that convention. It needed just that brilliant and irresistible wit which Mr. Richards, of Boston, and Mr. Richards, of Cambridge, possessed, with their inimitable manner of exercising it, spearing each other with flashes sharper than any rapier, sparkling like the white-heated metal on the anvil, but because of their personalities and acquaintances and friendship and their manner, all these demonstrations were as stinging as morning sunbeams. It has never been the privilege of the writer to witness a gathering of men so convulsed with laughter as was that company by the superb wit of these two men; and though the Boston man long since closed his career on earth, all who knew him are still admirers of his personality, and are grateful to him for his whole-souled, generous friendship. He

thoroughly loved his fellow-men and he had a quick sympathy for those who were struggling with him along the same lines of toil, and the sunshine which showered out of his nature, both in that convention, and in the year of his presidency of the association, had no little to do in making the fraternity the large and powerful and helpful agency which the years have proved it to be.

My time and your limits will not permit my taking up in detail all those who were at that convention, but who have since passed away from earth, but I cannot close without mentioning the two Richardsons, father and son, from Brooklyn, the former a conspicuous figure in so many of the conventions of the association, while the latter for many years was the secretary of the association and helped so much to build it up from its small beginnings to what it was at the time he was taken away. Both were typical gentlemen of the old school.

It was a bright and fruitful idea Mr. Littell conceived of securing an association of the street railway men of America, and as usual with him, to think was to act; he found a ready response to his suggestion, both in the East and the West, and we shall all of us ever be grateful to him for starting the association, which has been such a powerful feature in helping the American people to the superb facilities now enjoyed by almost the whole of America in the way of intra-mural transportation.

With kindest regards, I remain,

Yours truly,

C. B. HOLMES.

Chicago, September 21, 1901.

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#### SOME OF THE RECOLLECTIONS OF MR. J. N. AKARMAN, OF WORCESTER—HOW THEY CARED FOR THE MOTIVE POWER TWENTY YEARS AGO.

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Editor REVIEW: Seventeen years is a long time to look backward and pick out from the hay-stack of experiences and recollections the straws which were harvested at that time; but I have endeavored to call to mind one of the pleasantries of '84, which will bring a smile of recollection to the faces of older members of the Association.



JOHN N. AKARMAN.

My recollections of the third convention of the American Street Railway Association, held at New York in 1884, are somewhat effaced by time. I was a delegate, having the honor to represent the Charles River Street Railway Co., of Cambridge, of which I was superintendent. I was young in the business, and content to listen



and learn from my elders, among whom were such prominent men as William H. Hazzard, of Brooklyn; Jacob Sharp, of New York City; Calvin A. Richards, of Boston; Julius E. Rugg, of Boston; Daniel F. Longstreet, of Providence; Henry M. Watson, of Buffalo; William White, of New York; Charles Chemenshaw, of Troy; H. H. Littell, of Louisville, Ky.; Edward Lusher, of Montreal, and many others representing the large railroads of the country.

Among the supplymen present were the late Walter Jones, of J. M. Jones' Sons, representing everything in sight, with his happy disposition and pleasant, cheerful individuality; John A. Brill, of the Brill Car Co., of Philadelphia; William S. Silver, of car-spring fame; Major Evans, then introducing the girder-rail, which at that time was of light section, weighing less than 50 lbs. to the yard, and being about 4 in. in height; and many others, well known then and now to those young or old in the business.

Our efforts, then, were devoted to the successful operation of horse railroads, and the questions and discussions then pertained to the care and feeding of horses and the construction and maintenance of track, and we had no thought, then, of the scientific theories and tests, regarding the efficiency of electric motors and apparatus, such as now absorb the attention and engage the minds of street railway managers of to-day.

Apropos of the subject of the care of horses, I remember Mr. Littell interesting us with an account of how the mules were treated on his southern road; how they were brought in from their day's work sweating from their toil, allowed water to drink if they wanted it; given a shower-bath; taken to a sand-pit to roll and dry themselves, and then, for the sake of cleanliness in the stable, taken to the urinal and induced to relieve themselves by the assistance of a bunch of straw rustled under them, or by hearing the harmonious notes of the hostler as he whistled for their edification, or by the assistance of the sound made by running water.

Mr. Littell was very earnest in his description, and when some of those present could not repress a smile, I remember his convincing expression of countenance as he stood there, in his dramatic manner and shook an imaginary bunch of straw and imitated the seductive whistle of his hostlers, to the amusement of every listener.

Afterward, when Mr. White, of the Dry-Dock road, in discussing the northern methods, spoke of the impossibility of the president of a large road in New York City devoting his time to the education of the thousands of horses used in the service of his road, how the pent-up merriment was allowed free vent, and the general laughter made every one friends from that moment.

While a great deal was learned by all who were present at that convention, from the general discussion of subjects then pertinent, more time was devoted to the introduction of street railway representatives to each other, than at the convention of to-day.

The Association had been organized at Boston in 1882, and but one real convention had been held previous to this one, and every effort was being made to beget the co-operation and support of all the roads of the country through their representatives.

It is needless to say that the efforts of the organizers were successful, for, by the interchange of thought at the conventions, which followed, the adaptation of electricity as a motive power was recognized as a commercial success, and invited the attention of the capitalists to the great possibilities of earning dividends by the equipment of horse roads electrically and the consolidation of the conflicting interests representing the many roads which were then being operated in all the large cities, thereby doing away with the rivalry and expense incidental to their operation as separate corporations.

The lapse of time and the experiences at the many conventions I have attended since then, have made my memory somewhat treacherous when I undertake to probe it for facts and incidents of 1884; but "The Construction and Maintenance of Track" and "The Care of Horses" were indelibly impressed upon my mind, not to be crowded out by time or the sociability and good-fellowship of those whose good fortune it was to be delegates at that convention.

Yours truly, JNO. N. AKARMAN.

The annual report of the United Traction Co., of Albany, for the year ending June 30, 1901, recently published, shows the number of passengers carried to exceed 27,000,000. Gross earnings are reported at \$1,331,879.13; operating expenses at \$907,525.60; net earnings at \$424,353.53; income at \$432,082.32; net income at \$186,130.85; dividend, five per cent on capital stock, \$229,486.86, and net deficit, \$43,356.01.

## A WELL-KNOWN SUPPLY MAN.

The large business now carried on by the Frank Ridlon Co., of Boston, is largely the result of the ingenuity and business sagacity of one man, Mr. Frank Ridlon, whose name is associated with the growth of both the electric lighting and the electric railway industries, particularly in New England and the Eastern States. The business is unique in many respects. In 1891 Mr. Ridlon, who as a representative of the Brush Company, had for several years prior to this time, been engaged in installing electric-lighting machinery in the East, conceived the idea that the rapid developments which were even then being made in electrical research would soon make possible the establishment of a business devoted to the buying and selling of slightly worn electrical machinery, discarded for larger units, or made obsolete by improved designs. He accordingly took advantage of an opportunity that



FRANK RIDLON.

soon after presented itself and purchased a small repair shop in Boston, where he at once set about buying all the second-hand generators and motors he could secure, making such repairs as were necessary and selling them again at prices that created a ready demand.

The business grew at a rapid rate and in 1894, Mr. Ridlon associated with himself Mr. Edmund W. Kellogg, and a stock company was organized, known as the Frank Ridlon Co., under which title the business is still carried on. Mr. Kellogg had been connected with the Thomson-Houston Co. as engineer and salesman and brought with him a wide acquaintance and a rich fund of experience. The scope of the company's activity has been gradually enlarged and in addition to dealing in second-hand machinery it now makes electrical repairs of every description for electric light and street railway companies, and also acts as territorial agent for a number of specialties.

The Northwestern Elevated Railroad Co., Chicago, has ordered 60 new cars of the St. Louis Car Co., 15 of which are motor cars. This makes a total of 100 cars purchased by the company since last fall.

Dallett & Co., of Philadelphia, dealers in second-hand railroad and trolley supplies, are located at sections U. V., Madison Square Garden. They have an exhibit of specimens of their street railway motors, of which they carry an assorted stock. Their representative at the convention is prepared to talk cars, motors, generators, rails and steam locomotives.

The friends of Gus Suckow, manager of the Vose Spring Co., have appointed a committee of which Edward Lawless and William Silver are members to purchase a suitable medal or erect a monument in honor of the heroic achievement of Mr. Suckow saving a boy's life at the seashore recently. The New York dailies have given the subject considerable attention.

## CONSOLIDATION IN PITTSBURG.

September 30th the directors of the Philadelphia Co., of Pittsburgh, which controls the United Traction Co., agreed upon the terms for acquiring the property of the Consolidated Traction Co., and a meeting of the stockholders has been called for December 4th to consider the matter. The plan is to exchange one share of Philadelphia common stock for two shares of Consolidated common stock, and \$50 in mortgage bonds, \$7.50 in Philadelphia preferred, \$2.50 in Philadelphia common and \$3 in cash for each share of Consolidated preferred deposited before November 1st.

The Philadelphia Co. also contemplates acquiring the Mononga-

## THE BRILL EXHIBIT.

The new Brill convertible and semi-convertible cars are shown for the first time at any exhibition. Although the limitations of the Garden have prevented the company from bringing full-sized cars, the sections and models displayed will illustrate the novel features.

The peculiar arrangement of sash and panels by which the car is made convertible is the invention of Mr. John A. Brill. It appeared in its first form a number of years ago, but owing to the fact that very small glass was employed at that time, it made little headway. In its new form the glass can be of any desirable size.



BRILL CONVERTIBLE CAR.

hela and the Pittsburg & Birmingham properties, known locally as the Mellon lines. The terms, however, have not been made public.

The Mayer & Englund Co., Philadelphia, is represented by Charles J. Mayer, president; A. H. Englund, secretary and treasurer; Frank R. Shattuck, director; Willard A. Cockley, of the New York office; William A. Armstrong, Jr., Harry G. Lewis, Benjamin Hayllar, Jr., Edwin B. Ross, Harry J. Mayer, D. L. Crawford, George W. Provost, J. L. Merrill. The company has headquarters at the Murry Hill.

The side panels are made flexible to follow the sash and glass into the roof, the posts having precisely the same external form as those of standard open or closed cars.

The sash are in two pieces. Pockets are formed in the lower deck of the roof and the sash are safely stored in these recesses completely out of sight. Below the sash, there is also sufficient room for the side panels. When the panels and sash are raised into the roof, both sides of the car are open, and the passenger sees no difference between such a car and the ordinary standard open cars. Even the curtains are arranged to come to the floor, the round corner seat end panels permitting them to do this without difficulty.



BRILL SEMI-CONVERTIBLE CAR.

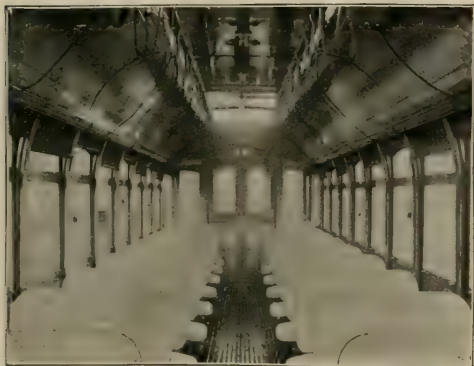
Mr. C. L. Fitch has been appointed chief engineer for the St. Louis & Suburban Railroad Co., his headquarters being at De Ho-diamont station. Mr. Fitch has had an extensive experience as operating and constructing engineer, having been with the Brooklyn City Railway Co. and the Columbus (O.) Central Railway Co. He has just recently removed from St. Paul, Minn., where he was engineer for the contractor of the St. Croix water power installation at Apple River.

In examining details one cannot fail to be struck with the simplicity of the means employed. The casual observer may perhaps miss one of the important, but inconspicuous features of its arrangement. It is that there are two grooves in the post which occupy the same space; one of these is at the bottom of the other. The panel slides in what may be called the outer groove while the sash, on trunnions, slide in the bottom one. This practically gives two tracks over one "right of way" until the point is reached where



the sash and panel have to go in different directions; at this point the grooves diverge and the panels and sash are sent in different directions without the necessity of a switch.

When the car is closed with sash and panels in place it has every appearance of the ordinary closed car. The windows and blinds can be operated as usual. The steps at the platforms give entrance and egress as in the standard form, while the running board is folded out of the way. There is an incidental advantage which this



INTERIOR CONVERTIBLE CAR.

car has over the ordinary type when open, and that is the low steps at the platform which are extremely convenient for ladies, children and elderly persons. It will be noticed that the ventilators are in no way obstructed when the sash are raised; in fact the interior of the car is not altered from the standard forms. The hardware used on both sash and panels is extremely solid and worthy of attention on account of both its strength and convenience.

When this construction is applied to cars of the semi-convertible type, these advantages are quite as apparent as when used for the convertible. The side panels of the semi-convertible cars are made quite low. This gives as large a space as is desired for the sash and



INTERIOR SEMI-CONVERTIBLE CAR.

glass. Both pieces of sash are completely out of the way, up in the roof, and can be raised or lowered in a few moments.

The car is said to possess many advantages over the old style of semi-convertible car, in which the sash must be removed and stored when the car is to be opened, and which requires that the car be run to the car barn or store room when it is desired to have the sash again fitted in place. One feature that railway men will appreciate is the fact that the car can always be suited to the weather requirements of the season of the year. Advantage can be taken

of warm pleasant days at any time to have the cars open and at any season of the year on a rainy, cold or uncomfortable day they can be closed and even heated without causing the management any further trouble than the mere issuing of an order. The Brill company claims that the manipulation of the sash and glass is as simple and easy as that of an ordinary drop sash.

This improvement as applied to the semi-convertible car has been received with unusual favor and a large number of orders have been placed for this type since the first car was put in service about six months ago. For suburban lines where high speed is essential and where stops are less frequent than on strictly city lines, the semi-convertible car is recommended as the entrances are exclusively at the ends, and passengers sitting next the windows are not disturbed by the entrance and exit of other passengers.

### OHIO BRASS EXHIBIT.

One of the most conspicuous displays is that of the Ohio Brass Company, of Mansfield, Ohio, which is located in the first balcony above the main floor. This exhibit is very attractively arranged, and shows a representative line of overhead material, motor and car supplies and track bonding devices, which are displayed on a pyramid of shelves at the back, and either end of which two very attractive poster girls are shown. At either corner and at the center of the exhibit several styles of the well-known "Wood's," "Richmond" and "Detroit" types of flexible pole brackets are mounted on iron poles. A very extensive and complete line of overhead materials, such as trolley wire hangers, ears, cross-overs, splicers, strain insulators, etc., is exhibited, including many new



EXHIBIT OF OHIO BRASS CO.

types, as well as improved forms of existing types of these articles. Among the newer types of trolley wire hangers shown are several forms of twin hangers, for both straight line and single and double curve suspensions. These hangers are designed for supporting two trolley wires on single track electric roads, to avoid the necessary complications of overhead switches and frogs, where only one trolley wire is used. One of the well-known specialties made by the Ohio Brass Company is the "Monarch" track cleaner, which is shown mounted on a stand in such a way that its construction and operation may be readily seen. The company reports a large and increasing sale for this device. Two types of adjustable track brush holders, adapted to flat and upright guard boards, respectively, are displayed, as well as a variety of steel wire track brooms for them.

The company will be represented by C. K. King, secretary, G. A. Mead, G. A. Harwood and A. L. Wilkinson, of the Mansfield office and by R. A. Byrns and A. B. Edes of the New York office, Bert Gellatly, of Pittsburg, and J. W. Porter and Max A. Berg, of Chicago.



## THE AUTOMOTONEER.

The proper way of starting cars has long been an important question among street railway men and there has been a great deal of time and labor expended in the endeavor to provide a practicable device which would compel the motorman to correctly manipulate the controller at starting. As illustrating the evils of "fast feeding," a test made by George W. Knox, formerly electrical engineer of the Chicago City Ry., may be cited:

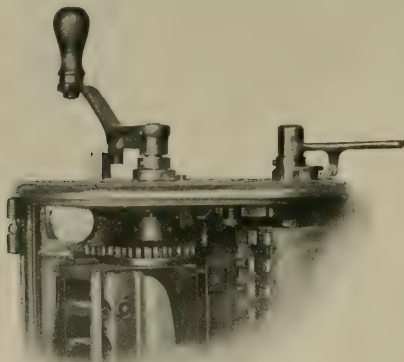
	Right Start.	Wrong Start.
Time, when full power is turned on.....	4 sec.	10 sec.
Time, when full speed is attained.....	9.5 sec.	12 sec.
Distance car travels at time full power is on.	13.5 ft.	110 ft.
Distance car travels at time full speed is attained .....	85 ft.	150 ft.
Maximum current consumption in making start.	140 amp.	60 amp.
Volts drop in making start.....	80 volts.	20 volts.
Watt seconds consumed in making start.....	307176.4	221676.0
Average H. P. used in starting.....	43.3	24.7

This table shows a startling loss of current and consequent loss of efficiency between a start consuming four seconds and a start consuming ten seconds. Besides this loss of power there is also an actual loss of distance traveled at the time the full speed is attained.

Many street railway managers contend that they must start their cars and attain full speed in the shortest possible time, notwithstanding waste of current, in order to maintain schedules, but other managers find in actual practice that as good time can always be made, and often better time, where correct feeding is used, and at the same time the saving in current is secured.

The ideal acceleration is as rapid as can be attained without the slipping of the car wheels, and considering these features, on an average track a ten second start is claimed to be ideal. The correct and economical application of the current of the motor car not only works a large saving in the expense of the power but also lengthens the life of the motor in proportion to the reduction of the amount of work required of them, which in the course of a year will result in a large saving for motor repairs. The proper feeding of current will also reduce the risk of personal injury by the sudden starting and jerking of the car.

In an article entitled "The Motorman as an Element in Street Railway Economy," read before the Engineers' Club of Philadelphia, Mr. Charles Hewitt, electrical engineer, Union Traction Co.,



THE AUTOMOTONEER.

of Philadelphia, gives the results of some tests made on the lines of this company that shows a possible saving of about 45 per cent., and Mr. Hewitt says: "The difference between the men is due almost entirely to the manner in which they handle the controller, and but very little to number of passengers or condition of rails." He also states that he believes it possible to secure a saving of about 20 per cent., or assuming a cost of  $1\frac{1}{2}$  cents per kilowatt hour, a saving of \$185 per car per year, for power alone.

Needlessly increased current at starting means extra wear on the

motors and a more variable station load, both of which are to be seriously considered.

With the view of meeting the widespread demand for a device which will compel motormen to handle their controllers properly, the Garton-Daniels Co., of Keokuk, Iowa, has just placed the "Automotoneer" on the market. The types now completed are for General Electric K-2, K-10 and K-11 controllers; other models are being designed. The device consists of the gear wheel attached to the shaft of the controller and the cylinder casting, which is shown at the left of the large gear with the smaller pinion meshing with it. In action the Automotoneer requires the motorman to stop on each point of the controller for a predetermined time. This time element may be adjusted so that it is impossible to turn on the full power in less than five seconds, seven seconds, ten seconds, or as desired.



APPLIED TO K-11 CONTROLLER.

The "Automotoneer" does not interfere with throwing off the current, but it is designed to prevent the motorman from losing his head in an emergency stop when the current is reversed and throwing it wide open, which usually results in opening the circuit breaker or blowing a fuse, thus cutting off all hope of controlling the car by the current.

Our illustrations show the "Automotoneer" designed for attachment to a K-11 controller. It will be noted that when the door is closed the "auto" is out of sight.

The Garton-Daniels Co. is represented at the convention by its secretary, Mr. J. V. E. Titus, and has the "Automotoneer" on exhibition in Madison Square Garden.

The St. Louis Car Co. now has the following orders in hand: 30 cars for the Boston Elevated; 250 18-ft. cars for Buenos Ayres; 15 cars for Wheeling, W. Va.; 20 cars for Nashville, Tenn.; 30 cars for New Orleans; 45 trail and 15 motor cars and 60 Hedley trucks for the Northwestern Elevated R. R., Chicago; two 34-ft. cars for the Cleveland, Elyria & Western; six 20-ft. cars for Pine Bluff; ten cars, 60 ft. over all, for the Jackson (Mich.) & Suburban; 120 cars for the Chicago City Ry.; 50 cars for Los Angeles & Pasadena; 20 cars for the Birmingham (Ala.) Railway, Light & Power Co., of the same type as the Chicago City cars; 20 cars for the Elgin (Ill.), Aurora & Southern; 3 cars for the Anaconda Copper Mining Co.; eight 50-ft. body cars for the Canton, Akron & Southern; 7 cars for Syracuse, N. Y., of the Chicago City convertible type; 10 cars for the Georgetown, Pa., & Ipswich road, near Boston; eight 21-ft. body cars for the Union Traction Co., of Indiana.

The Columbus, (O.), London & Springfield Railway Co., has completed the stringing of trolley and feed wires over a distance of seven miles on the Columbus, Grove City and Southwestern branch. Aluminum feed wire was used, marking an innovation on Ohio interurban roads. The mechanical equipment at the new power house has been installed, and the road will shortly be opened for traffic.



THE EXHIBIT HALL AT 4 P. M. TUESDAY.

## DELEGATES REGISTERED YESTERDAY.

D. B. Dyer, president; R. R. Conklin, vice-president, Augusta Railroad Co., Augusta, Ga.

John B. McClary, general manager, Birmingham Railway, Light & Power Co., Birmingham, Ala.

John R. Graham, second vice-president, Brockton Street Railway Co., Brockton, Mass.

Ira A. MacCormack, general manager, Cleveland Electric Railway Co., Cleveland, Ohio.

John A. Rigg, president; H. C. Moore, vice-president; F. L. Fuller, general manager, and A. C. Jack, superintendent, Chester Traction Co., Chester, Pa.,

T. C. Penington, treasurer, Chicago City Railway Co.

N. H. Heft, president, Meriden Electric Railroad Co., Meriden, Conn.

Moses S. Hopkins, general superintendent, Columbus Railway Co., Columbus, Ohio.

Walton H. Holmes, president, Metropolitan Street Railway Co., Kansas City, Mo.

E. P. Shaw, Jr., general manager, Haverhill & Amesbury Street Railway Co., Haverhill, Mass.

H. H. Vreeland, president, Metropolitan Street Railway Company, New York.

J. R. Beetem, general manager, New York & Queens County Street Railway Co., Long Island City, N. Y.

L. E. Myers, president; I. C. Pinkney, general counsel; Walter Barker, Peoria & Pekin Terminal Railway Co., Peoria, Ill.

W. Worth Bean, president, St. Joseph & Benton Harbor Street Railway Co., St. Joseph, Mich.

F. H. Reed, W. H. Coverdale, R. B. Marchant, C. O. Lenz, Alton Railway, Gas & Electric Co., Alton, Ill.

C. N. Duffy, auditor; Richard McCullough, assistant general manager; C. E. Wilson, chief engineer; H. B. Fleming, superin-

tendent track and buildings; M. O'Brien, master mechanic; L. Jewell, superintendent time tables; C. E. Lund, Chicago City Railway Co.

T. A. Henderson, general superintendent; P. Needham, assistant superintendent; J. Z. Murphy, chief engineer; John Millar, master mechanic, Chicago Union Traction Co.

H. M. Sloan, general manager, Calumet Electric Street Railway Co., Chicago.

Fred H. Fitch, secretary and general manager, Denison and Sherman Ry., Denison, Texas.

E. D. Hibbs, auditor; George F. Chapman, general superintendent; H. H. Adams, master mechanic, North Jersey Street Railway Co., Jersey City.

H. C. Switzgale, purchasing agent; W. C. Kirkpatrick, secretary and treasurer, Metropolitan Street Railway Co., Kansas City.

J. B. Dennis, director; James H. Blair, director, East Side Electric Railway Co., Kansas City, Mo.

E. C. Foster, general manager; H. E. Farrington, master mechanic, Lynn & Boston R. R.

W. P. Bristol, John M. Hall, William F. Merrill, W. E. Chamberlain, John Henney, F. B. Smith, W. A. Appleyard, B. F. Simmons, W. E. Hoppen, Alonzo Klaw, George W. Pierce, George Webb, C. S. Symond, John Vaughn, Julius Jansen, H. A. Selah, Meriden Electric Railroad Co., Meriden, Conn.

Elton S. Wilde, E. E. Potter, A. D. Gore, Union Street Railway Co., New Bedford, Mass.

H. A. Fitzsimmons, Saratoga Traction Co., Saratoga Springs, New York.

D. L. Huntington, general manager; L. R. Notbohm, superintendent, Washington Water Power Co., Spokane, Wash.

S. G. Averell, H. S. Collette, Maurice Hoopes, H. O. Lardner, J. G. White, G. H. Walbridge, San Juan Light & Transit Co., San Juan, Porto Rico.

Charles T. Herrick, Williamsport Passenger Railway Co., Williamsport, Pa.



## CONVENTION NOTES.

The Wellston and Jackson Belt Railway Company, of Columbus, Ohio, is not a street railway, as a good many persons have assumed, but a standard steam line, with some electrical equipment for local passenger service. It is leased to and operated by the Hocking Valley Railway Company. Otherwise, Mr. F. B. Sheldon, the president's assistant, writes they would be happy to send a delegate to the A. S. R. A. convention.

The closing up of the affairs of the Wilmington Street Railway Co., of Wilmington, N. C., which was up for sale Monday of this week, precludes the possibility of the presence of Receiver A. B. Skelding.

Chief Engineer G. I. Brown, of the Portland City & Oregon Railway Co., of Portland, Oregon, has been traveling in the East and will reach New York just in time for the convention. The president of the road, Mr. W. H. Hurlburt, unfortunately cannot be present. Mr. Brown will probably register at the Hotel Bartholdi.

Supt. H. G. Lawrence, of the Chippewa Valley Electric Railroad Co., of Eau Claire, Wis., expresses regret at his inability to visit New York this week. He is unselfish enough to add that he wishes "one and all a very pleasant time."

Mr. A. A. Anderson, general manager and treasurer of the Mahoning Valley Railway Co., of Youngstown, Ohio, and Harry Davis, assistant treasurer, of Cleveland, with their wives, are among the latest arrivals.

Things are booming up in Fredonia, N. Y., and Manager M. M. Fenner, of the Dunkirk & Fredonia R. R. Co., writes that they are too busy to send a representative to the convention. There is a remote possibility of Mr. Fenner coming down for one day.

President Charles W. Wason, of the Cleveland, Painesville & Eastern Railroad Co., Cleveland, Ohio, will arrive in town tomorrow morning and will remain two days. Mr. Wason has secured apartments at the Manhattan, on 42d street.

Manager W. J. Brown, of the Union Electric Co., of Dubuque, Iowa, states that his people are doing a large amount of construction work and installing new machines. Hence his inability to be present.

At the Hotel Imperial, Broadway and 32d street, there arrived today President Elias Lyman, Treasurer W. F. Hendee and Electrician Richard Whalen, of the Burlington Traction Co., of Burlington, Vt. Mr. Hendee is also manager of the company, as well as president of the Military Post Street Railway Co.

One of the earliest arrivals was Mr. L. E. Myers, general manager of the Peoria & Pekin Terminal Railway (Pekin Fast Line) of Peoria, Ill., who came on Monday. Mr. N. C. Draper, general superintendent, came also. They are stopping at the Holland House.

From Burrville, Conn., comes word that Supt. Charles Alldis, of the Torrington & Winchester Street Railway Co., expects to arrive tomorrow. He will stop at the Grand Hotel, Broadway and 30th street.

Mr. George S. Davison, secretary and general manager of the Monongahela Street Railway Co., Pittsburg, Pa., represents also the Pittsburg & Birmingham Traction Co. He is accompanied by Mr. Frank McCoy, superintendent of the Monongahela company.

There will be general disappointment at the announcement that Mr. Marsden J. Perry, vice-president of the Union Railway Co., of Providence, of which Senator Nelson W. Aldrich is the president, cannot be present, owing to the pressure of business engagements. Mr. Perry has just returned from Europe, where he has been looking into traction matters.

At the Murray Hill Hotel may be found Mr. Charles E. Hubbell, vice-president and general manager of the Syracuse & Suburban Railroad Co., of Syracuse, N. Y. That is, he will be at the hotel when he is not at the convention.

W. Judson Smith, president, and R. R. Canfield, general manager of the Syracuse, Lakeside & Baldwinsville Railway, of Syracuse, N. Y., are here and will make the Imperial Hotel their headquarters.

Mr. T. C. Du Pont, prominent in street railway circles at Wilmington, Del., frequently runs in and out of New York City, making his headquarters at the Manhattan Club, and will visit the convention.

Mr. Frank E. Haff, secretary and treasurer of the Ocean View Electric Railway Co., and secretary of the Long Island R. R. Co., as well, has his office in New York, at 128 Broadway, and will be a regular attendant at the convention.

Mr. E. G. Hastings, of Palmer, Mass., regrets that it will be impossible to attend, owing to the press of business that just now besets him.

Mr. Walter Washabaugh, superintendent of the Keyport & Matawan Street Railroad Co., of Keyport, N. J., will be a daily visitor to the convention.

Owing to an immense amount of work in the line of new construction, the Venango Power & Traction Company, of Oil City, Pa., will have no representative at the convention this year. General Manager John R. Forbes states that President Geary and himself regret that they cannot attend.

Reducing fares to one-half cent a mile has increased business on the Niagara Gorge Railroad Co., of Niagara Falls, N. Y., to such extent that the general manager, Godfrey Morgan, cannot spare more than one day to visit the convention, which he anticipates with pleasure.

The Crocker-Wheeler Co., of Ampere, N. J., announces that beginning October 1st, its New York office is under the management of Mr. Francis B. De Gress. Mail for this office should be addressed to Crocker-Wheeler Co., New York Branch, 39 Cortlandt St.

The Hoffman House shelters General Manager J. A. Trawick, of the Little Rock Traction Company, Little Rock, Ark., when he is not at the Garden, or somewhere else.

General Manager James H. Dawes, of the Greenville Traction Company, Greenville, S. C., greatly regrets his inability to be present, as it would be a matter of great interest to him to meet with the members of the convention.

The Ohio River Electric Railway and Power Company, of Philadelphia, is well represented by the following officials: John Blair Mac Afee, vice-president and general manager; Louis S. Kite, treasurer; Charles L. Furbay, superintendent. Mr. Mac Afee is domiciled at the Waldorf-Astoria and Messrs. Kite and Furbay at the Hoffman House.

Mr. E. B. Clark, general manager and treasurer of the Columbia Electric Street Railway, Light and Power Company, Columbia, S. C., is another who finds the time all too short to attend to the business of the corporation and is sorry to say that he cannot come. He is very much interested in the convention, nevertheless.

Mr. F. A. Estep, president of the R. D. Nuttall Co., of Pittsburg, and Mr. L. W. O'Brien will attend the convention, with headquarters at the Netherlands.

Mr. C. S. Mitchell, auditor of the Philadelphia Co., Pittsburg, will stop at the Fifth Avenue Hotel.



Gen. G. H. Harries, vice-president of the Washington Traction & Electric Co., will be in attendance.

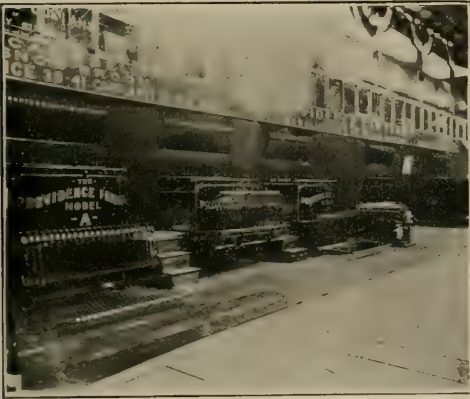
President Ham, of the Accountants' Association, is at the Fifth Avenue.

Mr. S. L. Nelson, general manager of the street railways at Wichita, Kan., and Danville, Ill., and of the Ft. Wayne (Ind.) & Southwestern Traction Co., expects to arrive in New York on Thursday morning, and will make his headquarters at the Fifth Avenue Hotel.

#### PROVIDENCE FENDER EXHIBIT.

The Consolidated Car Fender Co. has one of the most attractive and interesting of all the many exhibits, and it also displayed very commendable diligence in having its booth completely arranged early in the week, this exhibit being one of the few that was completely installed on Tuesday afternoon.

The exhibit comprises four types of the company's fenders, which are known as A, B, C and D, the Campbell snow broom and the Millen car step lifter. The type A fender is designed for high, the type B, for low cars, and the type C for all patterns of cars. The type D is designed for large and heavy interurban cars. The first three were shown attached to dummy platforms, while the type D was on the platform to which was attached the Millen car step lifter; this last named device is a most ingenious arrangement for lifting the running board of open cars and is actuated by the motorman. This is the invention of Mr. Thomas Millen, master mechanic of the Metropolitan Street Railway Co., of New York,



CONSOLIDATED CAR FENDER EXHIBIT.

and should prove particularly advantageous on all lines where the headway is short.

The Campbell snow broom has a "bird cage" type of head or hub in which the strips of rattan are thrust double and secured by bars parallel to the broom axis; this has proved to be an extremely satisfactory method for preventing the rattan strips falling out.

Attention was also called to the fact that there are some 10,000 Providence fenders now in use.

Mr. John Shepard, Jr., president, and Col. A. C. Woodworth, general manager, of the company are in attendance, and are assisted by Messrs. George Hollingsworth and E. C. Hall.

The Protected Rail Bond Co., Philadelphia, has an elaborate and complete display of its "Protected" rail bonds and tools for applying them, including a complete outfit of hydraulic punches and compressors for applying bonds to girder and T-rails. It is represented by Charles J. Mayer, President; A. H. Englund, treasurer; Edwin B. Ross, secretary.

#### WHY HE STOPPED USING HIS PASS.

A prominent street railway manager recently explained to a party of friends why he now pays his fare when he rides on his own lines, instead of using passes as most of his subordinates do. He was interested in several lines and, of course, had passes for all the systems; in addition to a card pass intended for the purpose of identification the company provided small cards with the holder's name on each, one of which was collected by the conductor in lieu of the fare. These tickets being good in the two or three cities, where he spent most of his time, nothing was more natural than for our manager to offer one of the little cards to the conductor in a town where it wouldn't go. And that is just what happened.

The conductor took the card, which had been given him in a fit of abstraction, read the name, and then courteously said: "I am very glad to make your acquaintance, Mr. —, but you'll have to dig up five cents just the same."

The nickel was produced, and also a package of cards which were promptly torn in bits, and ever since one "old man" has always his fare.

#### A NECESSARY APPARATUS.

The Crocker-Wheeler Co., manufacturers and electrical engineers, of Amper, N. J., has done quite a little work for the Metropolitan Street Railway Co., of New York, in the way of furnishing motor outfits to operate pumps, air compressors, coal conveyors, etc. These orders have come as a rule, however, through builders of the machinery the motors were to drive, so there were no direct dealings with the company. It is said of the Crocker-Wheeler apparatus that it has been instrumental in completing the installation of most large railway systems, being used not only in the power plants, but also by many of the contractors who laid out the systems.

The La Clede Car Co., of St. Louis, has recently completed 50 convertible cars, 28 ft. body, for the Brooklyn Heights Railroad, and has 50 more of the same type in hand. Other orders in hand are 40 cars for the Young roads in Jersey City, Orange and Passaic; 15 large cars for the United Traction Co., of Pittsburg, and orders of 5 cars and upwards for Peoria, Ill.; Westmoreland, Pa.; Salt Lake City, and other cities.

The Stuart-Howland Co., electrical supplies and specialties, of Boston, has a most attractive exhibit in charge of Mr. H. W. Smith, assistant manager of the street railway department. Mr. William Wampler, Atlantic representative, and Mr. T. C. White, manager of the Central Union Brass Co., whose line the company handles east of the Ohio River.

The Lorain Steel Co. will be represented at this convention by P. M. Boyd, Lorain, Ohio; H. C. Evans, New York City; F. J. Drake, New York City; S. P. Ellis, Pittsburg; W. W. Kingston, Atlanta, Ga.; A. S. Littlefield, Chicago; D. J. Evans, Chicago; Randolph Clitz, Lorain, Ohio; H. D. Bayne, Lorain; R. T. Lane, Lorain; F. A. Merrick, and E. B. Entwisle, Johnstown, Pa.; H. F. C. Kleinschmidt.

The street railway system in Windsor, Ont., which has recently been acquired by the Everett-Moore syndicate, will be thoroughly overhauled. Modern machinery will be installed at the power house, and new rolling stock will be added. The system will be under the direct management of Mr. J. C. Hutchins.

The Beloit, (Wis.), Delavan Lake & Jamesville Electric Railway Co., has awarded the Allis-Chalmers Co., the contract for two cross compound condensing engines of from 800 to 1,200 h. p. capacity, to be installed in the Beloit power house by February 1st.

Mr. L. E. Fischer was on October 1st appointed superintendent of the Danville (Ill.) Street Railway & Light Co., succeeding Mr. O. J. Penwell, who retires after 17 years service with the company. Mr. Penwell intends to go abroad for an extended trip.

## MR. MITTEN AS A HOST.

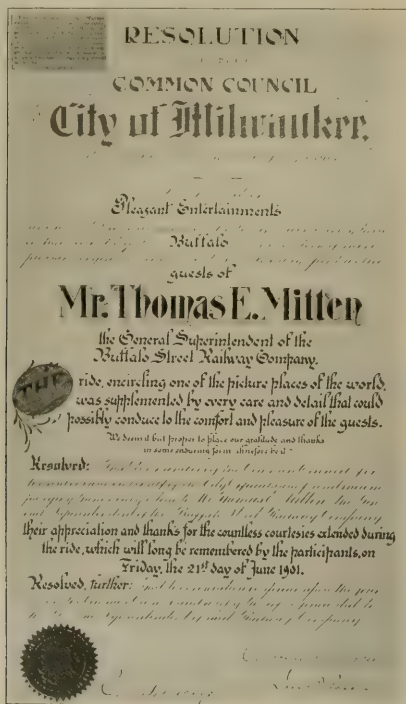
All of our readers who have had the good fortune to enjoy the hospitality of Mr. T. E. Mitten, the general superintendent of the Buffalo Railway Co., know how gracefully he fulfills his duties as



T. E. MITTEN.

host, and can well appreciate the feelings of the members of the Common Council of Milwaukee, when in July last, it passed the resolution, a photograph of which we produce.

The council and city officials of Milwaukee and their friends were entertained by Mr. Mitten on the occasion of their visit to the Pan-American Exposition in June last, and in recognition of the courtesies



received made a formal record of the matter and sent a copy of the resolution to Mr. Mitten.

## THE CHARLES E. DUSTIN CO.

Mr. Charles E. Dustin, lately president and general manager of the well-known firm of Rossiter, McGovern & Co., has severed this connection and has organized a new company under the corporate title of the Charles E. Dustin Co., of which he is president. The

new concern has opened offices at No. 11 Broadway, Manhattan, and will carry on an extensive business in all kinds of electrical apparatus, engines, boilers, cars, etc., dealing in both new and second hand materials and supplies. It is ready to buy or sell practically everything in any quantity that enters into the construction and operation of power plants of all descriptions. In addition to this industry the company is prepared to do a general engineering business and has retained as consulting engineer Mr. W. S. Barstow, formerly general manager of the Edison Electric Illuminating Co., of Brooklyn, an engineer of prominence and ability.

Mr. Dustin brings to the new company the elements of success. His intimate knowledge of the needs of electric railway and electric lighting companies, gained through years of experience as financial expert in these lines peculiarly fit him for the business of buying and selling second-hand materials. He has also had a thorough training as organizer and manager.

Mr. Dustin was the founder of the Schuyler Electric Co., which was one of the leading makers of electrical apparatus. Later he was made receiver of the Excelsior Electric Co., which was also afterward purchased by the General Electric.

## LIST OF EXHIBITORS.

Name.	Space.
American Vitrifired Conduit Co.....	34
Atlas Railway Supply Co.....	47
American Railway Supply Co.....	39
Anderson, Albert and J. M.....	49
American Brake Shoe Co.....	65
Allston Foundry Co.....	66
Adams & Westlake Co.....	26
American Car Seat Co.....	28
American Electric Heating Corporation.....	53
American Electrical Switch Co.....	32
American Circular Loom Co.....	14
American Telegraphone Co.....	75
Bierbaum-Merrick Metal Co.....	32
Baltimore Car Wheel Co.....	3
Brill Co., J. G.....	55
Bay State Electric Heat & Light Co.....	38
Brandau, G. F.....	74
Brown, Harold P.....	6
Bishop Gutta Percha Co.....	43
Brady Brass Co.....	80
Boston Electric Heat & Power Co.....	63
Bridgeport Brass Co.....	63
Brooklyn Heights R. R.....	54
Bliss Manufacturing Co.....	84
Crocker-Wheeler Co.....	9
Christensen Engineering Co.....	16
Consolidated Car Heating Co.....	39
Consolidated Car Fender Co.....	36
Chapman Double Ball-Bearing Co.....	63
Camp Co., H. B.....	35
Continuous Rail Joint Co. of America.....	8
Craghead Engineering Co.....	25
Curtain Supply Co.....	26
Crane Co.....	82
Columbia Machine Works.....	81
Corning Brake Shoe Co.....	84
Diamond State Steel Co.....	62
Dearborn Drug & Chemical Works.....	83
DeWitt Sand Box Co.....	85
Dallett & Co.....	70
Duff Manufacturing Co.....	50
Dunning & Co., E. J.....	42
Electric Railway Equipment Co.....	32
Electrical Review.....	40
Electric Storage Battery Co.....	48
Franklin Incandescent Lamp Co.....	32
Fowler & Robert Manufacturing Co.....	op. 61
Garl Electric Co.....	75
Globe Ticket Co.....	5
Granger, Francis.....	84
Granger Safety Tread Co.....	84
General Electric Co.....	12
Gold Street Car Heating Co.....	37





## THE PENNSYLVANIA STEEL CO.

The Pennsylvania Steel Co. announces that hereafter all matters relating to the sale of products from the frog, switch and signal department will be in the hands of the general sales department, conducted by Mr. Howard F. Martin, general sales agent to whom inquiries should be addressed. Under his direction, Mr. Chas. W. Reinohl of the Steelton office, will give his special attention to this department.

The company has recently completed new shops to better take care of certain classes of work.

The assembling shop, where street railway special work, curves, etc., are assembled and completed, is 375 ft. long and 150 ft. wide, to be served by four traveling cranes. This stands at right angles and at the ends of the other shop. The special work shop in which street railway and other special work is fitted, is 495 ft. by 150 ft. This shop will also be served by four traveling cranes. The frog shop in which all steam railway frogs will be fitted and completed, is 720 ft. by 75 ft. served by several traveling cranes. The switch shop is 405 ft. long by 80 ft. wide for planing, fitting and assembling of split switches or point switches. It is parallel to the frog shop building and separated from it by a space of 250 ft., which will be occupied by the loading shed. The loading track runs through the loading shed and the end of the assembling shop, giving a total length of tracks for loading under cover and under crane, of 400 ft. Separated from this group of buildings, is the smith shop building, 300 ft. by 75 ft.; building for switch stand and signals, 300 ft. by 75 ft.; foundry building, 200 ft. by 75 ft.; building containing saws for cutting rails, 125 ft. by 75 ft. There is also a gas plant for the making of water gas by the Loomis process; drafting room for laying out and drafting of steam railways and special work, 120 ft. by 100 ft.; and office building, 52 ft. by 65 ft. The total area of space covered by plant is about 25 acres.

The Buffalo Railway Co., on September 20th, secured the conviction of three of its employees on the charge of stealing fares. The plan followed by the men was to secure unused transfer tickets from conductors on other lines, punch them properly and turn them in in lieu of cash fares which they had rung up on the transfer register instead of on the cash register.

In the early part of last month, the Mineola, Hempstead & Freeport Traction Co., opened its general offices at Hempstead. The construction of the road has been begun at Mineola, and is being rapidly pushed to completion.

Two men charged with conspiring to defraud the Union Traction Co., of Philadelphia, by pretending to have been thrown off the company's cars and then offering to settle all claims for a sum of money, pleaded guilty in the criminal court September 12th. Two others, who had conspired with them, were subsequently tried on a similar charge.

## ROSSITER, MAC GOVERN &amp; CO.

It is with pleasure we announce that by reason of certain changes and additions in the affairs of Rossiter, MacGovern & Co., that well-known firm is to take a much more prominent place in the street railway world than ever before. General changes have been made in the personnel, chief among them being the election to the presidency of the company of Mr. Clinton L. Rossiter, formerly president of the Brooklyn Rapid Transit Co. Mr. Rossiter takes a large block of the new stock recently issued by Rossiter, MacGovern & Co., and will devote much of his time and energy to the company's interests.

Mr. Frank MacGovern, vice-president of the company, needs no introduction to the electrical trade. He has devoted nearly a lifetime to his chosen vocation, that of buying and selling machinery and supplies, and by making this his specialty, has acquired a business insight and training that bespeaks a success even more phenomenal than has been his in the past.

## THE JOHN STEPHENSON CO.

Mr. L. M. De La Mater who has been connected with the John Stephenson Co. since 1855, a period of 46 years and is at present the secretary and treasurer of the new company, is one of the ablest supply men in the trade. Mr. De La Mater has the following to say regarding the display of his company:

"The exhibit of the John Stephenson Co., at the Garden, is one that cannot fail to be of interest to the general public as well as those more directly concerned in matters pertaining to street railways. This exhibit consists of two quarter-sized models of trucks selected from the four new styles now being put on the market and a full sized car of the new Stephenson semi-convertible type. This car, which is the invention of Mr. P. M. Cling, general manager of the company, is something entirely new in the art of car construction and its novelty consists in the rapidity with which it may be converted into either a closed or open car as may be desired. Otherwise this car is of the usual style in use on well-equipped roads. Cars of this type are already in use on the Utica Belt Line and the one on exhibition will be delivered to that company after the convention closes."

## AN INTERESTING BOILER PLANT.

The accompanying illustration shows an interesting view of the boiler room of the Hecker Mill, of the Hecker-Jones-Jewell Milling Co., New York, which has recently been equipped with the Jones under-feed stokers, by the Under-Feed Stoker Co., of America. The installation includes tracks supported on the boiler fronts and on the boiler room wall on which the coal chutes leading to the stoker hoppers can be moved back from the boiler front when it desired to clean the flues, or open the front for any other purpose.

The boiler plant consists of six horizontal tubular boilers, each 72 in. by 16 ft., with 96 tubes of 3½ in. outside diameter. The heating surface of each boiler is 1,478 sq. ft. and the grate surface 36 sq. ft., giving a ratio of 41.06. The rated capacity is 125 h. p., which gives 11.82 sq. ft. of heating surface per h. p.

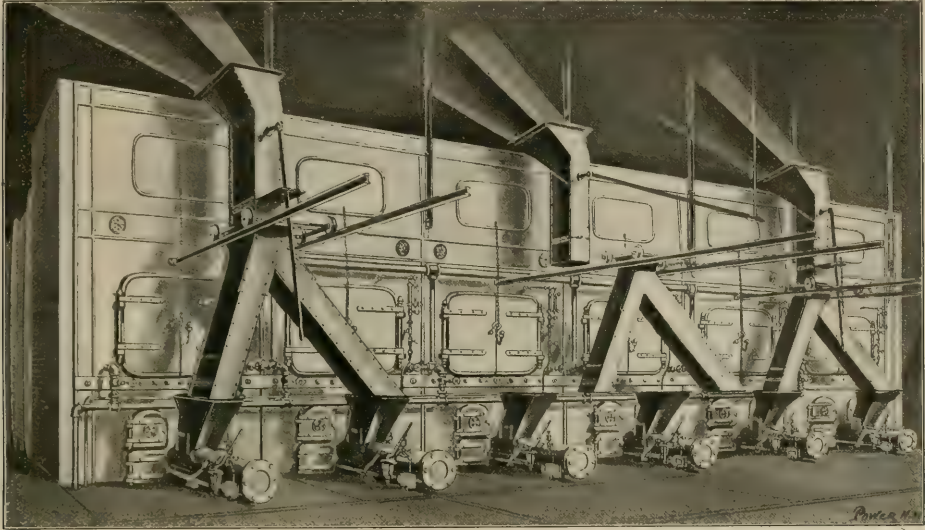
Prior to adapting Jones under-feed stokers for the entire plant, one boiler only was equipped and comparative tests were made between two boilers in the same battery, one hand fired and the other with the Jones stoker. Tests were made with both anthracite and bituminous coal for hand-firing, and the results are reported as follows:

	Hand Firing.		Under-Feed Stoker.
	Anthracite.	Bituminous.	Bituminous Slack.
Kind of coal used.....	24 hours.	24 hours.	24 hours.
Duration of test.....	21,000	20,700	19,650
Total coal consumed, lb.....	4,288	2,313	4,200
Total ash, lbs.....	16,712	18,487	15,450
Total combustible, lb.....	20.4	10.69	21.37
Per cent of ash.....	592	584	554
Coal per hour per sq. ft. grate surface.....	24.3	24	160,796
Total water fed to boiler.....	148,632	164,342	80.6
Average steam pressure, lb.....	81.5	84.8	159.5
Average temperature of feed water.....	167.8	169	
Equivalent evaporation from and at 212°.....	160,819	177,727	175,354
Evaporation per lb. of coal.....	7.077	7.94	8.18
Evaporation per lb. of combustible.....	8.89	8.89	10.41
Evaporation per lb. of coal from and at 212°.....	7.658	8.58	8.91
Evaporation per lb. of combustible from and at 212°.....	9.623	9.61	11.35
Average temperature escaping gases.....	194.23	214.65	433
H. P. Developed.....	55.5	71.7	211.78
Excess above builder's rating.....			69.42
Efficiency of stoker over hand firing with anthracite.....			17.04%
Efficiency of stoker over hand firing with bituminous.....			18.06%
Water evaporated per hour per sq. ft. of heating surface.....	4.19	4.63	4.53



W. K. CLARK.

It is also stated that when burning anthracite coal the steam pressure could not be kept up, and it was necessary to shut down the engine when cleaning fires. With the stokers no difficulty was experienced and the combustion was practically smokeless. Before the stokers were installed, the plant burned an average of 49 tons of anthracite coal per day, costing \$3.60 per ton; it is now operating on about 39 tons of bituminous coal, costing \$2.70 per ton.



PLANT OF THE HECKER-JONES-JEWELL MILLING CO. JONES UNDERFEED STOKERS.

The general offices of the Under-Feed Stoker Company of America, are in Chicago. The New York office, at No. 149 Broadway, is in charge of Mr. Walter K. Clark, New York manager, who will be pleased to arrange visits of inspection to the Hecker mill plant for those delegates who desire to see it. Mr. Clark was formerly of Chicago, having been chief engineer of the lighting and pumping plants at Lincoln Park for several years, but he has been associated with the Under-Feed Stoker Company since its organization. Our engraving is from a photograph taken when Mr. Clark was assistant engineer in the United States Navy.

#### A HANDSOME PARLOR CAR.

The new parlor car "Larchmont," just completed by the St. Louis Car Company for the personal use of Col. N. H. Helt, on

is 45 ft. long and divided into three compartments, the center being 25 ft. and the end compartments 10 ft. each in length. The center compartment is carpeted with Wilton Brussels carpet and the ends with Linoleum. There is a well-equipped buffet at one end; the other is used for observation purposes.

The interior woodwork is a very rich, mahogany piano finish of plain design, with Marqueterie decorations. There is a large

French plate mirror 4x6 ft. in each partition, the mirrors and windows being draped with handsome silk damask, while the ceiling is highly painted and decorated.

Upholstered wicker chairs and French plate glass windows add to the attractiveness and comfort materially. The trucks upon which the car is mounted are known as the St. Louis No. 23.

Mr. C. F. Freeman, secretary and manager of the Rapid Transit Railway Co., of Dallas, Texas, writes that he will have his hands full, caring for the crowds attending the annual State Fair now in progress in Dallas, and for that reason the company will not be represented at the convention.

Mr. H. H. Carr, general manager of the Newport News & Old Point Railway & Electric Co., of Hampton, Va., has friends just



PARLOR CAR FOR PORT CHESTER, N. Y. ST. LOUIS CAR CO.

the New York & Stamford Street Railway at Port Chester, N. Y., is one of the finest ever built, and is thoroughly up to date. It

outside of New York, with whom he will stop while attending the convention.

### THE RUGGLES ROTARY SNOW PLOW.

The Peckham Manufacturing Co. has just brought out a new catalogue of the Ruggles rotary snow plow, which will be sent on application.

Orders for the Ruggles plow have already been received this fall from the following roads:

or five years. Its construction is practically the same as the rotary plows used upon steam railways where it is operated by a steam engine. The Ruggles rotary plow is operated by electric motors located inside of the cab, which are provided with a main shaft connected to the rotary fans at each end of the cab and can be operated in either direction. Its operation is very simple and only requires one man in addition to the ordinary motorman, as

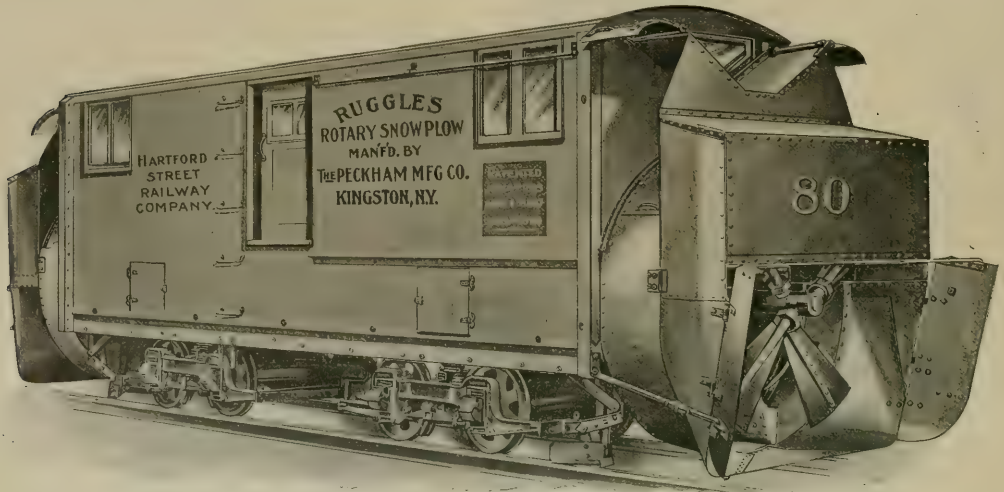


DOUBLE FAN ROTARY PLOW.

The United Power & Traction Co., Reading, Pa.; Hartford & Springfield Railway Co., Hartford, Conn.; Manchester Railway Co., Manchester, N. H.; Fitchburg & Beominster St. Ry., Fitchburg, Mass.; Detroit Construction Co., Detroit Mich; Camden & Suburban Railway Co., Camden, N. J.; Somerset Traction Co., Skowhe-

this plow easily removes snow to the depth of from four to eight feet and will keep open any suburban railway, no matter how severe the storm.

The new Peckham works are equipped with special machinery for the construction of these plows.



RUGGLES ROTARY SNOW PLOW.

gan, Me.; Schenectady Railway Co., Schenectady, N. Y.; Detroit & Toledo Shore Line R. R., Detroit, Mich.; Utica Belt Line Street Ry. Co., Utica, N. Y.; Erie Traction Co., Erie, Pa.

The Ruggles rotary plow is thoroughly established, having been in use on many of the largest suburban railways for the past four

The two horse-car lines on City Island, the Pelham Park Railroad and the City Island Railroad, which together comprise some 3½ miles of track have been purchased by Samuel McMillan, formerly Park Commissioner in New York, and will be converted for electricity.



## DAILY STREET RAILWAY REVIEW

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CHICAGO OFFICE,

324 DEARBORN STREET

Application made for entry as mail matter of the second class.

VOL. XI.

THURSDAY, OCTOBER 10, 1901.

No. 2.

Do not fail to preserve each copy of the "Daily Review." It is necessary in order to make your yearly files complete.

Owing to the large number of papers presented before the American Association yesterday, we are compelled in this issue to omit much matter of general interest concerning the exhibits.

It is proper to call attention to the fact that the discussion on the Accountants' papers is a comparatively brief abstract only, it being the policy of the association to reserve for itself the publication of complete reports of discussions.

It will be of great assistance to the "Review" if all supply men in attendance at the Convention who are not connected with any of the companies having an exhibit here will leave their cards at the "Street Railway Review" booth, at the head of the main aisle in the Exhibit Hall. We will thus be able to make mention of all those who are in attendance, even though they may be late in registering.

The agent of the Bethlehem Steel Co. will be at the Bureau of Information office at the Garden, each morning from 9 until 10, for the purpose of obtaining the names of those who are to go to Bethlehem Saturday on the special train to view the Bethlehem Steel Works.

## EXTENDS COURTESY TO DELEGATES.

The New Jersey & Hudson River Railway & Ferry Co. writes us that it will be pleased to honor the badges of the American Street Railway Association for passage upon its West 130th St. ferry and electric railway line to Englewood and Hackensack. The announcement is made by Mr. Frank R. Ford, second vice-president and general manager of the company, whose courtesy will be greatly appreciated by the delegates.

## A GOOD RECORD.

The success which is achieved by a technical association depends to a very great extent on the ability of its secretary, who is the active executive officer, and the American Street Railway Association is to be congratulated upon having a secretary who has so well understood its needs. Since Mr. Penington has administered this office the growth of the association, both in numbers and influence, has been very marked, and this notwithstanding the large number of consolidations of street railway companies has tended to reduce the membership. Even with all the consolidations of member companies effected during the last year, the membership has increased over 10 per cent.

The association is also to be congratulated upon the extremely gratifying financial condition as shown by this year's report. When it is remembered that at the Montreal meeting, in 1895, when Mr. Penington was elected secretary and treasurer, the burning question was the large deficit, the A. S. R. A. has indeed prospered.

To many of the delegates at the convention the chief feature of interest on the Metropolitan system will be the big power station at 96th St. and the East River. This station was fully described in the last issue of the "Review."

Mr. A. A. Hilton, general sales agent of the St. Louis Car Wheel Co., is renewing old friendships and making many new ones at the convention.

## PROGRAM.

## American Street Railway Association.

THURSDAY, OCTOBER 10TH.

This is Supply Men's Day. The entire day has been set aside for the examination of Exhibits at Madison Square Garden.

FRIDAY, OCTOBER 11TH.

Convene at 10 a. m. Election of officers for ensuing year.

"The Adoption of Electric Signals on Suburban and Interurban Railways, Single or Double Track, and Their Economy of Operation." By William Pestell, superintendent of motive power, Worcester Consolidated Street Railway Co., Worcester, Mass.

"The Values of Storage Batteries as Auxiliaries to Power Plants." By W. E. Harrington, vice-president and general manager, Camden & Suburban Railway Co., Camden, N. J.

"The Best Manner and Mode of Conducting the Return Circuit to the Power House." By E. G. Connette, vice-president and general manager, Syracuse Rapid Transit Railway Co., Syracuse, N. Y.

"The Economies Resulting from the Use of Four Motors Instead of Two on Double Motor Equipments."

"Practical Results Obtained from Three-Phase Transmission and Rotary Transformers or Motor Generators in Transmitting Power on Railway Lines."

"The Modern Power House, Including the Use of Cooling Towers for Condensing Purposes." By J. H. Vail, Philadelphia.

11.30 a. m. Automobile ride for the ladies. Automobiles will leave Madison Square Garden at 11.30 a. m. sharp for a trip about the city. All ladies in attendance and gentlemen accompanied by ladies are cordially invited to attend this ride. The trip is made through the courtesy of Mr. Henry Sanderson, president of the New York Vehicle Transportation Co.

7.30 p. m. Annual dinner at Sherry's, 44th St. and Fifth Ave., New York City.

Installation of officers-elect, at the dinner.

SATURDAY, OCTOBER 12TH.

Through the kindness of the Bethlehem Steel Co., the Association offers to members in attendance a delightful trip to the works of the Bethlehem Steel Co., at South Bethlehem, Pa. Special private cars will be provided for the members, and will be attached to the regular train, leaving Jersey City at 8 a. m., with which the ferry from New York connects from the foot of West 23d St. at 7.40 a. m., and from the foot of Cortlandt and Desbrosses Sts., at 7.50 a. m.

## Accountants Association.

THURSDAY, OCTOBER 10TH.

Supply men's day.

FRIDAY, OCTOBER 11TH.

Madison Square Garden—10.00 a. m.

Paper: "Consumers' Accounts, Electric Lighting Companies." By S. E. Moore, comptroller, United Traction Co., Pittsburg, Pa.

Report: "Standard System of Accounting for Electric Light Companies." By G. E. Tripp, general auditor, Stone & Webster's Cos., Boston, Mass., chairman.

Annual Report: "Standard System of Street Railway Accounting." By C. N. Duffy, auditor, Chicago City Railway, Chicago, Ill., chairman.

2.30 p. m.

Paper: "Conductor's Accounts." By Elmer M. White, cashier, Hartford Street Railway, Hartford, Conn.

Report: "Standard Unit of Comparison." By H. C. Mackay, comptroller Milwaukee Electric Railway and Light Co., Milwaukee, Wis., chairman.

Reports of Convention Committees.

Election of Officers.

# TWENTIETH ANNUAL MEETING

# AMERICAN STREET RAILWAY ASSOCIATION

**New York City—Oct. 9—11, 1901.**

Opening Session—Wednesday Morning—Address of Welcome—  
President's Address—Secretary's Report—Papers by Messrs.  
McCulloch, Sergeant, Baumhoff and McCormack.

President Walton H. Holmes, of Kansas City, Mo., called the convention to order at 10.45 o'clock Wednesday, Oct. 9, 1901, and introduced Mr. Randolph Guggenheimer, president of the Borough of Manhattan, who delivered the following

## ADDRESS OF WELCOME.

Mr. President and Members of the American Street Railway Association: In the name of the City of New York, which I have the honor to represent on this occasion, I welcome the delegates of your association to the metropolis. It is not necessary for me to have a technical knowledge of railway management to say that you have acted wisely in selecting New York as the meeting place of your association for this year. We are proud of our city because we believe that it is preeminent among all the world's municipalities in many respects, and especially in its street railway system. There was a time not many years ago when President Vreeland would not have found it difficult to solve the problems of street transportation in the old city of New York. Then stages, drawn at the breakneck speed of four miles an hour, carried passengers as far north, in the Island of Manhattan, as 23d St.



RANDOLPH GUGGENHEIMER.

A great transformation was wrought by the laying down of horse car lines in various avenues and streets, until at last the usefulness of the horse was threatened by the adoption of the cable on Broadway and Lexington Ave. At that time New York City seemed to be contented with antiquated methods because even, in the neighboring city of Brooklyn, the overhead trolley was doing a rushing and killing business. We yield the palm of superiority even to Philadelphia in the matter of speed and the number of slain pedestrians. But I can congratulate President Vreeland and the Metropolitan Street Railway Co. upon their adoption of the sub-trolley system which, in my opinion, is the only reasonable solution of urban transportation. At the present moment the city of New York, as far as the lines of the Metropolitan Street Ry. are concerned, possesses the most perfect and the most rational street car service not only in the United States but in the whole world. I venture now, with great diffidence, lest the presidents of other lines

should be present and resent my words, to hope that, in the not distant future, the underground trolley will be adopted in every borough in the city.

The street railway business, especially during the last twenty-five years, has become one of the most important and colossal of all the industries in the United States and contributes materially to the welfare of the people. It does so in many ways. A calculation of the number of men employed in street railway work throughout the country would show that intramural transportation companies are the means of sustaining a larger number of families than the statistician would at first sight imagine. But in addition to the unconscious benevolence displayed by the bond and stock holders of the various street railroad corporations throughout the United States, they perform a public duty of incalculable value to a greater degree to-day than at any previous period in our history. The operations of commerce depend upon the efficiency of your transportation lines. If it be true that time is money and that the saving of time means success, I cannot understand to-day how the business of the community was efficiently performed when it required as long a time to journey from Harlem to the business districts of this city as it does to reach New York from Albany.

The adjustment of all questions relating to the enlarged organization of street railroad companies will become more and more difficult. The time will come when the surface of the United States will become an interlaced network of street railway lines. The administration of such corporate business requires the most acute intelligence and the highest degree of trained abilities. The men who preside over the fortunes of these companies must possess ability not less remarkable than those required for the government of the State and nation. But in this period in the history of the world which may be fitly called the age of electricity, the engineers employed by such corporations must possess the highest degree of technical skill. The era of the horse car and the cable is practically passed. Modern conditions demand a transportation service which shall be in keeping with the swift progress of the times.

I congratulate the American Street Railway Association that you number among your members men whose success in the past speaks a high degree of administrative prosperity in the future and that the American engineers, in your service, possess that scientific accuracy and progressiveness which have added so greatly to the reputation of America in applied science.

Again, Mr. President and members of the American Street Railway Association, in the name of the city of New York, I bid you a most cordial welcome to the metropolis. I trust that all the members of your society will bring to your homes the pleasantest possible memories of your visit to New York and that your convention may prove, both socially and professionally, the success which it so eminently deserves. I know that I am simply speaking for the people of this community when I express my most earnest hope that the American Street Railway Association will be so well pleased with their visit that they will soon again select the city of New York for the purpose of holding their annual convention. Let me thank you again for your courteous reception.

President Holmes: Mr. Guggenheimer, allow me in the name of The American Street Railway Association to thank you most heartily for your kind words of welcome. We will now proceed with the regular order of business. The first business on the programme is the calling of the roll. As it is customary to take the registration at the door for the roll call, we will dispense with the calling of the roll.

Then followed the

## PRESIDENT'S ADDRESS.

It is extremely appropriate that the twentieth session of the American Street Railway Association should be held in the City of Greater New York. In acknowledging the kindly spirit of hospitality prevailing the address of welcome to which we have just listened, I but feebly voice the feeling of every member of the association when I say that not the slightest doubt was ever entertained, but that our meeting in this great metropolis of America would prove to be the most enjoyable and profitable in its history. I am assured that every desirable arrangement has been made for your comfort and entertainment, an assurance entirely unnecessary from the gentlemen who have these matters in charge. Personally, I have the highest pleasure in meeting with you on this auspicious occasion, and I extend to one and all my hearty congratulations that once more we are gathered together in convention under circumstances and environment which guarantee that best interests of the association will be promoted and greatly enhanced thereby, and that we will return to our homes refreshed and stimulated by pleasant memories, and inspired to still higher efforts and greater success in our calling by the light of the experience, thought and fellowship of successful brethren working to a common end.

Since the last meeting of this association the President of the United States has been taken away by the ruthless hand of an assassin. It has been truly said of Mr. McKinley that he was the most beloved of all our Presidents while in office. His kindly disposition and sincerity of purpose attracted all men to him in such marked degree that through his example and influence the last vestige of sectionalism has been happily removed from our common country. Great as was the loss in his taking off, it was not without some compensating advantages. It has served to arouse and unite the whole civilized world in one common bond of sympathy, and to teach us, as well as anarchy, that the foundations of our government, being laid deep and lasting in the principles of liberty, right and justice, are not to be even momentarily shaken by an assault on the chief magistrate, however successful. By this unhappy event business was nowhere seriously disturbed except by its voluntary cessation for a short period actuated by universal patriotism and sincere grief that a great and good man had been so cruelly and causelessly removed from the service of the country which he had loved so devotedly and served so faithfully and so well. Peace to his ashes! And may the red hand of anarchy never be seen in our midst again.

At a session of the executive committee held in the early spring your President appointed a committee on Standardizing of Street Railway Equipment, known as the Standardizing Committee. This committee, I am informed, has given the subject very careful thought and consideration, and at the proper time the result of their deliberations will be reported to you. In my judgment no more important subject looking to permanent improvement in street railway conditions could engage your attention, and when the report comes in, I trust it will receive the full measure of discussion which the question deserves. While the views reported will be of great value in themselves, they will stand out in still bolder relief in the light of a full and intelligent discussion. I am so impressed with the importance of this problem that I beg to suggest the propriety of its continued study and investigation through committee until substantial results are obtained.

The past year has been one of peace and prosperity in the street railway business. No serious labor troubles have occurred, no doubt due to the fact that a better understanding is constantly being brought about between employer and employe. Managers and men are everywhere being brought close together, with the result that misunderstandings, often due to unauthorized acts of subordinates, are of much less frequent occurrence. Imaginary grievances are often more serious than real ones, and generally more difficult of settlement.

The standard of construction and equipment continues to grow more and more substantial and expensive, contributing measurably to the comfort of street railway patrons. The electric street car of today is a palace on wheels compared with the horse coach of twenty-five years ago.

The highest degree of comfort is being rapidly attained, and every day gives evidence that the well equipped street railway has

passed beyond the stage of a mere necessity of convenience and is looked upon by a very large percentage of the community as a primary source of pleasure and enjoyment. The street railway manager is nothing more nor less than a merchant selling rides on a large scale. The profit on each ride is so small that money is to be made only by doing a large business. This fact every competent manager fully realizes, and hence it is that he is ever willing to introduce improvements everywhere, even to the extent of discarding substantial and valuable equipment, whenever it can be seen that such action will bring anything like an adequate return in the way of increased patronage. His unremitting endeavor is to induce people to patronize the cars and to that end is constantly providing for them attractions in the way of parks and amusements in great variety. Wherever public parks or places of amusement are to be found, the efforts of the authorities in that direction are supplemented by the street railway manager who supplies them with attractions and exhibitions which would otherwise be wanting.

The time to be occupied by the deliberations of this association has this year been limited to three days, the whole of Thursday, according to the programme made by the executive committee, being set apart for the consideration of the exhibits made by the supply men. The action of the executive committee in thus emphasizing the importance of these exhibits I have no doubt will meet with your hearty approval. They contain all that is new and



W. H. HOLMES.

valuable to be known in the machinery and appliances pertaining to the business in which we are engaged. A careful and discriminating study of them is almost an education in itself. They have been brought from everywhere, in many instances from great distances at large expense, and are displayed in a manner most attractive and instructive. It is but right that this substantial recognition should be made of this exceedingly valuable feature of these conventions.

I trust that the members of this association will take particular interest in the work of the Accountants' Association, which is assembled here in convention at this time. They are accomplishing much of value in their special department, and by the work they are doing are greatly facilitating the interchange of desirable information and promoting the safe and economical administration of the affairs of street railway companies.

It gives me great pleasure to be able to state that the present condition of this association is the most healthy and prosperous in its history. During the past year its membership has greatly increased and its bank account is in a most satisfactory condition. No more convincing testimony could be given of the usefulness of the association and of the reason for its existence.

The thanks of the association are due to the secretary and the executive committee for the able and successful manner in which they have conducted its affairs during the past year.



In closing, permit me to say that the honor which you have conferred upon me is most highly appreciated. To be the president of this association is an honor of which any man might well be proud, and I shall ever esteem the compliment paid me in my selection to preside over your deliberations as the brightest jewel in the crown of whatever success I may have achieved as a street railway man. If my administration of the high office has been a success it has been due more to the kind and considerate support and co-operation of others than to any merit of my own. I can bespeak for my successor no greater surety of success than to be accorded the same generous treatment.

The secretary and treasurer, T. C. Penington, then submitted his report.

The following companies acquired membership at and since the last meeting:

Cincinnati Traction Co.  
Cincinnati and Eastern Electric Railway Co.  
Dallas Consolidated Electric Street Railway Co.  
Danville Street Railway and Light Co.  
Detroit, Rochester, Romeo and Lake Orion Railway Co.  
New Jersey and Hudson River Railway and Ferry Co.  
Citizens' Street Railway Co., Fishkill-on-Hudson.  
Jackson (Miss.) Railway, Light and Power Co.  
Lebanon (Pa.) Valley Street Railway Co.  
Lynchburg (Va.) Traction and Light Co.  
Meridian (Miss.) Street Railroad and Power Co.  
Hoosac Valley Street Railway Co., North Adams, Mass.  
Schuylkill (Ill.) Railway, Light and Power Co.  
Ottawa (Ill.) Railway Light and Power Co.  
Ottawa (Ont.) Electric Railway Co.  
Ohio River Electric Railway and Power Co., Pomeroy, O.  
Holmesburg, Tacony and Frankfort Electric Railway Co., Philadelphia.  
Monongahela Street Railway Co., Pittsburg, Pa.  
Rockford (Ill.) Railway, Light and Power Co.  
Saratoga (N. Y.) Traction Co.  
San Juan Light and Transit Co., San Juan, Porto Rico.  
Terre Haute (Ind.) Electric Co.  
Kansas City-Leavenworth Railway Co., Wolcott, Kan.  
The members withdrawn on account of consolidation were:  
Union Traction Co., Anderson, Ind.  
Aurora (Ill.) Street Railway Co.  
Cincinnati Railway Co.  
Lowell and Suburban Railway Co., Lowell, Mass.  
Portland (Me.) and Yarmouth Electric Street Railway Co.  
Quincy (Mass.) and Boston Street Railway Co.  
The Great Falls (Mont.) Street Railway Co. was reinstated.  
The membership a year ago was 163, and at the present time is 181.

The receipts of the association during the year were \$7,752.68, and the expenses to October 1, 1901, were \$4,624.68. The balance on hand is \$10,128.68.

Secretary Penington then read the minutes of the Executive Committee meetings held February 28, 1901, and October 8, 1901. These minutes consisted simply of a record of the routine work of the Executive Committee in the selection of the hall for holding the convention, the dates of the convention, the arrangements for the banquet, action concerning members in arrears of dues, selection of headquarters for the convention, selection of topics for papers and writers to prepare the same, and work done by the Executive Committee in considering similar matters.

The Executive Committee at the meeting held February 8 appointed the Committee on Standards.

Mr. Wyman: I move, Mr. President, that the report of the secretary and treasurer be accepted and spread upon the minutes, accompanied with the congratulations of the delegates on the exceedingly good showing which appears. Carried.

The report of the Committee on Memorials of deceased members was then read, as follows:

#### JAMES AFFLECK.

James Affleck, secretary and treasurer of the Eighth Avenue Railroad Co., and vice-president of the Ninth Avenue Railroad Co., New York City, died in that city Nov. 24, 1900. Mr. Affleck was born in Scotland, June 11, 1827, and came to the United States in 1849. He soon afterward entered the employ of the Hudson River Railroad Co., and in a short time became its cashier. In 1873, Mr. Affleck accepted a responsible position with George Law, and his connection with the Eighth and Ninth Avenue Railroad companies began in 1874. In 1896 he was made vice president of the Ninth Avenue road. For many years he was secretary of the New York & Brooklyn Ferry Co., a corporation operating a number of ferries across the East River.

#### JOHN H. BOWKER.

John H. Bowker, superintendent of the Globe Street Railway Co., Fall River, Mass., died Mar. 10, 1901, from cancer, caused by a runaway accident some 15 years ago. He was 61 years of age at the time of his death, having been born in Boston, July 21, 1839. In the year 1869, Mr. Bowker entered the employ of the Union Railroad Co., of Providence, as a conductor, and later became a foreman. He went to Fall River in 1881, as superintendent of the Globe Street Railway Co., which position he retained until his death. He was an efficient worker in the interests of the company, and highly esteemed by the employees of the company. He is survived by a widow and one son.

#### ROBERT P. BROWN.

Robert P. Brown was born in Whiting, Vermont, in 1867, and died in New York city Feb. 8, 1901. He attended a public school in Whiting, prepared for college at Goddard Seminary and entered Tufts College in 1888. Upon graduation, Mr. Brown entered the employ of the West End Street Railway Co., of Boston, remaining in the construction department of that company until 1893. He then went to Brooklyn and entered the electrical department of the Brooklyn Heights Railroad Co. In 1893 he was appointed the chief engineer of the Eastern power station, and in 1896, was appointed the electrical engineer of the company, in which capacity he was acting at the time of his death. As an engineer he possessed exceptional ability and was respected and esteemed by all his associates.

#### DAVID C. GOLDEN.

David C. Golden, treasurer of the Union Traction Co., of Philadelphia, died at Asheville, N. C., Dec. 27, 1900, where he had gone to seek relief from bronchial troubles. He was born in Philadelphia about sixty years ago, and spent his early years in the dry goods business. Mr. Golden had been comptroller of the Union Traction Co. ever since its organization and was formerly secretary and treasurer of the People's Passenger Railway Co. Mr. Golden married late in life, and left a widow, but no children.

#### GEORGE H. HOLT.

George H. Holt died at his country home at Great Neck, L. I., on July 31, 1901, after a long illness, in his fifty-eighth year. He was born in West Boylston, Mass., Sept. 10, 1843, and at the age of seventeen entered Amhurst College, graduating in the class of 1864. He subsequently studied law in the office of his cousin, Judge Holt, in Washington, but after two years he abandoned that profession and joined the New York Stock Exchange. Mr. Holt was president of the Denver City Railroad Co., and the West End Street Railroad Co., of Denver, which were consolidated with the other street railways in the city under the name of the Denver City Tramway Co. He was also the chief organizer of the Cleveland City Cable Railway Co., which he financed through his firm, and which was afterwards consolidated with other street railway properties in the city under the name of the Cleveland City Railway Co. One

of his most important enterprises was the formation of the Mutual Union Telegraph Co. which, while originally intended chiefly to supply the demand for private telegraph lines between New York and other leading Eastern cities, developed into a commercial telegraph company. This development was so rapid and popular, and it became such an important competitor of the Western Union Telegraph Co., that the latter absorbed it, guaranteeing its bonds and dividends upon its stock. Mr. Holt left a widow, who was Miss Newlin, of Philadelphia, and one step-daughter.

#### ALBERT L. JOHNSON.

Albert L. Johnson died at his home in Brooklyn, N. Y., July 2, 1901. Mr. Johnson was a man of powerful physique, who always led an outdoor life, and his death from heart failure caused great surprise. His first ventures in the street railway field were in the city of Cleveland, where he operated, in conjunction with his brother, Tom. L. Johnson, a short mule line. Mr. Johnson's largest success in the operation of street railways was achieved in Pennsylvania. With Allentown as a center, he developed lines of urban and interurban trolleys which now connect over sixty villages and towns. The formation of the Nassau Railroad Co., in Brooklyn, proved a very profitable enterprise for the Johnson brothers, as the property is said to have been sold to the Brooklyn Heights Railroad Co. for a large price. At the time of his death, Mr. Johnson was interested in several new undertakings, among them being the building of an underground railroad in London, England, and a trolley line from New York to Philadelphia. He also made proposals to build tunnels under the East River and under the Narrows so as to give a service from New York to Pennsylvania. Mr. Johnson is survived by his wife, who was a Miss Mitchell, of Louisville, and four children.

#### THOMAS H. McLEAN.

Thomas H. McLean, vice-president and general manager of the Toledo Traction Co., died at his home in Toledo, Ohio, March 1, 1901. Mr. McLean had not for some time been in good health. He was born at Albany, N. Y., Dec. 10, 1855. During his younger boyhood days he was a page and librarian's messenger in the New York Senate, and afterwards a clerk in the office of the Twenty-third Street Railway Co., New York City, and in 1882 was elected secretary and treasurer of the company. Mr. McLean was for a short time general manager of the Metropolitan Traction Co., of New York, and afterwards general manager of the Citizens' Street Railroad Co., of Indianapolis. For two years beginning May 1, 1896, he was the president and general manager of the Compania de Ferrocarriles del Distrito Federal de Mexico, and in April, 1898, became the vice-president and general manager of the Toledo Traction Co. He was first vice-president of the American Street Railway Association in 1891 and a member of the Executive Committee in 1893.

#### CHRISTOPHER L. MAGEE.

Christopher L. Magee, president of the Consolidated Traction Co. of Pittsburgh, died Mar. 8, 1901. Mr. Magee had been ill for several years, although it was believed that he was recovering his health. He was born in Pittsburgh, Apr. 14, 1848, and at the age of thirteen years was employed in the controller's office of that city. He was afterwards employed by the Pennsylvania Tube Works, and ultimately became part owner of the National Tube Co. He was the owner of the Pittsburgh Times and a director in many financial institutions in his city. He was president of the Pittsburgh Press Club and Secretary of the Republican State Committee, and had been a delegate to every National Republican Convention since 1876. Mr. Magee's street railway experiences began early in the 80's, and he was successively interested in the Transverse Passenger Railway Co., the Pittsburgh, Oakland & East Liberty Passenger Railway Co., the Duquesne Traction Co., and others, and through the various consolidations of the traction companies of the city, with nearly every street railway interest in Pittsburgh. He was one of the greatest benefactors of the city and had a national reputation as a man of affairs. He was charitable and kindly in all his relations of life.

#### W. W. MARSH.

W. W. Marsh, Treasurer of the Omaha Street Railway Co., died Apr. 2, 1901, at Nassau, Bahama Islands. He had been ill for several years and spent much time traveling, in the hope of regaining his health. Mr. Marsh was born in Vermont in 1832, and settled in Dakota County, Nebraska, in 1856. Six years later he moved to Omaha and was actively identified with the city until the time of his death. He was also president of the Union National Bank, of Omaha.

#### MARTIN H. WATTS.

Martin H. Watts, secretary of the Montreal Street Railway Co., died at Montreal on May 21, 1901, at the age of forty years. His death was caused by pneumonia. Mr. Watts was born in England and came to Canada a number of years ago. He entered the service of the Montreal Street Railway Co., in 1892, as secretary to Mr. H. A. Everett, then with Mr. Granville C. Cunningham, and upon the death of Mr. E. Lusher, some three years ago, he was made secretary of the company.

Secretary Penington announced that the Compressed Air Co., of Rome, N. Y., invited the delegates to visit its works and inspect the plant for manufacturing compressed air motors; also that the Bethlehem Steel Co., of South Bethlehem, Pa., invited the delegates to visit the plant on Saturday, special cars being provided for that purpose. Also that the badges of the Association would be honored on all the street and elevated railway lines in New York, Brooklyn, Long Island City, Jersey City and Hoboken, as well as entitling the holders to the free service of the local and long distance telephones and the use of messengers of the American District Telegraph Co.

The secretary then read the following:

#### LETTER FROM CAPTAIN McCULLOCH.

Mr. President and Gentlemen of The American Street Railway Association:

I desire to apologize to you by offering an explanation of my absence from this meeting. I consider the request to prepare a paper for the Association a very great compliment. The compliment should have an acknowledgment in a painstaking preparation of the paper and its personal presentation to the convention.

The company with which I have the honor of connection, has a large number of heads of departments, who are much interested in all matters here presented and considered. We are many miles away from you and I recognize the necessity that some of us must stay at home and "keep house." In perhaps unwarranted vanity, I conclude that if I remain on duty a larger number can attend. I have sent you a good delegation and have cheerfully, and in your interest, denied myself the great privilege and pleasure of being with you. Respectfully,

ROBT. McCULLOCH.

Mr. McCulloch's paper, which had been printed, was then read by title:

#### STREET RAILWAYS: A REVIEW OF THE PAST AND FORECAST OF THE FUTURE.

By Robert McCulloch, General Manager Chicago City Railway Co.

Not until the latter part of the sixth decade of the nineteenth century, did the failure of the rumbling omnibus to meet the requirements and demands for facilities for commercial and social transportation in the cities, begin to force itself into public consideration and generate inquiry as to methods of betterment. The cities were spreading in their development beyond the limits of pedestrianism to those whose income justified the expenditure of the cost of the morning and evening ride, and as the distances became greater, the difficulties of existing efforts at accommodation increased. As the income of the merchant and manufacturer increased, so also grew the desire to separate the residence from the shop, and the suburban home followed. Then the time consumed in the journey at the two ends of the business day became

a consideration, and next the discomfort of the long ride over streets so poorly paved that they were only, in many instances, badly kept roads. The outgrowth of this casting about for a betterment was the street railway, and almost without exception the original railways were the successors of, and a transformation from, the bus line. The rails were laid in a fashion little akin to present style of construction. The "bob-tail" car was scarcely better in its



THE START.

accommodation facilities than its predecessor, but its speed was greater, and its frequency of service much increased, and its extension beyond the former limits of the stage still increased the opportunity and desirability for border habitations. The same spirit which would allow Davy Crockett to be happy and contented only on the extreme borders of civilization is ever and always making new and extended limits to our cities.

These adventurous pioneers contributed a patronage which encouraged the new enterprise. Rails were laid on all the stage routes. The bus was housed forever to the regret of the man who had sat so long on its boot and who was so cheerfully greeted by its daily patrons, to all of whom he had grown to be a necessity in the daily routine of life. He took his place on the little platform on the front end of the car, and in the changes that have followed so rapidly in the development of street railway conditions, no man has been his equal as an expert driver or motorman or gripman, and in no hands has the safety of his passengers been so well considered.

Immediately following the installation of the first railways came the war, which attracted the attention, the energy and the enterprise of the whole land. There was no thought then of else than methods and schemes of human destruction. The exciting and alluring and enticing pastime of war possessed the people of the entire land. No hero was so great as he who had stood in the midst of the greatest carnage and no heritage is so prized as that left by him who unflinchingly met an hundred times his gallant and determined foe. When sheer exhaustion brought peace at last, there had been engendered a vigor and enterprise, which perhaps would never have known existence but for the rugged experiences of four years of devotion and courage and manhood never equaled in the history of the world.

This vigor and enterprise found abundant opportunity. The good soldier became the useful citizen, and the street railway, claiming its share of attention, began to contribute its part toward mural development, which development has been made possible only through continued progress of methods and appliances and their application by men as tireless as the sun. Rails weighing 25 lbs. to the yard were considered ample in their strength and stiffness, and they were rolled in lengths little more than 20 ft. Those were spiked to wooden stringers which were held in gage and alignment by being notched into cross ties, on which notches they were

secured by dovetailed keys. Cars were constructed with special view of lightness in weight, every piece of wood and iron, being chamfered and worked down to the limit of prudent requirement for strength. Wheels were made of a weight as light as 140 lb., 180 lb. being a heavy wheel. With few exceptions, roads were originally equipped with the "bob-tail" car, the length of the body being ten or twelve feet, the front end enclosed with a circular dash, and a step on the rear, the passenger opening and closing the door as he passed through it. A fare box on the right of the front door was expected to have the respectful attention and consideration of every passenger, even though in his anxiety for transportation he could find a lodgment for only one foot on the rear step, and, holding himself in that position by an outstretched arm to the door jam, with his other hand he passed up his nickel or other money, the change was made, the nickel deposited and the balance returned by various reaches and through several hands. A great improvement consisted in the introduction of a mechanism by which the driver opened and closed the rear door, either by a rod and levers or an endless cord, and next followed a chute having places of deposit at each window post and on the outside of the rear end. The nickel was dropped into this receptacle, the chute having an inclinator to the front and ending in either side of the fare box, and thus the fare went up without the intervention of the fellow passenger. The stove was added in latitudes where the severity of the winter made it necessary, and then the little open car made its appearance during the summer months. This completed the luxury of metropolitan transportation and the street railway was becoming a recognized institution in the process of city development. The motive power of this vehicle was either a single horse or a pair of little fleet-footed mules, with a hill horse at the heavy grades.

The driver was necessarily a man of much capacity, endurance and versatility. He must be an expert in the handling of his horses and in controlling the car through the brake; he must watch in front that he did not run into other vehicles of over pedestrians; he must scan the side streets for the approach of intending passengers; he must closely observe in rear that he might keep track of the passengers who had and who had not paid their fare, that he might always observe a signal to stop, and that the rear step might not be occupied by those who did not intend to pay the required fee for the privilege of a ride; he must make change as desired; he must answer questions and give desired information; he must open and close the rear door; he must in winter take care of the fire in the little stove, and at night care for and adjust his lamps; and with all these duties he must stand exposed to the splashing of the mud, the beating of the rain and snow, with his lines in one hand and the other hand constantly on the brake. This work he performed during twelve to fourteen hours on his short day and sixteen to eighteen hours on the long one, and the long and short alternated.

The passenger, we would say today, was such through sheer necessity. If he lived five miles away he was an hour from his work, provided there were no mishaps or delays. If the car jumped the track he got out and lifted it on again. If the horse stopped on the upgrades to get his wind or by reason of the obstruction of snow or mud, the passenger "put his shoulder to the wheel" and helped to make the start. He dropped his nickel in the slot, he passed up that of his neighbor, and with the driver, he frowned on the man who ignored the fare box, and he seldom burnt the midnight oil or wasted his postage stamps in writing and sending letters of complaint. Appliances for the clearing away of snow and ice were crude, entailing ceaseless labor and watchfulness throughout the winter, and the heat of the summer brought equal burden in the care of the faithful animals whose even gait must be maintained notwithstanding the relentless soaring of the thermometer.

But the bob-tail car had only a short lived existence. It was replaced by a larger vehicle, drawn by two horses and manned by a conductor as well as a driver. In some instances this replacement was made in recognition of the necessity of better provision for an increasing patronage, and in others the angry protest of passengers against the performance of the duties of the conductor drove the last of the bob-tails from the street. In the meantime the weight of the rail had been increased and tracks as well as cars were improved. Then came the girder rail, and



about the same time the American Street Railway Association had its birth. This brought an era of fellowship and intercommunication among street railway men that had not previously existed. The method of treating colic in horses was no longer held as a trade secret, and the free interchange of experiences in the solution of common perplexities has contributed greatly to the rapid and wonderful developments which can only astound us when we look but a few years backward.

The demand for more extended and more rapid transportation by the man who insisted on living on the extreme border, as well as the driving of the tenement house from the heart of the city by the necessity of occupying this space for manufacturing and warehouse and office purposes, brought into use the cable, but its great cost and its lack of flexibility prohibits its adoption except under favored conditions.

Then, just as some higher and greater power, through human agency had given us, only when there became extreme necessity for it, steam, and the telegraph, and the reaper and the threshing, and the telephone, so there came the revelations that enabled the application of electricity to purposes of power for transportation.

The efforts at this application, in the beginning, were crude as compared with present practice. The motor was set up on the platform or in the body of the car and geared to the axle with chain and sprocket wheels. The wire conveying the power was on the side of the street and, through a traveling carriage and flexible wire, communicated the current to the motors. A 7 1-2 h. p. motor was considered ample, because, had not two real horses done the work? And engineers of ability contended long and vigorously that this new found power might do the work after a fashion on levels, but it could not climb a hill, however so slight the grade. But it did climb a hill, and it has climbed all the hills either real or imaginary which have seemed to obstruct its march of usefulness. As confidence came to those who had doubted or hesitated, the faithful horse was sent to the pasture, or to less considerate masters. The old horse car now had its motive power placed under it instead of in front, and the driver who had seemingly, only a short time previously left the boot of his omnibus, now exchanged his lines for the controller handle. A higher speed was attained, and the man who was content with living four miles from his business could not now be satisfied with less than six or eight. Patronage was increasing rapidly now, and heavier and better tracks were laid, larger cars were built, and motors were doubled and trebled and multiplied again in power. Power-house machinery was changed again and again, improvements and betterments were so rapid that, appliances being ordered, they were almost obsolete before they could be installed.

And all this has come about in so short a time, that many of us who have passed through the entire experience do not yet feel that our activity and usefulness have been at all impaired. In contemplation, it seems the work of the magician, and still the betterments go on and on, and I am asked to prophesy for the future. That would seem better the task of some resourceful writer of fiction. Could any prediction as to what may yet be developed, however so bold, be held as unworthy of consideration in view of what had occurred during the last decade?

Electricity in its flexibility is adaptable to purposes so varied that, to enumerate them would require a volume. It may be used as a toy and carried in the vest pocket to illuminate at will the tiniest personal ornament, whilst an enlargement of the same process gives us a search light rivaling the sun in brilliancy and extent. It runs the most delicate instrument the dentist can use and just as readily runs the heaviest trains of railroad cars. It decorates the palace and lights the alleys of the slums, it heats our houses when we have zero weather and cools the same space when the thermometer relieves itself through the top of the tube. It furnishes illusions and delusions, it makes the hot sands of the desert, and it lights the way as we follow our guide without fear of danger. But in nothing does it affect so large a portion of humanity as in its street railways application.

The street car has ceased to be "the poor man's carriage." It is everybody's carriage. It has ceased to be purely a necessity, a large proportion of its revenue coming from travel induced by pleasure alone. It has built, and expanded and beautified the city, and with the growing of the city its institutions have multiplied and enlarged. The mercantile establishments of to-day could not have their patrons and their necessary force of employees carried

to and fro by former means of transportation. The theaters owe their increased attendance to the speed and comfort with which the necessary journey is made. The former occupant of the tenement house no longer needs to live at the threshold of the factory or shop. The street railway has extended the time limit to the little cottage in the suburbs, and it has made the real estate man wonder if he really had an occupation in times gone by. In fact the city of to-day is as unlike its former self as is the street railway little akin, in construction, equipment and operation, to its predecessor. And paralysis is a mild form to signify the condition into which the city is plunged by misfortunes that stop the revolution of its car wheels. Then is realized how great a part the street car has in all the affairs of city existence; then in mock contrition we remember and retract the ugly words which in moments of unguarded impatience we uttered concerning vehicles and men whom we would welcome now with glad some smile; then indeed does "the stone which the builders had rejected be-



ROBERT McCULLOCH.

come the head of the corner," then we realize that in our prosperity, "men may come and men may go, but the 'street railway' goes on for ever." The labor and care and watchfulness of those who give it life and vigor and usefulness do not cease with the turning of the key in the door of the factory or shop or warehouse; their days are all of twenty-four hours' duration; in sunshine and in storm, when the world sleeps or is in turmoil, their duties are equally exacting; in their lists is no place for the laggard, nor for him who does not always place the performance of duty first before thought of self.

The street railway has not hesitated in its progressive march at the line marking the border of the city, it has made an "all hands 'round'" for the adjoining villages and settlements, and linked them in a community of interest, it has driven the steam road ignominiously from the field of short traffic, and, with a courageous confidence and irrepressible energy, which bring, usually, ultimate success, it reaches out for more extended distances. The man who contributes the nickel is the chief beneficiary of all this betterment and extension. His toll was a dime when the cumbersome bus jolted him scarcely more than a mile over the rough highway. Now, whilst the time consumed is of little greater duration, half that amount purchases the privilege of many miles of transportation with the allowance of transfer and re-transfer, and still each year brings betterment and improvement, in smoother tracks, larger and more comfortable cars, greater speed and shorter interval.

The future of the street railway is linked indissolubly with the city in all its advancement and improvement, its extension and growth, its physical and moral betterment and its health and adornment. In all these is the city the follower and the dependent, and of vastly more importance to its people and their interests is it that it shall have good street railways, than that the entire railway revenues should revert to its treasury.

There is a popular clamor for municipal ownership, and whether or not this idea may materialize has much to do with continued progress. Looking back over the rapid and costly changes of the past few years, we must question the likelihood that municipalities would have been strong enough and bold enough to have so ventured in discarding the old and grasping for the new. Only the stimulating expectancy of success and reward could have nerve the individual determination and risk that have resulted

in existing conditions. Municipal ownership has been made possible by the necessary legal authorization in perhaps only one state, and there it has utterly failed of fruition seemingly from the impossibility of agreement as to terms and conditions and the difficulty of financial provision. Because governmental control or ownership exists or is being attempted in a few foreign cities, is no rational justification for the conclusion that it would be wise or proper here. The requirements of the people, their customs and methods of business, are vastly different, and no city of this country could have attained its present development had its transportation facilities been as limited as the best given by municipalities which we find in control of that important institution. That the ownership and control by the city of water and light supply have been found of advantage does not warrant that the same result would follow their operation of its street railways. Whilst the former institutions may exist under the baneful political influences and incumbrances which we find embarrassing them, it is questionable if the daily transport of its people would be in safe or capable hands when entrusted to those whose terms of office and position rested on influences in which merit was no consideration. A healthy and vigorous competition bestows public benefit that all may enjoy, and a retirement of street railway transportation from this field, through municipal ownership could scarcely be doubtful of result, and the very spirit of paternalism and dependence which is fostered and encouraged by attempting to provide for a community, is the spirit, a rebellion against which founded and prospered this mightiest of all nations. We are not yet ready for municipal ownership, existing franchises in most instances having a generation yet to run, so we may safely assume that the same energy and earnestness which have characterized the conduct of the street railway during its recent wonderful developments will continue to exercise the same healthful influence.

The man who directs the affairs of a street railway is aware that in the community he is a merchant selling his ware just as other tradesmen are bartering theirs. If he would succeed he must give his customer the best that skill and industry and perseverance can provide, and like the other merchant he is entitled to the benefits that come from honest, persevering and painstaking application. With this stimulus to continued and renewed exertion, the benefits and increased advantages to the public must continue with each succeeding year. The scientist and the manufacturer, the car builder and the machinist, the rolling-mill and the foundry, can produce no appliance however so costly and extensive, that the street railway of the present and the future will not readily adopt and place in immediate use, if it promises a betterment of the service rendered to its patrons. The prosecution of no business or enterprise has entailed so many or such costly changes and abandonment of previous methods. Tracks, cars and power houses are discarded and renewed.

The ever increasing prosperity of the agricultural interests of the country, with improved methods of tilling the soil and saving the crops, enriches the farmer and enables him to indulge in luxuries formerly unknown to him. The city in supplying his demands must increase its factories and its supply houses and its population, but population and manufacture and trade cannot increase without a corresponding growth of the street railway, and in its growth it must keep pace with the spirit of progress which pervades our land. In track construction we have gone from a rail of 28 lb. per yard, to one of 100 lb., heavier than that required by the steam railway; 60-ft lengths, to decrease the number of joints, are used, and not content with that the joint has been entirely obliterated by welding process; and still we are ready to adopt any improvement in these conditions which the ingenuity of our craft will devise and the manufacturer provide. The same builders of cars who, a few years ago, were executing orders for 10-ft. cars as light as possible to hold together in safety, are now busy with lengths of from forty to sixty feet, and still we have not reached the limit. The designer of the electrical equipment has gone from two motors of 7 1/2 h. p. each to four of 40 h. p. each, and yet we are ready to encourage his further efforts by placing in use better productions whenever he will make them available. A modern electrical-power producing plant is a masterful combination of scientific design and the skill and handicraft of the artisan, but with all this excellence it perhaps bears as little resemblance to that which a few more years will develop, as to

the delicate little machines which have scarcely had time to grow rusty since they were discarded. The street railway of the future must and will have every device and method and appliance that will tend to the rapid, safe and comfortable transport of its patrons. Tracks and cars and propulsion must and will be the best that money and skill can provide.

But there is no better work for the future, and none of so great importance to every interest that concerns the ownership and operation and patronage of the street railway, than the consideration of the army of men who with ceaseless toil and watchful industry give safe transit to the multitudes of the city, the men who stand at the levers throughout the endless day, and guide the swiftly moving and heavily laden vehicles through streets teeming with life and bustle and activity, with countless other vehicles and pedestrians coming and going and crossing, each intent only on what concerns himself, leaving all the burden of care and watchfulness and promptness of discernment and action to rest on the shoulders already bearing enough; and the men who with equal attention and caution care for the occupants of the car, watch for their safety, attend to their wants, reply to their inquiries, and with patience and good nature discharge their multiplicity of duties; and the men whose eyes watch with unrelenting constancy and whose hands are always at the throttle valves, that there may be no hindrance to the continuity of the rolling of the wheels; and all the various departments filled with men, who, like the vigilant "minute man" of colonial days, are ever ready to perform with earnest intelligence the duties which they have assumed. All these men, thoroughly imbued with the spirit of self-abnegation, hold the discharge of duty first in all the purposes of life. With industry and intelligence and loyalty they perform their obligations, they represent us with the public, with persevering patience taking care of the annoyances and worries which, of necessity constantly arise. They are our friends and helpers and co-workers in the accomplishment of the task to which we devote our lives. Our relations with them should stand on a solid foundation of honest fairness, kindly consideration and appreciative confidence. The disturber should not be allowed to come between us and there should be a community of feeling in interest that allows no separation of purpose or effort. There are lessons of the past for both of us, which, if we heed, will guide us in the open way between the Scylla and Charybdis of the future.



THE FINISH.

The street railway of the future stands in grand relief as an institution of all future progress and development. Its service is a concern of every member of the community; there is no work or undertaking that so permeates the homes and life of all the people around us. Our responsibility is a burden to be safely borne on Herculean shoulders. Let us stand under it bravely, and with persistent and determined manliness, so that our own consciences at least, shall acquit us with the plaudit, "Well done, good and faithful servant."

Mr. Wyman: Mr. President, I desire to move the unanimous thanks of the convention to Captain McCulloch for this paper which he has so carefully prepared and put in such excellent shape; and in speaking to that motion permit me to say that I am quite certain that I voice the sentiments of all the delegates present when I say that we regret exceedingly the absence of Captain Robert McCulloch from this meeting. We regret that we are not able personally to thank him, not only for the paper, but for his services in the past, for the unflinching loyalty and devotion to the interests of the Association and the street railway fraternity in general, and for the help that he gave the Association in its earlier days, in its organization period, and the assistance which he has rendered it during all the time of its life. I wish that this sentiment shall be embodied by the secretary in the resolution which I have offered. The motion was unanimously carried.

#### THE PUBLIC, THE OPERATOR AND THE COMPANY.

By C. S. Sergeant, Vice-President Boston Elevated Railway Co.

It would be difficult indeed, to indicate the entire essence and range of street railway operation in fewer words than has been so tersely done by your president, in the title of this paper. It is with diffidence that I shall try to present a few thoughts in its illustration, feeling it impossible within the necessary limitations, to do justice to so comprehensive a theme. I assume that the intention of this title is to induce consideration, and perhaps discussion, of the relations of street railway companies to the public, and in particular those relations as concerned with the question of private or municipal ownership, or in connection with the conditions affixed to grants or franchises, or possibly as to the relations of the street railway company to the public in the matter of taxation.



C. S. SERGEANT.

Urban and interurban transportation of passengers on the public streets and highways, is, in its nature, so different from the movement of passengers by waterways or upon private rights of way that it is not only very difficult for those not actually engaged in the business, to appreciate its duties and responsibilities and its limitations, but it is natural as well that there should be a sentiment in the public mind in relation to street railways, somewhat different from that felt toward steam railroads, for the reason that the business of the street railway is transacted in the streets.

Few, however, of those who are so ready to lay burdens upon the street railway realize or have ever learned that the streets are not the property of the municipality, but belong to the public. A citizen of any European country has the same right upon the streets of an American city that a resident in that city has. The care of the streets devolves, it is true, upon the municipality, but this, of itself, gives the municipality no right to sell privileges belonging to the public, in connection with those streets. It is natural for citizens to assume that the street railway is a fair mark for the levying of taxes, ordinary and extraordinary, and the imposition of conditions, severe or otherwise, in granting franchises. From this sentiment,

and other causes, results a great volume of special legislation, often ephemeral in its character, varying in different states, all calculated to impose burdens and regulations upon this business. The great variety of such legislation is continually changing character and minor legislation (if it may be so called) which originates in city councils, or with highway authorities, places the entire business of street transportation in a condition of uncertainty, to which few other investments, and none of like magnitude, are subjected. In consequence of this condition of affairs, the street railway corporations are constantly placed upon the defensive, and necessarily much of the time and attention of their managements is devoted to a struggle for a reasonable existence.

In this connection I desire to quote from an address delivered at Philadelphia in April, 1900, at the Fourth Annual Meeting of the American Academy of Political and Social Science, by United States Senator William Lindsay, of Kentucky, this quotation showing that some of the evils of the present situation are appreciated by the public. The quotation is as follows:

"I may say, with reasonable confidence, that nine-tenths of the corporations now engaged in shaping public opinion, would welcome the opportunity to abandon that policy and gladly confine their attention and devote their monies to none other than the purposes of their creation. If they could be relieved from the annoyances and dangers attending the attacks of the place hunter and the professional agitator, and be protected against the demands of greedy party bosses in charge of party organizations, they would submit without remonstrance to all proper restraints and forget their past political affiliations in the more energetic prosecution of their corporate business."

The proposition which I wish to advance is the desirability of legislation substantially uniform in its character throughout our several states of the Union, which shall fairly, definitely and with reasonable permanency, establish equitable relations between street railway companies and municipal and state governments. The most ardent advocate for heavy franchise taxes or governmental ownership could not but admit the desirability of such a solution of this question from every point of view. Surely there is no street railway company but would deem a permanent settlement of this character most advantageous. The banker would be spared the long and careful consideration of the particular and special conditions in some small city and state before making his loan, and the patrons of the street railway company would receive the benefit of that improvement in service, which would result from a fixed tenure and a lower rate of interest upon the money invested.

I can devote but little space to the question of municipal ownership. If the term "municipal ownership" includes municipal operation, which has usually been understood to be the case, I believe that the tendency of the experiments already made abroad, and the knowledge which will result from a fair minded study of the subject, will be toward the abandonment of any such proposition. Not the least important reason for such a belief is the fact that street railways in this country at least, have long since outgrown municipal boundaries in the sense of one company being confined to one municipality. Rapidly they are also outgrowing state boundaries. The natural tendencies of the business therefore, are such as would greatly complicate the questions of ownership and operation by municipalities. Still further, the rate of interest which has been earned upon the money invested by municipalities in Great Britain in street railways, has been extremely small, and the facilities afforded have been most inferior to those enjoyed in this country. In general, aside from the question of municipal ownership, government restrictions upon the construction and the operation of tramways in Great Britain have been so severe that the citizens have been deprived practically until the present time, of the benefits which have been enjoyed by the citizens in this country, growing out of the freer opportunities which have in the past been afforded investors to provide tramway facilities for cities and towns.

Unquestionably the most important social benefits, development of real estate, and increase of taxable property, have resulted from the general policy which has been in vogue in the United States. Why, then, should our legislatures and municipalities consider changes of a restrictive character, calculated to reduce the profits of tramway operation, and consequently restrain and dwarf its future development? We are told by the so-called "economists" that such is the trend of thought. Why should there be such a trend of thought, if a fair investigation is given the subject?



Presumably it will be generally admitted that the only proper source which can be drawn upon for payment of taxes, rentals, assessments for paving, street cleaning and other similar burdens, is the gross revenue, and consequently the net revenue of the street railway company; that this gross revenue is contributed by the public; that therefore all such burdens are taxes levied upon the public who use the cars. It must then follow that every burden of this character is one tending either to increase the fares, to maintain them at a high level, or to diminish the facilities afforded the public in the quality of cars and tracks, frequency of service and its general maintenance. A company unfortunately, is regarded as an entity, rather than as an association of individuals. What ownership could be, in fact more public, than the ownership of a street railway corporation? Its shares can be purchased by everyone, and investigation will almost invariably show such ownership to be widely disseminated, and largely among a class of citizens, male and female, who can ill afford the impairment of the anticipated revenue. What greater benefit could be conferred upon our citizens than legislation of a character calculated to eliminate from street railway securities their speculative nature and place them substantially upon the basis of a savings bank deposit?

Many persons have pointed out the social benefits of street railways, especially electric street railways, and in particular due to the American system of a uniform fare, regardless of distance, within a reasonable radius from a centre of population. Examination of this subject, especially in contrast to the European system, will show extraordinary advantages of the American system. The very small fare for the very short distances, which has been the general custom abroad, has neutralized the benefit which otherwise would have been experienced by the community in such large cities as are provided with good tramway facilities. The poorer element in the population, as a result of such system, is confined abnormally in centers of population, and the amount of expenditure for policing, lighting and the attention to the public health, is necessarily greatly enhanced, and the moral effect of such concentration of population is most serious. Uniformity of fare tends to break up the slums; gives the workmen and his children a home of their own in the suburbs, and the question of rates is therefore one in which the great majority of the people are vitally interested.

In the light of these facts, is it not unwise to so tax in one form or another, the tramway enterprises, that they are prevented from rendering that service in transportation which might otherwise be secured? In these days of extravagant expenditure by municipality and state, it is doubtless a difficult matter to determine how the necessary funds are to be provided, and it is natural that the business of the street railway company, being always in the public eye, should seem a proper subject of assessment; but we should never lose sight of the fact that any such burden is in restraint of transportation facilities. A frequent argument for municipal ownership is that municipalities can borrow money at lower rates of interest than private corporations. Why then, pass such laws as will make the credit of private corporation good enough to command the lowest rates of interest? But, it is also argued that great profits would result and therefore great abatement of taxes upon others, if the cities were in control of the tramway.

As I have already pointed out, it seems reasonable to suppose that the greatest benefits to a community have accrued, and will continue to accrue, by private ownership.

The question as to whether the capital invested in street railways and their property, should be exempted from all special taxation, in order that the greatest inducements may be afforded to investors to increase such facilities, or that the profits should be restricted by limitation of dividends, or division of surplus earnings with the public, or bearing additional burdens in the maintenance of street surface and otherwise, is a fair ground for discussion. Much may be said upon both sides of the argument, yet I am firmly of the belief that greater public benefit is to be had by exemption from taxation than by other methods.

It is not to be supposed that in any city or state, capital should be permitted to conduct the affairs so vitally bound up with the private interests of every citizen without proper restriction and regulation, but the persons whose capital is invested have equal right to the protection of our laws, although that side of the question is too often overlooked. The best service can never be secured when several corporations are entrusted with the duty of providing trans-

portation for any centre of population. A properly regulated monopoly undoubtedly conduces to the best of service, and with suitable provision for freedom of investment in its securities, and suitable regulation of the services performed, the public good would be conserved, and the evils which arise from unnecessary investments, due to competitive enterprises, upon all of which (necessary or unnecessary) the public must pay interest, or must suffer as patrons and investors, would be avoided. Under the conditions usually existing, the operator of a street railway is charged with duties and responsibilities of the most exacting nature. His work, in so far as it is manifest to the passenger, is of so public a character that there is little opportunity for a failure to provide proper service to go unremarked; and he is therefore held to so strict an accountability that the character of the service must necessarily be continually improved.

Probably the greatest misfortune attendant upon the conduct of a street railway is the inability to provide comfortable accommodations during the so-called "rush hours" of the afternoon. It may almost be said that street railway traffic during rush hours increases as the square of the facilities provided. It is the constant endeavor of every operator to meet these conditions, but his efforts in the provision of extraordinary power supply, rolling stock and employees, are seldom appreciated, for the reason that it is impossible to prevent the overcrowding of cars during such hours. This overcrowding tends to much loss of revenue, to minor accidents to passengers, and creates in the minds of the passengers a feeling of dissatisfaction towards the transportation company, and a belief in its extraordinary profits. As a matter of fact, everything surrounding these conditions tends to diminish the company's profits and to increase its investments.

Erroneous ideas prevail in the public mind relative to the profits to be derived from street railway enterprises. Those who are engaged in the business realize that the utmost endeavors and watchfulness are necessary to secure a fair return upon the investment. When there are added burdens in the way of excessive taxation, or otherwise, then, indeed, is the operator in need of all his experience and skill to save a proper dividend from the net earnings.

Your association has been in existence for a considerable term of years, but it has not become feeble in its old age. It would seem to be within the power of the Association and within the scope of its duties, to take some action looking towards uniformity of legislation relative to street railway companies, and to aid in the correction of fallacies by dissemination of information upon many points as to which the general public is entirely ignorant.

If, in the few thoughts which have been suggested, there is anything worthy of your consideration, my purpose in writing this paper will have been accomplished.

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#### THE AMERICAN STREET RAILWAY ASSOCIATION: THE PURPOSES OF ITS ORGANIZATION, AND THE BENEFITS ACCRUING TO INVESTORS IN, AND OPERATORS OF STREET RAILWAY PROP- ERTIES BY MEMBERSHIP THEREIN.

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By G. W. Baumhoff, St. Louis.

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The subject is, it is needless to say, a fruitful one, justifying a paper in keeping with the title, but appreciating brevity where facts only are desired, I shall endeavor to enumerate some of the many advantages of membership in this Association to owners and operators of street railway properties.

A learned doctor once said, "Ignorance, pestilence and avarice make the human race akin." Substituting the word "ambition" for "avarice" I am constrained to believe the same agency is responsible for the organization of this association; for if one person's knowledge of street railway affairs were as thorough as that of some others, the necessity would not exist for attendance at conventions to lay in a store of information to better fit oneself for such duties. Who will deny that disease among horses and the best means of guarding against the spreading of such pestilence, and the care of horses, was at one time the chief topic for discussion at our meetings? And is not ambition one

of the chief incentives which prompts mankind to excel his neighbor and competitor in proficiency and results, a motive for seeking membership in an association which has witnessed the evolution of electric traction with its vast improvements, from the old-time animal traction, has outdistanced the cable, and is now looking forward with eager eyes to still greater achievements with this mysterious power, and by many, to yet another change whereby to improve and perfect the transportation system of street railway service?

The founders of this association built not only wisely, but with beneficial results to the street railway systems of this country far beyond their realization.

To the foresight and indefatigable energy of H. H. Littell, D. F. Longstreet and Thomas Lowry, from whose "Littell" beginning the Association has passed through the "Long-street" of progress without "Lowry-ying" its usefulness, belong the credit of the present efficiency and the high state of perfection of the street railway systems of this country, and which the entire world has adopted as its standard.



G. W. BAUMHOFF

The growth of the Association has been marvelous; the good it has accomplished, inestimable. It doubtless represents through its membership a greater combined capital than any organization or association in the world, and through its channels has disseminated information resulting in the establishment throughout civilized communities, of electric railway systems where no other service could be maintained, and in supplanting animal traction with its resultant saving in time.

It has been the means of saving millions of dollars to many investors in street railway properties by information procured from papers and discussions at our annual meetings, particularly at a time when much doubt was involved as to the best system to adopt in changing from animal to mechanical traction.

It has been the means of bringing the executive and managing departments of street railway properties in closer communion with their employes, and is largely responsible for the improved condition of street railway employes generally, today as compared with the period prior to its organization.

Its aim has been, and is, to encourage, elevate, and ameliorate the condition of that gallant and noble army of public servants, the Street Railway Employes, than whom none are more loyal or devoted to their work.

Through the proceedings of its annual meetings it has laid the corner stone of successful operations of the street railway systems of the world, and its gatherings are looked forward to with eagerness and assurances of greater additional knowledge concerning street railway improvements which are springing up like magic, everywhere.

It recognizes no creed, sect, or nationality. The universal law of God is its guidance, and the greatest good to its members and the community they serve, its ambition.

Investors have long since realized the many advantages resulting from this Association, and every company throughout this country should profit not only by membership therein, but insist on being represented at its meetings.

The Street Railway Accountants' Association is an offspring from this organization, and arranges its annual meetings to harmonize with the time and place of those of the parent body. The formulation and standardizing of account now generally ob-

served must prove of additional value to the investor and manager alike.

The appointment by this Association of a committee on standardizing street railway supplies and materials is another step in the right direction which will doubtless prove of inestimable value to the investor and manager, and will, in the opinion of the writer, result in the formation of another branch of this Association, bringing the mechanical department of the various street railway systems in closer touch with the managing and accounting departments.

In conclusion, there is another auxiliary originating from this Association, the importance of which must not be overlooked, the street railway press, through whose untiring efforts we are constantly advised of improved methods from an interchange of ideas and whose work when more generally appreciated, will, it is to be hoped, be substantially rewarded.

#### THE RELATION OF INTERURBAN ROADS TO CITY ROADS.

By Ira A. McCormack, General Manager Cleveland Electric Railway Co.

It is the writer's opinion that the relation existing between a city road and an interurban road should closely resemble the relations existing between the members of a partnership firm. Both should exert their efforts with the same end in view and should miss no opportunity of developing the mutual interests, although they may occasionally have individual interests which do not coincide. This rule should hold as good when two roads are controlled by different people as when they are owned by the same interests.

In the case of the company with which the writer is identified, with but one exception the interurban roads radiating from the city are controlled largely by the same interests as those which own the city lines. The majority of the interurban roads have been bought up since they were built, but the original agreements as to city traffic still hold good, and the interurban managers are as anxious as ever to make a good showing, so that, while in many cases they are trivial matters, contingencies frequently arise which require careful handling to prevent the other fellow from getting ahead of us in matters which are not carefully stipulated in the text of the traffic agreement.

The arrangement known to street railway people as a traffic agreement is a comparatively new institution, dating from the introduction of interurban roads. In the more thickly settled Eastern states, the majority of the suburban roads are simply extensions of the lines of the city companies, which quickly followed the development of electric propulsion because the suburban population demanded the new service; and so far as can be learned there are few instances where independent suburban companies enter on city tracks under a traffic agreement. In the West, however, the early history of the suburban or rather interurban roads appears to have been somewhat different. They operate from town to town, and in a great many cases the original promoters were parties who figured on giving the residents of their towns better communication with, or access to, the neighboring cities, and in entering the city they were obliged to apply to the city companies for some sort of arrangement whereby their passengers might be carried to the center of the city. In numerous cases, either because of the city ordinances which it was thought would debar traffic arrangements, or because of the unwillingness of the city company to make such arrangements, the interurban cars were forced to stop at the city limits and transfer their passengers to the city cars. This arrangement is still in vogue in many places, but it has never proved satisfactory to any of the parties concerned because it is not conducive to the full development of the interurban business. People generally prefer using the steam road to making the changes and running the risk of failure to make connections. Besides it is unquestionably a fact that the best advertisement for the suburban cars is to have them seen on the streets. One of the greatest arguments in favor of the new mode of traffic is that a person can take a car in front of his home and step down at his destination. For these reasons the traffic arrangement has become an imperative necessity, and the time finds the progressive city company not only perfectly willing but anxious to



enter into such an arrangement with outside companies, since the additional business brought into the city more than compensates for any trouble arising from handling the suburban cars.

The early traffic arrangements were comparatively simple agreements, generally setting forth the compensation required by the city company for permitting the outside cars to run over its tracks, an agreement as to the crews who were to handle the cars, an understanding as to responsibility in cases of accidents, and other similar matters of detail. But it has been found that the rapid development of the interurban roads is presenting problems to the city companies which were never thought of in the earlier days. The question of weight, the question of wheels, the question of voltage, the question of type of cars, the question of mail, freight and express, and many other matters, present difficulties to the managements of both the city and suburban lines which are becoming more and more difficult to adjust to the satisfaction of both.



I. A. MCCORMACK.

The question of unusual weights of cars is without doubt the most difficult one with which we are obliged to contend at the present time. The city tracks of five years ago were designed for single truck cars, weighing from 8,000 to 14,000 lb. Today our smaller city cars weigh from 16,000 to 20,000 lb., while the heavier double truck cars weigh from 24,000 to 30,000 lb. These are bad enough on tracks designed for the lighter cars, but the effects of the latest interurban cars weighing from 35,000 to 60,000 lb., on rail joints and special work is doubtless becoming fully appreciated by many of those present.

Coincident with the increase in the weight of cars comes an increase in wheel dimensions and this increase brings with it troubles which are almost as expensive as those caused by excessive weights. Our city wheels have a flange  $\frac{3}{4}$  in. deep as against one of 1 in. for the interurbans. The city wheel face is  $2\frac{1}{4}$  in. as against  $2\frac{1}{2}$  in., and these differences not only play havoc with our special work, but greatly reduce the life of the wheels by tearing and chipping the flanges. Plainly, some sort of a standard of measurements should be adopted; but, which shall conform to the other and which shall bear the expense are questions which will have to be settled by individual arbitration.

One thing is certain, if the interurban companies expect to continue increasing the size and speed of their cars they should as a matter of safety, equip their roads with trucks and tracks equal to those used by the steam trunk lines and as a standard for future practice it is suggested that the Master Car Builders' standard wheel forms an excellent criterion to follow. The dimensions are, 33 and 36 in. in diameter;  $3\frac{3}{8}$  in. tread;  $\frac{5}{8}$  in. width;  $1\frac{1}{4}$  in. depth of flange.

It is understood that in some cities where new construction work is going on, Utica, N. Y., for instance, they have ordered all special work with sufficient clearance and depth and width of groove as will be required for the above standard. But in cities which are provided with the older equipments in good condition, such changes are out of the question for some time to come, and in the meantime, the interurban companies, the parties most benefited by the traffic arrangement, will either have to bide their time until the city companies can make the change, or else they should bear the expense of making the improvement on the city line which they traverse. In some cities, Dayton, O., for instance, the traffic arrangements specify that the interurban companies must make all changes in track or special work, made necessary by the use of unusually

heavy cars or extra wheel dimensions. Incidentally, it might be added that such contingencies present one of the reasons why the city and interurban roads can most advantageously be operated under one management. Of course the only permanent remedy for rail troubles is the adoption by the city companies of a girder rail with high head, or better still the T-rail. The use of the Trilby rail appears to be on the wane. In an Ohio city during the past month, the interurban company has obtained the permission of the city council to remove its Trilby rails and curves, as it was shown that the grooves fill with mud and sand in summer and ice and snow in winter, rendering cars more liable to leave the tracks, besides chipping and otherwise damaging wheel flanges, thus rendering accidents liable when traveling at high speed. The thickness and depth of groove of the Trilby rail also greatly increase the amount of power required to propel the car.

Unquestionably the ideal rail for all round use is the T-rail, but unfortunately the popular fallacy that it is wholly unsuited for city use is still deeply instilled in the minds of every layman—owners of vehicles in particular—as well as with the majority of city engineers, but the writer predicts that the day is not far distant when, by persistent effort we shall be able to convince authorities to the contrary. Practically the only logical argument that can be advanced against the T-rail is, that when laid without pavement, it is hard on vehicle wheels, but every one here knows that with heavy pavements, tracks can be made nearly flush. Of course such a track can never be made as satisfactory to the driver of a tired horse, but if for no other reason than that the T-rail will do away with such causes of lost time, damage suits and profanity, it will be a step in the right direction. In many European cities, if a vehicle is damaged while in a car track, the owner not only cannot collect damages, but he is quite likely to be fined for being on the track. Unquestionably, vehicles should be prohibited by law from using the car tracks, and it might be added that the heavy and swift moving interurbans are doing much toward correcting this evil.

It is of interest to note that the T-rail is making headway for city use. In Brooklyn, two of the leading lines are equipped with such rails and are giving perfect satisfaction. It is particularly gratifying to state that within the past month, after a hard fight, a franchise has been granted in Sandusky, O., whereby T-rails are to be used on all city streets; this being the first municipality in Ohio to grant such a privilege. In Brooklyn, the bricks next to the rails on the inside are beveled to allow for the wheel flange. Some time ago the town of Flushing, L. I., made exhaustive inquiries and experiments as to the best rails to be used in connection with macadam boulevards and it was unanimously decided to adopt the T-rail.

The width and length of cars are points which should be considered in traffic arrangements. In Cleveland the space between the rails—or devil strip as it is called there—is uniformly 4 ft. so that it is necessary to place screens on the inner sides of open cars to prevent passengers from being injured. The distance between tracks is regulated by franchises and of course cannot be changed, hence the interurban companies are forced to regulate the width of their cars accordingly. Some of the cars recently purchased by one of the interurban companies are so wide that they almost touch in passing, so that great care is required in their operation. In the future we shall endeavor to secure 5-ft. devil strips, and the writer would advise companies building new lines to take nothing less if possible. The traffic agreement in force between the Toledo city company and one of the interurbans, provides that cars shall not be longer than 49 ft. 6 in. and shall not be larger or heavier than those in use at the time the agreement was made. The flanges of wheels are not to be more than  $\frac{3}{4}$  in. in depth and the tread of wheel must not be of unusual width. This word "unusual" is a trifle ambiguous and seems likely to cause trouble; since that which was unusual two years ago is now common and even behind the times.

At the present time, so far as can be learned, the difference in voltage is not causing serious trouble. At present the Cleveland city lines operate on the ordinary 550 volt circuit, while the interurbans employ 750 volts. Naturally the cars operate at a slower speed while in the city and they do well enough. The only noticeable difference is that the lamps drop considerably when the city current is reached. The city cars employ three circuits of five lamps each, while the interurbans have three circuits of six lamps



each. Nothing is done to remedy this discrepancy although it could be easily corrected by cutting out one of the lamps at the city limits. In Cleveland it has never thus far been found necessary to install additional feed wire and side feeds to take care of the unusual loads of the heavy interurban cars, but if they keep increasing their weight and speed something of the kind will be found essential. The extreme weight of the interurban cars and the tendencies of operators to open up full speed make them more dangerous and harder to control than the city cars, and precautions should be taken to guard against exceeding the city speed ordinances. It is understood that in Buffalo, a system has been employed under which the motor man removes the ordinary controller handle at the city limits and substitutes another which does not permit the control to run above the series into the parallel. Such a device undoubtedly prevents many accidents.

The question of interurban roads handling freight is one which will doubtless require considerable legislation in many states before its status can be regulated. In Ohio the courts have recognized the right of interurbans to carry freight, but nothing is said about the quantity or kind that may be carried. Some of the municipalities and counties have attempted to regulate this by specifying package freight, mail and express. The majority of Ohio roads are operating combination passenger and express cars and only in one or two exceptions have attempts been made to operate exclusive package freight cars. In a certain Ohio city recently, the city authorities undertook to prevent the interurban cars from stopping on the streets to unload milk. After making a move the officials consulted the corporation attorney and he rendered an opinion that since the state gave the companies right to carry freight, it also gave them the right to unload it and at any time or place they thought fit. It may be noted right here that one of the most annoying features of the traffic arrangement is that interurban companies insist on unloading milk or freight at points along the route most suited to the convenience of their customers. In many of the more recent arrangements it is specified that the interurban companies must provide a freight station in the center of the city, with turnouts from the city tracks. In many cases small interurban roads cannot afford to go to this expense and the writer believes in such cases it would be good policy for the city company to build and equip the freight station, and lease it to the interurban company or companies, at a figure which would cover the interest, depreciation and expense of maintenance. To digress a trifle from the subject in question, the writer believes that it would prove an excellent investment, besides being a great convenience to merchants, to utilize the interurban freight station as a general transfer station for freight of all kinds. Freight cars can be transferred to the various steam roads during the night by the use of powerful motors, and the objections of excessive noise made against this practice would thus be eliminated. The station should be located on some side street off from the main line of travel, and in this way much of the heavy teaming which interferes with the street railway service, would be diverged to other streets.

To return to the interurban freight and express business, it is becoming generally appreciated that this factor of the business is one of the most promising features of the new mode of transportation, and already in some sections it is reaching very large proportions. In Ohio probably the best example is the Cleveland & Eastern road, which taps a very rich isolated farming district and handles immense quantities of package produce and milk; during the past few months, the receipts of this road from freight, mail and express amounted to a trifle over 25 per cent. of the gross earnings. This company maintains exclusive express cars which run into the city twice a day, in addition to combination cars which are almost invariably filled to their utmost capacity. Some of the properties of the Everett-Moore Syndicate are not at present handling package freight although they will in the near future, but the reports for one year show that out of gross earnings of \$10,000,000 for the various properties, \$200,000 was derived from package freight. As is generally appreciated, the handling of this class of business adds but little to the expense of operating the road. The major portion of this class of business can be carried on combination cars at times when passenger traffic is not heavy; hence, aside from the cost of handling at stations, the receipts from this branch are almost all clear profit. Naturally the city companies should share in these receipts. The method of division varies in different cities.

In Cleveland the city companies take such proportions of the amount received in carrying United States mail, express and freight, as the distance on the city tracks is to the whole distance carried. This arrangement also exists in Toledo and other cities. In Toledo the traffic agreement provides that the suburban company shall pay all costs of loading and handling and the arrangement may be altered by arbitration after any period of three years. At Columbus the city company recently made an agreement with an interurban company whereby the latter shall pay the city company 10 per cent. of the gross receipts from freight. The majority of agreements provide that the city company does not guarantee the right of the interurban company to handle the freight and the city company is to be held free from damage in case the business is restrained by legal or other action.

Comparatively few of the traffic arrangements in the various cities are exactly alike. There are almost invariably local conditions which have their effects, and frequently agreements which would be satisfactory in one place would be unfair in others. There are many reasons why the city company in one city should receive a higher rate for handling the cars of the interurban company than those in other places. For instance, it is worth more to handle the heavy interurban cars in extremely hilly cities like Kansas City and Pittsburgh, than in Cleveland or Detroit. The extreme cost of fuel in Denver or Omaha would make a difference as compared with Buffalo or Philadelphia. The length of the haul is also an important factor to be considered.

The Cleveland agreement is briefly as follows: The city crews take charge at the city limits, (since this agreement was made, this section of the agreement has been changed by some of the roads. The crews remain on the cars and while on the city line they are paid by the city company the same as its own men.) The city companies collect and retain all the local fares and pay to the interurban companies mileage at the rate of two cents per car-mile, during the first two years of the contract. This part of the contract to be arbitrated at the end of each five years, thereafter. It might be added that no occasion has ever been found since for changing this clause. While in charge of city crews, the city companies are responsible for all damages to cars or individuals. This agreement was made between six interurban companies and two city companies and it was agreed that no other companies should be admitted to the city tracks without the consent of those having the privilege. The suburban companies agreed not to make traffic arrangements with any other city companies, should they appear in the field, and agreed to take no interest in any city project. The city companies agreed not to build extensions that would in any way compete with the interurban companies.

At Detroit several years ago one of the city companies made a traffic agreement with a company which proposed to operate from Royal Oak to Detroit. The companies settled on a meeting point and each extended its line until they connected. The cars of both companies were operated the length of the two lines, the crews changing at the connecting point, the men always remaining on the line which employed them. Both companies sold single and round trip tickets; tickets sold by one being accepted by the other, and at the end of the month, the debtor paid the balance against it. Later, the suburban line was extended to Pontiac and thereafter the Pontiac company furnished all the cars for the through runs. The city companies furnished the crews at the city limits and assumed the responsibilities and paid the suburban company two cents per car-mile.

A carefully prepared agreement existed until recently between the Toledo Traction Co., of Toledo, and the Toledo, Fremont & Norwalk Railroad Co., one of the longest and speediest traction roads in the country. The agreement as stated before provided for specified types of cars, weights, wheels, flanges and other technical details. It provided that the city company did not guarantee the right to operate passenger or freight cars but merely granted such rights as it had a right to grant. The city company was held free from damage in case of failure of power or in case city company is legally restrained from operating the cars.

The city company did not guarantee the strength of its equipment, neither did the interurban company guarantee the strength of its cars. The crews of the interurban road remained on the cars but the city company reserved the right at any time to remove them and utilize the city men. The company whose crews were in charge of the cars to be responsible in cases of accident. Under this ar-

rangement the city company received of fares collected within the city limits, during the first five years of the agreement, 4 cents; during the second five years,  $3\frac{1}{2}$  cents; thereafter, 3 cents.

The Dayton city company has two kinds of agreements; one by which it received all local fares (meaning all fares collected from passengers carried from any point on the city lines to any other point on the city lines and no further) and  $2\frac{1}{2}$  cents per passenger, other than local, carried by the interurban company over any part of the city line. By the other agreement the city company received 3 cents per passenger carried over any part of the city lines. In each form of contract the interurban company keeps an account of all freight, mail and express or other matter carried, and pays the city company in proportion to the distance it is carried over the respective lines, the city receiving one-half of such proportionate amount which would be due it if the whole sum received should be divided. The interurban crews remain on the cars and all fares collected within the city are recorded on registers furnished by the interurban company and agreed upon by the presidents of both companies. The interurban company discharges employees upon reasonable complaint by the city company. The interurban companies are responsible for all damages caused by their cars or employees while on city tracks. The city company is not liable in case of interruption in power or damage to tracks or bridges.

In Columbus an agreement has recently been made on a modification of the last mentioned plan. In that city the local company utilizes a broad gage track, this being also the case in Cincinnati and a number of tributary towns. In this case the interurban company agreed to stand the expense of installing a third rail to accommodate the standard gage. The suburban crew are to remain on the car and the city road is to receive 3 cents out of each 5 collected for city fares. In another Ohio city (Cincinnati) the local company uses the broad gage and an interurban road entering the city has also been built with this gage. The city company pays the interurban company 30 cents per hour, or \$5.40 per day (18 hours making a car day) as rental for the cars while on the city tracks. The city company takes up the interurban tickets at regular rates and the interurban company pays for them each month.

The Buffalo & Niagara Falls Electric Railway, before its consolidation into the present system of the International Traction Co., had a line which extended from the city of Buffalo to the city line at Niagara Falls and the cars used the tracks of the Buffalo Railway Co. in Buffalo and those of the Niagara Falls & Suspension Bridge Railway Co. in Niagara Falls. When the cars reached the Buffalo city tracks, the city company's men took charge and all fares collected went into the treasury of the Buffalo company; in other words, the suburban company gave the use of its cars for this distance for the privilege of carrying through passengers. In Niagara Falls the situation was different; here the suburban company paid 3 cents out of every 5 collected for the power and use of tracks. It is understood that the 2 and 3 cent plan is used in Pittsburgh, St. Louis, Kansas City, Indianapolis and other places and it appears to be deemed a very equitable basis of division.

In preparing this paper the writer requested information as to traffic arrangements from nearly all cities where interurban cars are known to enter over the city company's tracks, but for some reason or other the majority of managers failed to reply, or else declined to give detailed information. As one manager put it, "We have had a hard time settling on a satisfactory arrangement and do not propose to educate those who may become our competitors." Another manager wrote, "We have no traffic arrangement with interurban companies and if I can help it do not propose to have any, as I believe in the policy of the metropolitan system in any city constructing all the lines that could be reasonably demanded."

The handling of local city passengers by the interurban cars presents a problem with many different phases, dependent to a large extent upon the terms of the traffic arrangement and the inclination of the crews in charge. Under ordinary circumstances the interurban companies are anxious to get their cars in and out of the city as rapidly as possible and they do not care to stop at every street for city passengers; and it might be added that the city passengers have a decided weakness toward the larger and more comfortable interurban cars. This desire on the part of the interurban company is especially marked when, as is the case in Cleveland, the interurbans do not share in the city receipts, but are

paid so much a mile covered. On the other hand where the interurban company shares in the city receipts it is sometimes considered worth their while to cater to the local traffic and generally this tendency is not at all to the liking of the city company. The writer has in mind an instance where two interurban companies use the same tracks for the matter of twelve miles to the city limits and then both enter over the city tracks. It is a matter of common talk that both companies jockey for the twelve miles of interurban business and then both have a contest with the city company for the city business. It is said that the interurban cars race to get ahead of one another at the junction, while at the city line the city company makes it a point to have a city car precede each incoming interurban. Laying aside the small profit that can be derived from the city business, it is unquestionably against the best interests of the interurban companies to cater to the city trade. The interurban roads are coming more and more into competition with the steam roads and to the person who has a long interurban ride in front of him, there is nothing more tiresome or more discouraging than the frequent stops and crowded cars consequent with picking up and letting off city passengers. Were it not for city ordinances which provide that all cars must stop for passengers, it would, in the long run be more profitable for the interurban cars to run through to the center of the city without stop except to let off or pick up their own passengers.

The question of ordinances regulating the stopping of cars is one which should be taken up with a view of securing concessions for the interurban cars. Although in the majority of cases such cars are recognized by the city ordinances only as city cars, it is time they should receive certain privileges and not be compelled to handle local traffic. It should be pointed out that the interurban cars are greatly benefitting the merchants of large cities by bringing in people who have traded at country stores, thus aiding greatly in the development of the commercial centers, and it can be proved that this development can be still further increased by giving the urban residents speedier transportation and better accommodations. It might be argued that much business would be lost to the interurban cars through failure to make stops in the city to pick up passengers, and this is true, but unquestionably much of the difficulty might be overcome—providing the city ordinance permit—by having the conductor of the interurban car question each passenger as to his destination, before he steps aboard; if he desires to go to a point on the city line, he should be requested to take the next car. If legislation on this point cannot be secured, then the trouble can be eliminated to a certain extent by posting notices requesting city passengers not to use the interurban cars and by having the city company precede or follow each interurban car with a city car.

One of the roads running into Cleveland, the Cleveland, Painesville & Eastern, operates what are known as "Special Limited" cars. They are designed especially for business men who reside in Painesville, Mentor and Willoughby, and they reach the center of Cleveland each morning in time for business, running after business hours in the evening. They make no stops except at these towns and save about 30 minutes on the run of 30 miles. Inside the city limits the cars are considered as specials and do not stop for local passengers. Thus far the practice has caused no complaint among city people and the cars are a great luxury to the suburban town residents who do business in the city. It is understood that other roads are soon to follow this practice as it is of immense advantage in building up the small towns. It affords a constant income to the interurban roads and does not detract from the business of the city companies since the city fare is collected as usual, and therefore it may well be encouraged by both.

Under no circumstances should the city company attempt to make the interurban car part of its regular schedule; such an arrangement is not conducive to good service for either party.

The status of interurban railways in years to come is one which few people are willing to prognosticate. Just at present it appears to many people that the interurbans occupy, and will continue to occupy, a field which is separate and distinct from that of the steam roads. They are operating from town to town, opening up heretofore isolated country and affording short routes between points, which, heretofore have been far apart from the fact that they are located on different steam railroads. In this way the electric railroads aid greatly in the development of the country



without actually interfering with the business of the steam roads; on the other hand they frequently improve the steam road business. Will this continue to be the situation is the question which plainly is troubling the steam road people. If this tide of electric trunk line building can be abated, the steam road people are now clearly willing to share the passenger business by turning over to the electric roads the short haul traffic. The business which comes from small towns surrounding the larger cities and that which goes from one small town to the next, is said to be detrimental rather than beneficial to many of the steam trunk lines. The president of one of the most important steam roads in the country has recently been quoted as saying that it would be money in the pockets of stockholders if the short haul passenger business could be turned over to the electric roads. He figures that people could be brought into the larger centers on the suburban cars and from there they could take through fast trains for distant points. He stated also that the increase of freight business consequent with the building up of numerous suburban towns would more than compensate for the loss of the short haul passenger traffic.

Briefly, the foregoing appears to be the aim of many of the present promoters of electric roads, but it is a well known fact that there are many others who claim that the day is not far distant when electricity will compete in every way with steam. Some of the roads under construction are being equipped with 80-lb. rails identical with those used on steam roads and speeds of 60 to 70 miles an hour, with through sleeping and dining cars, are freely talked of. An Ohio company promoted by C. A. E. Appleyard, of Columbus, has recently placed a contract for electric sleeping cars which will be placed in operation within the next ten months between Cincinnati and Columbus. Within as many months the Everett-Moore Syndicate will have through cars operating from Cleveland to Detroit and it is the intention to compete for through traffic with the fastest steam road in the country.

Clearly, such arrangements can have little in common with the 10 mile an hour schedule which of necessity must remain permanent so long as cars traverse the surface of crowded business and residence streets. Laying aside the question of speed, the electric trunk lines will sooner or later find it to their advantage to handle heavy freight, coal, grain, etc. At present the citizens and city authorities of large cities make little complaint against combination express and package freight cars, or even an occasional exclusive package car, but it is expecting too much to calculate on freight trains transporting merchandise of all sorts through residence streets, even at night.

Obviously, the only solution of the problem under the various conditions mentioned is, for the interurban cars to enter the center of the city by means of underground or elevated tracks with special tracks for through cars.

The Chair requested Mr. Albin E. Lang, of the Toledo Traction Co., to open the discussion.

Mr. Lang: "I appreciate that a traffic arrangement which might be desirable between an interurban company and a city company would vary according to the local conditions that might exist in each city. The considerations which would arise in making a traffic agreement between a city company and an interurban company desiring to enter New York, Chicago or Philadelphia, would be vastly different from the considerations which would apply in the case of an interurban company desiring to enter a city the size of Toledo, which has about 150,000 inhabitants; so that in making the few remarks upon this paper, which I shall make, I must of necessity speak more particularly of contracts which exist in Ohio, and of which I have more or less information. The contracts which have been made for cars in Cleveland, Cincinnati and Detroit differ from our contracts in this—that the city companies in those places at the outset expected to make the suburban cars do the city work, and in so doing to repay to the suburban company a certain mileage for the use of the cars. In our city we have a different rule in making these contracts. We recognize the advantage of having the employees on the suburban road run their cars into the city and out again. The suburban company assumes all liability of accident. That is not desirable, however, unless you have some provision in your contract which gives you practically the control of the suburban railroad employees. It is somewhat difficult to make that kind of a contract, but we have deliberated on the question as much as possible

with our attorneys and we think we have provided an arrangement of that kind; whereby, in giving notice to the suburban company that an employee of the suburban road refuses to recognize the authority of our superintendent the man should be immediately discharged. My theory of the suburban railroad is that it is the rapid transit feature of it that makes it of value to the city companies, and hence in the contracts we have made, we provide that the city company shall receive from the suburban company a proportion of the fares collected; and that proportion in our case generally runs from three to four cents per passenger. That gives the city company the benefit of the growth of the interurban business, and with the freight business we have made a temporary contract, which permits the city company to receive from the suburban company the proportion of the amount of freight receipts due the city company based on the proportion of the mileage carried over the tracks of the city company. We are not satisfied that this is a good provision to make, or that it is fair to either side, but inasmuch as the freight privileges have only recently been granted, and it is somewhat doubtful whether the interurban railways will get anything under the Ohio laws, we have made these contracts to extend over periods of two or three years, with the right of either party to adjust them at the end of that time. The Supreme Court of Ohio has recently held that an interurban company chartered under the laws of Ohio has a right to carry freight and express matter into the cities, irrespective of any ordinance of the city prohibiting the carrying of freight. Thus it seems to be the policy of the court to extend to interurban companies larger powers so as to carry out the purposes of their organization.

We have recently constructed in Toledo, and I think there is now being built in Detroit, a central station for handling freight. Its location is in the heart of the city and it is built much after the plan of the steam railroad stations, whereby the freight cars of the interurban road run alongside the freight depot with a water shed extending out over the car far enough to enable us to load and unload freight with safety. Our plan is to figure the cost of the land and building, the interest on the investment, taxes, depreciation, etc., and charge the interurban companies for the time being a given rental for the use of that building. It is expected that later on a company will be formed for doing the express and freight business of the city, to solicit business and exchange it between these roads, but at the present time we are operating in the manner stated.

We experienced some difficulty with the suburban companies, growing out of the use of wheels of broader tread and deeper flange than the city work reasonably permits us to use. We find that most of the suburban roads are projected and their equipment contracted for before the final arrangements are made with the city companies; so that we sometimes have to yield to the interurban companies some points that are not desirable, unless we desire to enforce some conditions which, on their face, appear to be hardships; hence the expression in the paper on the part of the writer that he did not understand what the reference to unusual width of tread or flange meant. The conditions to which this statement refers is that a suburban railroad constructed 20 cars when it was discovered that they had a tread of 2½ in., whereas the ball of our rail is only 2 in. We were nearly ready to commence business, although the exact terms of the contract, had not yet been agreed upon, but we had told the parties we would make the contract. This contract was to have been similar to those which had up to that time been made by us. Our purpose was to encourage the building of these roads, and the putting of them in operation at the earliest moment possible.

We have made those traffic arrangements and we have found them in all cases to be revenue producers. We have made no arrangements with interurban companies by which passengers, when they reach the city, can be transferred to other cars; but the fact has been, that we have felt this increase of business that the interurban roads have brought in, because in going into the city they would want to reach other points, and would have to pay us full fare to reach them.

I have noticed that nearly all of the promoters of interurban railroads are exceedingly anxious to obtain the most favorable terms possible for entering the city. It means money to them. Hence we have, speaking from the standpoint of the city companies, set ourselves resolutely against yielding on all of these points, and yet, as I say, the project is so far advanced when they



come to us, that you would necessarily hold up the interurban companies if you did not yield on some of these minor points; and yet these minor points are always of considerable importance to the city companies. I think in the case of the first interurban line we allowed to use our tracks, we have had practically to reconstruct the entire track over which that company ran, due to the heavier cars and higher speed. I have discussed with some street railroad men this question of contracts with interurban roads and I find a diversity of opinion upon that subject as to whether these contracts are desirable or not. I refer to the city I represent. I found some things that indicated these contracts to be desirable; but time only can tell whether they will be profitable for all city companies. It is a question of revenue that governs us in all these affairs, and we can only get at that question by comparison with others.

On the question of freight cars on the interurban roads, in our city the interurban roads have built freight cars designed especially for the business and they ran at given times during the day according to the traffic they have and so far the people of the city have made no objection to the use of these cars. Street railway managers now and then fear a criticism about freight cars being run through the city streets. We have arranged that, while our freight cars are at the center of the city, they are a little off to the side, so that the cars do not trail through the central part of the city. The favor which this freight traffic receives on the part of dealers is astonishing. Butchers, grocers and others patronize it very generally. I was told the other day by a man who deals in eggs that his business has been doubled since the advent of the interurban railroad, owing to the facility of getting things in and out of the city, and the day before I left home an insurance man told me his business had been improved by reason of the extra facility in getting his agents in and out of those suburban towns. I apprehend such instances might be given in large numbers to prove the value of the freight service to interurban roads. The interurban road of the future will be very valuable to the city companies, in my judgment, by reason of this great privilege. Possibly some of you have heard of an invention called the "Bonner Rail Wagon." It has been tried in one or two cities in Michigan to a limited extent, and a road on the Isle of Wight is now operating them successfully. The plan is to have a wagon built with a wide tread wheel, that is mounted on a truck, and when the wagon gets to its destination, it is taken from the truck and a horse attached to it and the wagon run the same as any other wagon. It makes trips to the farms, is brought back to the station, then put on the truck again and carried on the street railway into the city and, so on, back and forth.

In my judgment, the interurban roads in the future will make a great many connections from the main line to small hamlets and places where freight and other farm products can be gathered together and shipped with despatch and cheapness to the centers of population. In some of our interurban roads, we know of cases where "buss lines have been formed to connect with the main line, and running to hamlets three or four miles away, and in that way the traffic of the interurban railroad has been largely built up.

In our state until within the last year there has been a great deal of difficulty in making arrangements with steam railroads for effecting crossings; but the steam railroads have come to recognize the inevitable, that the suburban roads are bound to be built and that they might as well make the best terms possible with them, because of the right of eminent domain the suburban company has a right to cross anyway; and the steam railroads are meeting the interurban roads with more cordiality than heretofore. A steam railroad man told me not long since that he looked for the time when the relations between steam railroads and the interurban railroads would be very cordial; that it would go so far as to include an exchange of traffic, and in that view of it, it seems to me as if the interurban railroad might prove to be a very valuable adjunct to the city railroad of the future.

Mr. O. T. Crosby, Washington, D. C.: Referring to the paper under consideration, I think that while the arrangements being effected between the city roads and interurban roads are based upon conditions as they now exist, yet I see, I think, that these conditions are going to change, and much of the work under the arrangement must change with the conditions. The reasons lie in this—that independent of the question of ownership, that is, as to whether ownership shall be vested in the town, city or country road, or vice versa, there are still various questions of a mechanical

and electrical character, which lie at the bottom of them, and which I think will become better and better understood as we go along. The tendency is rather to a divergence of mechanical operation, I do not say of interest or management, but of mechanical operation, between the outside and the inside road. The city road has practically reached its limit in respect to the size of car and the speed of car. When you have set down certain sizes and weights of cars and certain average speeds that you are to maintain, you have practically determined a number of important electrical and mechanical considerations. You have so far determined them, that the use of the same mechanism under widely varying conditions of weight and speed will not be desirable. The outside or country road has not reached its limit, either in respect to the size of car or the speed. There shall always be, as long as we know how to make motors that will run faster than those we are running to-day, a desire on the part of the outside or country people that they shall get the last form of motor, and it will be given to them somehow or other. So also in respect to the size of the car. There is a demand on the part of the outside people for an increase in the size of the car all the time, because they must be in the car longer and the car must be run at higher speed, than is the case with the city cars. It may be, therefore, although I think this view of it has not been widely taken, that we must approximate more for our interurban service to the methods of the steam road people who have had the problem before them for 50 years, than we do to the methods of our electric railways for the movement of people in the cities. We have got to provide somehow or other for that want and save time for the suburban man, and do what he wants; try to squeeze down the time he is in transit to an equality with the time the city man is in transit; and to do this we have to pass him through the city faster than we do the city man, as the country man has added to his time of transit the time he spends outside in the country in passing from one town to another. It looks as though you would want a special track for the handling of large high-speed suburban cars, a track that you can keep up nearly to its ordinary outside speed; for, bear in mind that the operation of a very heavy high-speed car on a city track subject to city conditions is a thing by no means desirable. You must almost inevitably operate, from the electrical point of view, at a disadvantage. You are often required, in order to meet the best conditions of voltage outside, to have a high voltage outside. The result is, when you get into the city you have an undesirable state of affairs. I went into this matter very carefully with Mr. H. H. Littell, when we built the Buffalo & Niagara Falls road, which was one of the earliest cases, perhaps, where a large car intended for high speed was to be operated over city tracks. We compromised the matter by putting four motors under the cars, while, on the score of economy and maintenance, we might be justified in putting only two. The question of alteration of speed came up; the question of throwing on cars of tremendous capacity, of lower resistances. In the handling of such cars it means a good deal to the city station. Mr. Littell at that time looked at it with the interest of the city end, and objected to the use of two motors of low resistance, because in starting and stopping such motors you make an unusual demand for an instantaneous supply of current from the station; and in order to meet that condition we put on four motors instead of two. This is a mere illustration of the case as it exists in Toledo, and in similar places, because the roads in these cities have not reached the limit which will be required by future service as to size and speed of cars. It is evident that it is desirable some compromise should be made. If the public will frankly recognize and the street railway men will frankly recognize that there is a disparity between the conditions, there may be obtained a corresponding supply, so to speak, of space, of trackage room, etc. This is difficult to bring about, I know, and it may be necessary, in order to overcome this disparity, to get some kind of a track where the cars will be permitted to maintain a high speed. This is asking a good deal from the city point of view, but it seems the only way out of the problem, as it now exists; because, under the present conditions, where country and city service are combined, it is difficult to get a satisfactory speed for country service. The country service is necessarily more sharply marked into hours of great activity and hours of very little activity. You, therefore, have this problem. You say you won't make more than a certain number of stops on the suburban line. That is all right, as far as it goes; but what are you going to do on most of the busy streets of our large cities?

The moment the interurban car strikes the regular city service, it is brought down to the speed of the city service, whether it stops or not. If a highway were provided where there was comparatively little demand for the usual city service, they might make this higher speed with fewer stops, and in that way obtain practically a higher speed. In that way the freight business would be cared for which has been dwelt upon as being a matter of considerable importance. It is quite out of the question to handle any considerable amount of freight business satisfactorily on city streets. If this business reaches any sort of magnitude it will prove to be objectionable on city streets. I am sure in saying this I am not explaining the cause of the disappointment that many men have felt in laying out suburban roads. They expect to get a nice freight business and they do not get it, because they cannot handle the business properly and do that which the public has imposed on them, and which must be done in most cities, namely, the giving of proper service for the people in the city. Of course, we must have our freight service as well as passenger service. The suggestion made of the wagon which could be put on a truck is very interesting, but you could not stop a car to take a wagon off in the street. I think that a satisfactory system of rapid transit through the country and the city will be obtained by stopping the high speed heavy suburban cars in the upper portion of the city and have the people transfer to the lighter cars ordinarily used in city service.

But in all this discussion we must bear in mind that when you once strike the well served city streets, you cannot move the heavy car any faster than the regular car, which does the city business and all of whose characteristics have been worked out for city service. Therefore, if you operate a city car over the city line, even though you have transferred your passengers from the interurban line, you are operating such car as carries your passengers at better advantage. I think we shall find, even if we dump the people out, undesirable as it is, for everyone, the suburban service has not been carried to its ultimate limit. We see the suburban lines growing longer, and as they grow longer the speeds must go up and size of the car must go up, because you are handling larger numbers of people; and hence you get this disparity of mechanical conditions greater all the time, and, therefore, one of these two conditions will in the long run obtain, namely, a changing of cars in some well selected outer portion of the city, or some special line if transportation through the city. In the latter case you can handle freight service also through the special line, but in the former case the freight business must be distributed by means of wagons to the station. I think the question is an important one, and I am only advertising to these important mechanical considerations, because I can see they must come, and that these contract arrangements will then vary with the change in mechanical arrangements.

I should not distract the attention of the members of this convention from the immediate question that arises in the matter of making these traffic arrangements. I have had many times to go over them and I know it is difficult to make these arrangements. It easily straightens itself out when the ownership is common, except the underlying mechanical conditions, which remain just the same. I would be glad if the author of the paper or any other gentleman would throw some light on this question—What is the fair and proper limit of the size, weight and speed of cars we should try to handle in a typical city service. That has, I think you will see, much to do with the ultimate relation between the two.

President Holmes: We have a paper on that subject to be discussed on Friday, which I think will meet your question. I wish to thank Mr. Crosby for his able discussion of the question. I will ask Mr. Willis E. Gray to tell us something about suburban roads from the standpoint of a steam road.

Mr. Gray: After a good many years of separation, I am glad to meet the president of this association. The question has come up as to the service on steam railroads, which I think is quite similar to the propositions on electrical railroads, aside from the difference of motive power. The gentleman who has just spoken, it seems to me, has the right idea. Your field in suburban service is in its infancy, as I see it. You have before you a great many problems to solve, which will require a great many mechanical changes in your equipment. Your speed must be greater, your facilities must be better, although they are now excellent. It was my pleasure not long since to stop at Painesville, Ohio, for the purpose of riding over the suburban line to Cleveland. I was very much impressed with the speed and the possibility of that service.

In that trip the possibilities of this service came to me. You must have more speed, you must have a better arrangement for the handling of your passengers, you must have a place where you can carry light packages and all those things, and that brings about the question of mechanical matters. Personally, I feel you are only beginning to enter the interurban system. I thank the president for his pleasant remembrance of me.

Mr. L. E. Myers, of Peoria: Representing as I do a joint steam and electric railway, I think some of our experiences along the line of the statements just made may be interesting. We operate steam locomotives and electric passenger cars over the same tracks and do a very large freight transferring and switching business with a great number of steam railroads of such magnitude as the Big Four, Rock Island, and roads of that character and importance. We handle all our package freight on electric passenger cars. We handle through freight business with our steam locomotives and have two local freight trains each way daily for the transportation of such bulky trade as we cannot carry on our passenger cars. We find on a single-track road, of which eight miles is used jointly by the steam and electric cars, that it is a serious problem to handle our freight trains, and for that reason we have found it necessary to maintain a complete train despatching system, and at the various crossings with steam railroads we have standard interlocking signal towers and maintain our electric service in exactly the same method as is used on the steam service, which would go to show that the destiny of the interurban railway is substantially along the lines of what the steam railway people have done.

I want to disagree from the gentleman who preceded me as to the probable attitude of the steam railroads. Although we are a steam railroad in fact, we find that we cannot get any recognition from our connecting lines, except such as we force upon them by originating the business. We have a number of instances on our road where we have originated a considerable freight business. Such as we originated and controlled, the steam railroad will take from us, but invariably they will divert their business so as to escape paying us any charge for using our rails. While I should like to agree in the opinion of the gentleman who preceded me, that the relations of the steam railroad and interurban railway are going to be closer, my experience has led me to believe that instead of the relations becoming closer they will become more antagonistic as the success of the interurban railway becomes more clearly defined.

Speaking on the subject of Mr. McCormack's paper, I am connected with three interurban properties, widely distributed, and in each instance we succeeded in making traffic arrangements with the existing local properties at each end. It is my opinion, based on a somewhat varied experience, that there are no two conditions alike; and while Mr. Lang's agreements are excellent as adapted to Toledo, they would not, in my opinion, be well adapted to some other cases. From what Mr. Lang tells me, I think the contracts he makes with the interurban roads are eminently fair. My idea of the solution of the problem of the relations of the interurban and local roads is to have an independent entrance provided by the local company for the use of the independent road, the local business to belong to the local company and the interurban should not expect to participate in that business under any circumstances.

The question of high speed is a vital one to the interurban road. I am now building a road where I think we have reached the limit of weights and sizes of interurban equipment. We are building our cars 61 feet long, and we are equipping them with 75 horse power motors, and the weight of the equipment, completely loaded, will be 45 tons. We are building these cars, in my judgment, out of all proportion, because we are limited to the eight. The track centres of the existing road at one end are such that we cannot have our cars any wider than 8 ft. 5 in., which is too narrow, in my opinion. The solution of the problem between the interurban road and the local road, in my judgment, is an independent entrance to the interurban road, to be owned and furnished by the local company. I think that would be the best arrangement eventually for both local and interurban service.

Mr. Nicholl, of Rochester: I think, perhaps, that my experience in this matter might be of some benefit to this convention. I have built and am operating a road from the centre of the city of Rochester 41 miles straightaway to Sodus Bay in the state of New York. I am also operating the other lines centring in the city of Rochester, some 100 miles of track, and I have had a great many of these



questions come up for decision for myself and associates. I think it makes a great deal of difference as to what your traffic arrangements are going to be with the suburban road, whether your suburban road runs on the highway or private right of way. I think a great deal depends on that feature as to the amount of business your suburban line will get and bring to the city. In our case we have built probably two-thirds of the suburban line on the highway and one-third on private right of way. We find that the conditions existing along the highway, passing through little villages, etc., are very similar to those we have to consider in our cities. We find the people require a certain kind of railing, some of them want the grooved rail, some the tram rail, and some will permit the T-rail; and in order to have a satisfactory rail on a suburban line it is necessary, in my opinion, to have a T-rail, wide tread and deep flange, about the same as the steam railroads use. We found in the building of the Rochester & Sodus Bay R. R. that on account of having to go into the city of Rochester over a grooved rail, we had to go practically to the same width of tread and depth of flange as we do in the city, namely,  $2\frac{1}{4}$  in. for the tread and  $\frac{3}{4}$  in. for the flange; but owing to the fact that when you go out from the town there is greater oscillation, side-wise particularly, of the car, we had to make the flange heavier in order to prevent the flanges from breaking in going over the switches, etc.

Regarding the size of car, we also found, in order to run our cars into the city that about 45 ft. was the minimum length; that is, 35 ft. body and two platforms of 5 ft. each, in order to go around the corners of streets. Furthermore, we found it was necessary to limit the width of our suburban cars in order to do this, to 7 ft. 9 in.; this being determined by the width between city tracks. We find we can use practically the same motors as in the city, but require more of them, so that they can make higher speed outside the city, but in order to get business on that suburban line it seems to be necessary to make the same speed in the city that we do on the highway. If we were going to build a line again we would make a private right of way as near to the lines of highway travel as possible, and yet get away from them so as not to have to make so many stops, which consumes our time.

As far as the discussion in regard to the traffic arrangements between the roads is concerned, we have gone on the principle that the city road is entitled to very near all of the income from the suburban sections. Accordingly our contracts have been made on the basis of the earnings per mile, or per car hour of the city lines. For instance, if we found that the suburban company wanted to go on one of our lines on which we obtained 20 cents per car-mile, we charge them 20 cents per car-mile; they together being divided up between power and operation. We furnish the power and furnish the men for the car. As soon as the car reaches the city limits it becomes our car and the crew becomes our crew, entirely under our charge, with certain provisions. For instance, if the crew be not such as we require on giving notice we can have them removed from the car. Also in regard to the condition of the cars, trucks and motors, if certain repairs are not made within a certain time we have the privilege of making them or keeping the car off our tracks. We also do quite a considerable freight business. This we have found necessary to do in cars which have much the appearance of passenger cars, in order to comply with the wishes of the people of the city. The freight cars are painted exactly like the passenger cars, the windows along the side, so they can be used for passenger cars if we need them, with large doors in the sides through which to take the freight. These we run to the depot in the centre of the city. They are run independently, with trailers of the same size, through the city to our freight station. We run our cars upon the steam railroad practice, both freight and passenger cars, when they get outside the city, with regular train orders, which are communicated by telephone instead of telegraph, being repeated back to the dispatcher's office. In the city we find we have to take the speed of the city cars, and therefore we are delayed considerably and that has largely to do with the amount of business I think the interurban companies will get. In my opinion, it would be preferable to have the line go into the city on an independent track, but I hardly think that is necessary for a suburban road running on a highway where you are limited to speed in any way.

Mr. McCormack:—Mr. Lang spoke of an arrangement whereby

a wagon was to be hauled onto the interurban road to the city limits on a truck or flat car so that when the interurban car reached the city limits the wagon would be detached from the car or truck and take it to any part of the city. While I was with the Brooklyn Rapid Transit Company the marketing business coming in from Long Island assumed such proportions that the National Express Co., which has a contract to handle the freight business of the Brooklyn Rapid Transit considered the advisability of building cars to handle that business. In much the same line as Mr. Lang has suggested. An account was kept at one point, Jamaica, Long Island, of the number of wagons coming into the city loaded with produce, and in one night, from 6 o'clock in the evening until 6 o'clock in the morning, the number was 357 wagons. After getting some data on the question of what we would receive for the freight, it was found that the farmer could not pay the cost of handling that freight at such a price as to make it an object to the railroad company to build such cars. After going into the thing a little further it was found that the Long Island Railroad had tried the experiment, and built a number of cars and had them arranged so that the wagons could be carried on the cars. They experimented with it somewhat and then abandoned the system.

Mr. Crosby stated that in his judgment the question of interurban passengers coming into the city, would necessarily require a large car and equipment, such as to make it necessary to have a change of passengers. I want to say that out of the large number of interurban roads running into Cleveland that if they undertook to have a car there ready to meet every interurban car that comes in during any hour of the day the city car which would meet the interurban car would be overloaded, and in addition we could only give a limited amount of seating capacity compared with the capacity of the interurban car and there would necessarily have to be a number of passengers standing in the car, and we could not do any local business in the city. I wish to call particular attention to the last sentence in my paper which reads as follows: "Obviously, the only solution of the problem under the various conditions mentioned is for the interurban cars to enter the center of the city by means of underground or elevated tracks with special tracks for through cars."

Mr. Davidson, of Pittsburg:—The conditions in Pittsburg are such that I think it hardly possible that the interurban cars can occupy independent tracks. Some of you gentlemen here know the situation and I think you will agree with me that so far as we are concerned the problem will have to be solved by bringing the independent cars in over the city tracks. One gentleman has brought to your attention the mechanical difficulties, and reasons have been given as to the electrical troubles and also as to the change in the size of the flange. The fact has also developed that lighter treads are used on the interurban cars than on the urban cars and that point has not been dwelt on enough to show why that is so. The rail on the streets is so well laid that there is no opportunity whatever for the gage altering from time to time. On the tracks outside the city, where the T-rail is used, there is not the lateral support to the rail which is the case with the heavier rail in the city and the chances for the track getting out of gage is therefore an important matter, and for that reason a wider tread is necessary as the city road uses, say, a 2-in. or 2 1-4-in. ball on the rail, while the width of the tread on the interurban cars is increased to probably 2 3-4 or 3 in. which, as has been pointed out, makes considerable trouble in the case of the rails on the city roads. For my part, I think the rails on the city roads will have to meet the conditions of the interurban roads. I think it will be necessary to increase the width of the ball of the rail, and also the depth of the guard rails, so as to accommodate the wheels on the interurban lines. The city road must meet the requirements of the interurban road. I am connected with an enterprise in Pittsburg where we are building an interurban road out of the city for a distance of some 35 or 40 miles. We will use the girder rail in the city streets and also in two or three towns to the west, but in all the other towns I am glad to say we have built entirely on private right of way between the cities where we propose to maintain high speeds and at the same time have kept within easy reach of the main thoroughfare in the country through which we travel, and thereby we expect to get all of the local business we could have had by going on the public road, but at the same



time we get the benefit of the high speeds on the private right of way. We took up a right of way 33 ft. wide and are grading our lines for a double track, T-rail construction, stone ballast, and the specifications of the road are practically that of a first-class steam railroad construction of the day.

I happened to be general manager of the plaintiff company in the case mentioned by Mr. McCormack where he spoke of being a witness in the case, where it was a question as to what one company should pay another for use of track in the city. I am able to report something which Mr. McCormack probably does not know and that is the judge who heard the case concurred with some of you gentlemen who were witnesses, Mr. McCormack, Mr. Lang, and others, as to the theory on which our company presented its cases, namely that the compensation should be on the basis of the passengers carried. The other company advocated the theory that we should be paid on the basis of the actual investment. The court took our view of the case, but not entirely. The court attempted to arrive at the same results, but instead of awarding a price per passenger, took the data furnished and figured it out on the basis the past five or six years, how many passengers on the average were carried in the interurban cars made a report on that basis. We have taken exception to that particular method of arriving at the result per passenger. The court it will be seen agreed with us in the general principle if not in the method of arriving at the result. I am also connected with another in that city as general manager, and we are the interurban company in that case. We have a contract with the city company, which is practically perpetual, and the condition of the 5 cent fare in the city was made in making that contract. I do not know that the gentlemen who made the contract had any data on which to make their figures a basis of a contract, but I have been much interested in comparing the figures for some three or four years after the contract was made, in trying to find out what the result, financially, was to the two different companies. Without going into details I will say that I have made calculations which show that the gross returns per car mile of that portion of the line over which the fare is divided is about the same to the two companies. I think that condition was probably arrived at without any data, and it figures out that way now after three or four years' experience. In this case the right of the city company to all fares on their track was recognized. As to the balance the passengers, traveling over the tracks of both companies, it is also fair to argue that both companies are interested in that fare. One company furnishes the trackage over one end of the route and the other company furnishes the trackage over the other end of the route, going in the opposite direction, and I think it is only necessary therefore to figure out a proper proportion for a division of the fares passing over the two tracks.

The meeting then adjourned until 2:30 p. m.

#### AFTERNOON SESSION.

The discussion was continued upon Mr. McCormack's paper. The speakers were: Mr. Roberts, of Cleveland; Mr. McCormack, in reply; Mr. Crosby, Mr. Wason, Mr. Hopkins, Mr. Connette, Mr. Haggerty, Mr. Parker, of Detroit; Mr. Davis and Mr. Myers.

#### THE BEST FORM OF CAR FOR CITY SERVICE: A CONSIDERATION OF THE VARIOUS TYPES OF CAR AND ARRANGEMENT OF SEATS—INCLUDING BEST TYPE OF BRAKES AND WHEELS.

By Eugene Chamberlain, Superintendent of Equipment, Brooklyn Rapid Transit Co.

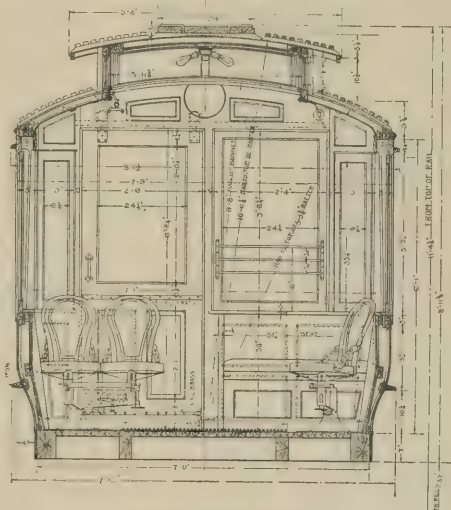
The evident magnitude of the subject assigned and the ideal opportunity offered for criticism cause the writer to feel that any and all suggestions should be made with a certain degree of caution and that they should so far as possible be sustained by facts.

It is probable that traffic requirements in different cities vary to such an extent, that a car designed to meet the conditions in one city would be but poorly adapted to meet the conditions of another city; and this, together with the fact (as was brought

out in the discussion at the Kansas City convention last October) that several electric railroad systems were giving much attention to the development of the most advantageous vehicle for each particular road, makes it difficult to suggest a car that would prove uniformly satisfactory.

The double-truck car having body of 25 ft. and upwards in length is usually selected for heavy continuous city traffic, while the single-truck car, with a body, say, from 18 to 21 ft. is usually operated upon side lines where travel is fairly uniform but not unusually heavy. If this is a correct statement of the conditions, it is apparent that both the double and single-truck cars have their particular functions to perform, and each will for some time at least remain a factor on electric roads in the handling of various classes of traffic.

It should be borne in mind that for good and sufficient reasons a number of electric roads do not provide a permanent equipment of trucks and motors for both summer and winter (closed and open) cars, but at indicated periods transfer such equipment from one class of cars to the other entailing thereby considerable expense, but presumably less than would be represented by the investment, interest and deterioration on a large



CROSS SECTION OF CAR.

number of trucks and motors permanently installed on cars stored for a part of each year, and the cost of purchase or rental, and maintenance of large houses or barns for the storage of cars kept out of service; which is a very considerable factor in expenses of operation in large cities where land is usually valuable and rents high.

It must then be obvious that with a car of the convertible type, designed to meet the conditions of traffic as regards seasons (that is to be operated as a closed car during the winter and as an open car for the summer), we would secure the following advantages:

First, the shifting of truck and motor equipment would be avoided;

Second, the roads would be efficiently operated with a less total number of cars, and

Third, there would be required only limited room for storage of cars not in service.

These are all certainly desirable objects to attain, as they are based upon economical grounds.

It is proposed that a car as hereinafter described would meet the conditions above referred to. This proposition is not advanced as a matter of theory, but as "facts are stubborn things," it is based upon the actual operation of a number of cars of this type extending over a period of several months and showing increased earnings as against other so-called standard cars of nearly similar size; and emphasized by the very

favorable comments of the press and public as to the comfort and convenience of this particular vehicle.

The car in question may have any length over all, consistent with clearances and the service it is desirable to perform. The one proposed herewith for general service, is of the "combination" or convertible type, as illustrated in detail by the accompanying engravings in a general way has the following dimensions:

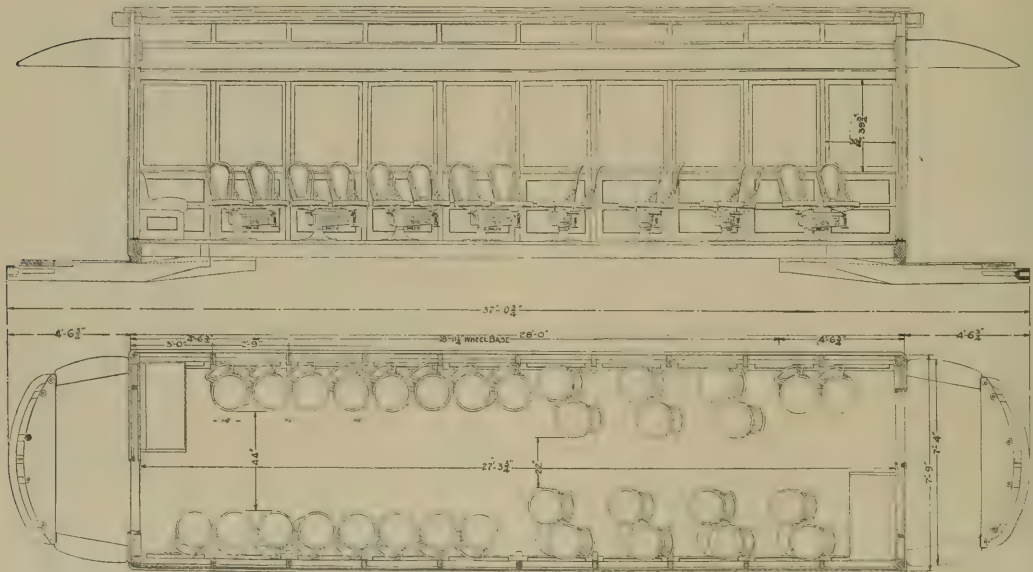
Length over all .....	37 ft. 3/4 in.
Length over corner posts .....	28 ft. 0 in.
Platforms .....	4 ft. 6 3/4 in.
Width over all at drip sill .....	8 ft. 1/2 in.
Width over all at sills .....	7 ft. 0 in.
Width over all at steps .....	7 ft. 4 in.
Height from rail to top of trolley board .....	11 ft. 4 1/8 in.
Height from sill to top of trolley board .....	8 ft. 11 1/8 in.
Wheel base .....	18 ft. 11 1/4 in.
20 Side window openings .....	30 3/4 in. x 38 3/4 in.
Floor clearance, inside .....	27 ft. 3 3/4 in. in length.
Floor clearance, inside .....	6 ft. 7 in. in width.
Clear width inside at window sills .....	7 ft. 1 in.

No great novelty is claimed for the design of the car, or fram

are of the individual revolving type, of either cane, with bent wood frames and backs, or upholstered as fancy may dictate, resting upon a movable arm carrying the seats in multiple, the arm in turn being pivoted out of center upon a fixed base secured to the car floor. This device allows the seats to shift in pairs from a transverse to a longitudinal position, giving in a car of the foregoing dimensions an aisle 22 in. in width while the seats are in transverse position, and 44 in. width while the seats are in longitudinal position, and the car prepared for a standing load. In either position they will positively seat 36 passengers, 34 facing the direction in which the car is moving, and under no circumstances can a passenger, of whatever proportions, without discomfort, occupy a space greater than allotted for one seat.

The seats have a clearance underneath, giving ample room for the placing away of hand bags or parcels that so often obstruct the main aisle of a car in the case of the usual type of fixed side seat. Electric heaters are ranged along the wall of the car at convenient points and when the seats are in longitudinal position the heaters are entirely out of the way of contact with ladies' dresses. It is proposed to install electric heaters in the arms supporting the chairs as a more desirable location for bringing the heat nearer the center of the car.

The electric lighting arrangement consists of three center clusters, and five single incandescent lights ranged along each



PLAN AND LONGITUDINAL SECTION—BROOKLYN HEIGHTS CAR.

ing of car body, but several features are introduced which we trust will meet approval.

Window sashes are removable, being held in position by three set screws passing through each side and tapping into bosses cast on metal strips in position on the outside faces of the posts; and a change from closed to open car, by removal of sash, may be effected in about forty minutes.

At window openings grooves are cut diagonally from top to bottom on the sides of the posts to take cable curtain fixtures, so that when sashes are removed and curtains are drawn down, they incline outward forming a satisfactory watershed during storms; the curtains are also provided with a spring flap at the bottom. Inside panels are cut in between side posts for the purpose of giving stiffness to the side of the car, and also greater interior clearance.

The seats, of course, are quite an important factor. They

side of car, with a lamp under each platform hood and electric headlights.

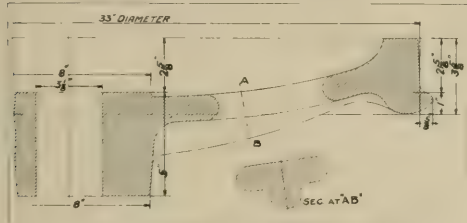
Maple floor strips, slightly beveled, are used for sanitary reasons and for ease in cleaning floors.

There can scarcely be a satisfactory argument advanced in favor of side steps or running boards on open cars as against the end steps usually installed upon the closed or convertible cars having center aisles. The former rather invite accident when persons enter or leave the car at any opening on the side, while the end step, being almost constantly under the supervision of the conductor, avoids to a great degree the danger to passengers boarding or alighting from the car. This fact is emphasized by the greater number of accidents as shown by "Reports of accidents of passengers when entering or leaving open cars," and substantiated by a statement courteously furnished by a claim adjuster connected with a road of considerable

prominence, and covering a period of six years, showing the comparative immunity of closed, compared with open cars, from accident occurring to passengers while boarding or alighting from the car.

For purposes of comparison the adjuster selected three winter months in which closed cars are operated, as against three summer months in which open cars are operated exclusively; it was his observation that the extremes of temperature during the months compared affected the question of accidents, that is, extreme cold benumbs and extreme heat dulls the faculties, so that the cold of winter in this respect offsets the heat of summer, and renders a fair comparison possible. The result of the comparison was that closed cars will perform from two to four times the mileage of open cars without accident of the character described; in other words, the proportions of accidents to passengers boarding or alighting, are about three on open as against one on closed cars.

There are also other classes of accidents analogous to, but not enumerated in, those included in the foregoing comparison occurring constantly with the operation of open cars, which do not occur on closed cars, such as: Falling under guard rails; being brushed off running or step board in passing a standing or moving object in the street; sudden jerk on starting car, running rapidly into curves, etc.; all of which added to the foregoing entails an accident account of no mean proportions and tends to confirm the suspicion that a convertible car with end



SECTION OF CAR WHEEL.

steps and center aisle is a coming feature in the traction business.

In regard to the question of brakes, and eliminating all discussion as to whether the Elder, Hodge, Stevens, Tyler, or any other design of leverage is the most efficient, you will all probably agree that a power brake for electric car service is desirable from the standpoint of safety in operation and the avoidance of accidents where emergency stops are necessary. But what shall it consist of, an electric air-compressor or axle-driver compressor, fixed plants for charging air cylinders attached to car body, a mechanical brake giving increased power or leverage, or what?

Unquestionably many street railway managers are to-day passing through the experimental state in testing the merits of each style of brake, and endeavoring to determine which will meet your needs, in point of cost of maintenance and efficiency of operation; and it has occurred to the writer that advance opinions upon this subject would be a trifle undesirable and might be attended with unsatisfactory results, so with your permission we will proceed to touch briefly upon the subject of car wheels.

You are undoubtedly familiar with the arguments advanced upon the less power required to move the wheel of smaller diameter, and the advantages accruing from the use of the 33-in. wheel for the mounting of present day motors to ensure clearance from obstructions. You have probably passed through the experience of originally using a wheel of 30-in. diameter with a weight of 300 lb. or less, and have found that, owing to the increased weight of cars and also increased speed it is desirable to attain, a wheel of greater weight has become necessary. Many city systems also operate suburban roads, where T-rails instead of the usual girder rails are laid, and where the derailment of the car from the usual height of the T-rail would result in disaster to the wheel. There is also the disposition on the part of the motorman at times to run at a high rate of speed through curves with trucks having a wheel base of seven or

eight feet. This all tends in the direction of requiring a wheel of sufficient section and strength at hub, spoke, rim, tread and flange to meet the conditions. The experience of several roads has demonstrated quite satisfactorily that a 33-in. wheel weighing, say, 420 lb. and designed in section as shown by the accompanying engraving, has given very excellent results and shows economy as to replacement.

The author of this paper fully realizes the task with which he has been honored and understands that a device of any character, to have and retain merit, must be subjected to the most severe criticism, which is now fully and freely invited; and he feels satisfied that, with a body of men of your recognized ability and standing, all "hobbies," if any such exist, will be for the time eliminated and justness and fairness govern all criticisms of whatever character, and he believes that you, in common with himself have an object to attain in determining the most satisfactory vehicle for electric roads in point of efficiency in service, economy in operation, and last, but not least, the convenience and comfort of the traveling public.

The paper was discussed by Mr. John I. Beggs, Mr. Sergeant, of Boston; Mr. Fuller, Mr. Wason, Mr. Crosby, Mr. Davis, of Pittsburgh; Mr. Bent.

#### ALTERNATING AND DIRECT CURRENT TRANSMISSION ON CITY LINES.

By M. S. Hopkins, Manager, Columbus (O.) Railway Co.

When requested to prepare a paper on "Alternating and Direct Current Transmission on City Lines," I frankly stated that I was not an electrical engineer, and had had no experience with alternating current and I did not feel competent to present the subject before the Association. In reply I was requested that I present the subject at least in such a manner as to bring forth a profitable discussion by the members of the association. This, I have attempted to do.

The problem of transmitting power to outlying districts on city lines is one constantly confronting a large number of managers today. The steady growth of outlying districts and the increased suburban traffic incidental thereto, requiring larger and heavier cars and increased speed, have severely taxed the direct current distribution; the manager finds his transportation department unable to provide sufficient cars to handle the increased traffic and maintain schedule speed; the cost of transportation high, due to necessary slow speed of cars; loss of transmission enormous, and must admit his present feeder system entirely inadequate to meet rapidly growing demands made upon it. In attempting to meet these demands the usual course has been:

1. To add copper to the feeder system which has already reached enormous proportions.
2. To raise the voltage on certain feeders by means of boosters.
3. Install storage batteries at the ends of lines.
4. In extreme cases to build an additional power station, located with reference to economy of copper.
5. Install an alternating current system in the main power station, and rotary substations at convenient points.

The first four plans mentioned lack flexibility, and extensions of any magnitude are necessarily attended with large outlay for copper, burdening the system with heavy fixed charges and large power-house expense.

It is not within the province of this paper to take up the various methods for meeting these increased demands, but to try and set forth the main features of polyphase alternating transmission with rotary converter substations working in connection with an existing direct current feeder system.

It is with exceeding interest that the railway manager has observed the development of polyphase alternating current apparatus, and the several and reliable methods of installing and handling high voltage circuits of large power. It is now possible by means of rotary converters or motor generator sets to have as many feeding points or substations, changing high tension alternating current to 600-volt direct current, as may be found ex-



pedient, and this at a comparatively small outlay and at a minimum charge for power house expense. Of course, the number and location of these substations is determined by striking a balance between the cost of operation of the substations, including interest, depreciation, attendance and fixed charges, and the interest, depreciation and fixed charges on the copper investment. In many cases the item of station attendance, otherwise the most serious of all, may be eliminated almost entirely by making the substations a part of the power house, repair shop or ticket office, or even general office.

For long distances, alternating transmission is now almost universally adopted where an entirely new plant is installed.

The many weak points, which are always present in any new



M. S. HOPKINS.

system, have been well worked out and remedied, and it would seem that the time has now come for companies using the direct current apparatus to at least make future additions to plant with alternating current machinery and thereby avail themselves of economies offered by modern invention; still using their direct current system within an economical range, and the alternating current for the outlying districts, thus working the two systems in harmony with each other.

The alternating current system, owing to its great flexibility, can very well be operated in connection with the direct current system, and lends itself particularly well to the solution of the problem of transmitting current to outlying districts.

The generators can be wound for high potential, so that the cost of copper is comparatively small, and a high efficiency maintained.

Alternating current machinery consisting of generator, step-up and step-down transformers, and rotary converters, as now installed, seem simple in operation, and should require but very little more attention than does existing direct current machinery. The generator, at main power station, should require even less attention than a direct current unit of the same size,—the step-up and step-down transformers requiring practically no attention. The rotary converters can be located at convenient points along the line; in car houses, or at other points where an attendant is necessarily on duty at all times, little or no expense would be required. Starting up in the morning, shutting down at night, keeping the bearings lubricated, and the occasional putting in of a circuit breaker are about all that would be required.

In installing an alternating current system in connection with existing direct current system, it would seem wise to use a number of small rotary converters located at load centers over line. These machines can be so designed as to work in parallel with existing direct current feeders,—the rotaries caring for the average load, the direct current feeders coming in to help care for sudden fluctuations, and in case of injury to any one unit, the direct current system would tide over the difficulty. The load factor at the station should not materially change from that now existing with direct current, owing to the fact that even if there are violent fluctuations in the amount of power required from any one rotary, it is not likely that the maximum demand for power will occur simultaneously on the other rotaries, and if the

machine is properly wound and connected in with the existing direct current systems, direct current feeders should go far towards equalizing the load between rotaries.

A temporary substation mounted on a flat car which can be easily moved from point to point, will be found very convenient for relieving extreme and unusual loads which frequently occur in most cities during certain seasons of the year. Railways are required to move enormous crowds in a very short time, and that frequently at a considerable distance from the power station. On account of the heavy and infrequent character of these loads and long length of feeder usually encountered, the cost of copper necessary for the handling of this service by simple direct current feed is prohibitive, and the series booster is frequently resorted to. Even with this device the first cost of installation is considerable, and owing to the resistance of the ground return a practical limit to the amount of power and distance to be covered is soon reached. A temporary substation divides the current returning in the track, reduces the drop to one-fourth of that obtained with a straight feeder, and permits much more satisfactory service to be given with less than one-fourth the amount of direct current feeder copper otherwise required. Where the transmission voltage does not exceed 6,600 volts, it is possible to avoid step-down transformers, and thus decrease the weight of apparatus on the car, by using an induction motor generator set, having this induction motor wound direct for high voltage. Besides reduction in weight, this arrangement possesses a further advantage over the rotary converter in that the direct current voltage can be regulated by hand over a much wider range, allowing easy and accurate regulation of the load, which is frequently of great importance in putting the set into service where the line drop is very heavy.

In determining the details of a system of this kind the local conditions existing must be carefully considered; the districts through which transmission lines pass should largely govern the voltage; the center of load and convenience of attendance, the location of rotaries.

From such information as the writer has been able to obtain, the three-phase system seems to be the best adapted for railway work because of its simplicity and economy in copper, as in each wire of the three-phase system, two alternating currents, differing in phase, are combined, and the loss less than when the same power is transmitted by continuous, single phase or two-phase currents; the three-phase circuit requires but three wires, while four are necessary for a two-phase circuit, the same size wire being used in both circuits.

The 25 cycles apparatus has the advantage for railway work, the high inductivity effects, troubles encountered in operating machines in parallel, and the difficulty in obtaining slow speeds, have caused the higher frequencies to be abandoned for this work.

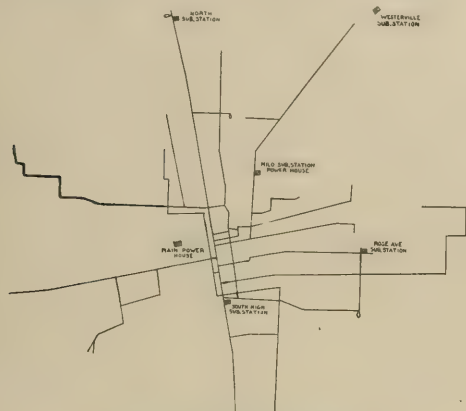
Having thus attempted to outline the general characteristics of the three-phase alternating current system, using rotary converters, it may prove of interest to show the intended application of those principles to the operation of railway lines in the city of Columbus, and the various economic considerations affecting the choice of system and the number and location of substations.

The Columbus Railway Co. with which the writer has been connected a number of years, now owns and operates two steam power plants, known as the Milo and the Spring St. power stations. As will be seen from the accompanying map, the Spring St. station is located near the center of the city on the Scioto River where all necessary water for condensing purposes can be obtained, and has the best railroad facilities for the handling of coal. The Milo station is located somewhat to the northeast of the center of the city, and where no water can be obtained save that which is pumped from artesian wells of limited capacity. The cost of producing current at this station is much higher than at the Spring St. The Milo station is used largely as reserve and put into service only when demanded by heavy traffic to Minerva Park, Westerville or the Fair Grounds.

The two stations are electrically connected by a heavy feeder system so that under normal conditions during winter months the

whole system may be handled from the Spring St. station, using, however, a series booster located nine miles out on the Westerville line at Minerva Park to maintain voltage on the Westerville end.

There is at all times a steady load of considerable magnitude on the lines running out to the eastern suburbs, and during the summer months on the lines running north to Olentangy Park, a pleasure resort, which is owned by the company and which frequently attracts large crowds. These loads have continued to



COLUMBUS STREET RAILWAY LINES.

increase for several years past without our making additions to feeder lines. Frequently during extreme traffic it has been found necessary to use the three M. P. 75-kw. machines in parallel as a booster in order to handle traffic. This overloading of feeders has occasioned heavy loss in transmission. In order to determine just exactly what this average loss is, two wattmeters were calibrated together; one was then installed in the feeder line at the power station, the other where feeder taps into the trolley, the difference in watts showing exactly the loss resulting in transmission, both in overhead copper and ground return. These meters have been installed for two weeks at a time under average conditions in outlying feeders which would be affected by the installation of an alternating system. The results show the loss to be equivalent to the following per cent. of total load for an average 18-hour day:

	Per cent.
East Long St. section .....	23.0
East Oak St. section .....	31.2
East Main St. section .....	27.4
South High St. section .....	27.8
North High St. section, (Park not open).....	25.0

Owing to the heavy peaks of loads, from station to station, we were unable to get accurate results, showing loss, but from results obtained, estimate the average loss at 20 per cent. The loss on the Westerville line varies from 40 per cent. during the winter months to from 60 to 75 per cent. during the summer months. During the periods of heavy load, and when the maintaining of voltage is highly essential, the loss is far in excess of these figures on all sections.

The capacity of both power stations is now frequently taxed to its utmost, and an additional unit must soon be installed at Spring St. station; the entire feeder system of the road is now inadequate to meet the present demands, and must be increased at once. It is, therefore, proposed to install a 350-kw. 6,600-volt. 25-cycle, three-phase, revolving field generator direct connected to an engine at the Spring St. power station, together with necessary exciter, generator panel, and 6,600-volt line panels for controlling the three outgoing feeder lines; to install a rotary converter substation at the Oak and Rose Ave. car house to handle the loads on all eastern lines; one at Milo power station to

handle normal station load, using the steam plant now at this station for reserve; and rotary substation at Minerva Park to handle park business during summer months, and through Westerville business during winter months. As the reserve capacity at Spring St. station will be small even after this unit is installed, it is highly important that the system be so arranged as to permit the distribution of load between all units in the power station as may be desired. In order to make the maximum capacity of alternating current unit available under all conditions, it may be necessary to install rotary converter station at the South High St. car house, which is located near the center of load, and easily connected with direct current feeders, making it possible to relieve the overload on direct current units, and increase the load on the alternating unit.

In addition to these permanent stations, it is proposed to use a portable substation, to be located normally at the North High St. car house to handle Olentangy Park travel during summer months, and when occasion demands, this station can be quickly moved to help out other substations.

You will note that all substations are to be located at car houses, and car house employees are expected to attend them in connection with their regular work.

The best engineering practice has limited the potential of transmission lines carried overhead through city streets to 6,600 volts. There are a considerable number of lighting and railway companies in this country following this practice with perfect satisfaction, and with modern method of construction, such a transmission line would be no more harmful or dangerous than the usual city arc light circuit; it would therefore seem advisable to use this voltage on transmission lines,—consisting of three No. 4 B. & S. feeders from Spring St. power station to Milo, a distance of 2 miles; to Rose Ave. substation, 3 1-3 miles; to North High St. substation, 4 miles, and to Westerville substation, a distance of 9 1-2 miles.

With these substations installed, the following amounts of feeder wire would be replaced by substations and available for use in reinforcing direct current feeders not reached by substation feed:

Milo substation .....	43,890 lbs.
Rose Ave., substation .....	35,530 lbs.
Westerville substation .....	73,620 lbs.

Total .....153,040

At 13 cents per pound this copper would represent a value of \$27,547, from which deduct the value of high potential copper in place, some \$10,000 would leave \$17,507 to be credited to the cost of substations, and charged to increase in direct current feeder system, which will be ample for present needs.

In this estimate we have retained the present feeder copper on North High St. circuit for the reason that substations will be used for intermittent service only.

In considering the economy of alternating transmission, station installation need not be considered in this case, as the cost of alternating current machinery will not materially differ from direct current. The cost of rotary substations is estimated as follows:

Milo station .....	\$10,000
Minerva, or Westerville station .....	7,500
North High St. or portable station .....	12,000
Rose Ave. substation .....	10,000
South High St. substation (if installed) .....	7,500

Total cost of substation apparatus ....\$47,000

To this should be credited \$17,547.20, the difference between the cost of copper to be supplanted and high potential copper required, as this copper will be taken down and used for reinforcing sections which are still to be supplied by direct current, the investment being more than taken care of by economies resulting from increased capacity of direct current lines. This leaves us an investment of \$29,453, the interest on which should be taken care of by the savings in loss due to transmission.

Assuming the value of a kilowatt-hour of current at .6 cent exclusive of fixed charges, the loss shown by wattmeter readings

on sections to be fed by substations, would amount to \$5,363 yearly.

The plan as outlined for transmitting current to these districts should keep the loss well within 15 per cent, between main station and substation busbars, even during periods of heavy load, which would result in a saving of \$3,804 in yearly transmission of average load from station to substation busbar. From this should be deducted the loss from the substation busbar to the car. In this case owing to the location of substations and interconnecting of direct current feeders, the loss will not exceed the loss now existing to-day from the point where direct current feeders now tap, and where wattmeter readings were taken, to the car; hence we have \$3,804, the net saving in cost of power due to high tension transmission, being equivalent to 12.8 per cent. on the investment, which from a financial standpoint alone, would seem to warrant the plan of transmission outlined without considering the greatly increased facilities for handling of large crowds, the saving resulting in the transportation department, due to increased speed, and the ability to make future extensions of almost any magnitude without the attending losses and a large outlay for copper necessary with direct current.

The paper was discussed by Mr. Crosby and closed by Mr. Hopkins.

An adjournment was then taken.

#### RECEPTION TO THE LADIES.

The concert and reception given to the ladies in attendance at the convention by the ladies of the Local Entertainment Committee was an unqualified success and was thoroughly enjoyed by every one present, if the smiles and generous applause that greeted the conclusion of each number on the programme be taken as an indication of approval. Long before 11.30, the hour set for the concert, the handsome parlors of the Murray Hill Hotel were thronged with elegantly gowned women, laughing and chatting among themselves as they renewed old friendships and formed new ones. There was a fair sprinkling of men in the audience.

The programme of classical selections was rendered in a masterly style by the Kaltenborn Quartette, one of New York's famous musical organizations. The concert yesterday was thoroughly enjoyed and encores were insisted upon. The 'cello solos of Louis Heine and the violin solo by Franz Kaltenborn seemed to please especially, and the applause was quieted only by a repetition of the numbers. The following is the programme rendered:

Quartette—C major, "Kaiser".....Hayden  
Allegro Moderato.  
Poco Adagio Cantabile (variations).  
Minuetto.

#### FINALE.

Cello Solos—*a.* Elegie.....Massenet  
*b.* Gavotte.....Popper

Mr. Louis Heine.

Quartette—*a.* Andante Cantabile.....Tschaikowsky  
*b.* Shepherd's Dance, Sinte "Henry VII.".....German  
*c.* The Butterfly.....Razek  
Violin Solo—"Czardas".....Hubay

Mr. Franz Kaltenborn.

Quartette—Paraphrase, "Loreley".....Nessadba  
Quartette—Allegro Moderato, op. 17, No. 3.....Rubinstein  
The members of the Kaltenborn Quartette are as follows: Franz Kaltenborn, first violin; William Rowell, second violin; Gustave Bach, viola; Louis Heine, 'cello.

After the concert was over the members of the committee and their guests adjourned to the dining room, where a dainty and enjoyable luncheon was served. Among those present were the ladies of the committee and practically all the ladies in attendance at the convention.

Mr. Charles L. Hull, general superintendent of the Chicago General Ry., is among the interested spectators in exhibition hall.

The Trogan Trolley Tender Co. and the Ham Sand Box Co. are represented by Mr. R. H. Ham, who shows a new trolley catcher that works without springs.

The Universal Safety Tread Co. is about the only firm that has an exhibit in a great many different places in the building, as the company's tread is used on all the stairs. The company is showing its car step with the Mayer & Englund Co. It is represented by F. H. Werks, O. H. Kittredge, C. D. Townsend, J. B. Losey and H. E. Sargent.

Mr. A. S. Littlefield, president of the North American Railway Construction Co. has been detained at Colorado Springs, where he had gone to close up some contracts. This is the first meeting Mr. Littlefield has missed in a number of years.

Mr. A. S. Partridge, the well-known supply man of St. Louis, piloted a party of Street Railway delegates who had a special car over the Big Four and New York Central.

The Dorner Truck & Foundry Co., of Logansport, Ind., is represented by Mr. H. A. Dorner, the general selling agent.

The Niles Car & Manufacturing Co., Niles, Ohio, is represented by Mr. W. C. Allison, general manager, and Mr. George E. Pratt, assistant general manager and contracting agent.

Mr. J. H. McGill, well known in the railway supply business in the west, makes announcement of his intention of embarking in the street railway supply business again. The new firm will be known as J. H. McGill & Co., with offices in Chicago, and it will handle a general line of street railway supplies.

The Wabash Railroad Co. brought down 120 convention visitors on a special train in charge of Mr. N. C. Keeran, city passenger and ticket agent, Chicago. The run was made in 25 hours from Chicago, with five sleepers, diner and baggage car. All report a very jolly time.

Mr. C. D. Wyman, manager of the railway properties of the Stone & Webster Co., of Boston, is here, and the different roads are represented by G. F. Wells, manager of the Plymouth & Rockton; G. W. Dickinson, manager, and C. F. Wallace, engineer, of the Seattle Electric Co.; K. A. Andrew, purchasing agent of the Terre Haute Electric Co., and John H. Oakley, of the Houghton County Electric Railway Co.

The Wells Light Manufacturing Co., of New York, the well known maker of portable lights for track and general night work, did not make an exhibit at the Garden, but instead, each night is showing a large number of its lights in use upon the different roads in New York. The Metropolitan company uses 103, while the Brooklyn Rapid Transit has 61 in use. Delegates by strolling up Broadway in the evening can see these lamps in use.

The Miller-Knoblock Electric Manufacturing Co., of South Bend, Ind., said to be the largest maker of armature coils and assembled commutators in the world, is represented by its secretary, Mr. Otto M. Knoblock.

The Central Union Brass Co., of St. Louis, had made arrangements to show two very finely arranged easels, displaying a complete line of their overhead material, car trimmings and general railway supplies. These, however, have been lost in shipment, and this company is only able to present its many friends with a very attractive souvenir, which Mr. Thomas White, manager of the railway department, is distributing.



# FIFTH REGULAR ANNUAL MEETING

# STREET RAILWAY ACCOUNTANTS' ASSOCIATION

**New York City—Oct. 9–11, 1901.**

The first session of the fifth regular annual meeting of the Street Railway Accountant's Association of America was called to order at 11 o'clock Wednesday, October 9th, by President W. F. Ham.

In the absence of Secretary Brockway, the president appointed Mr. C. M. Heminway, of the Connecticut Lighting & Power Co., secretary pro tem.

On motion of Mr. Elmer M. White, Hartford, Conn., the minutes of the last convention, as published, were approved.

The president then introduced Hon. Bird S. Coler, comptroller of the City of New York, who delivered a brief address of welcome. Mr. Coler said it was a pleasure to him to welcome to the city of New York, anyone interested in making things go. It was considered by some people that New Yorkers were almost too fast, but he (the speaker) had observed that when anyone made a great fortune out of the street railroad business, or in any other enterprise, he always considered New York a good place to which to come and live and spend his money. New York was the greatest



BIRD S. COLER

city upon the face of the earth; its population to-day was about the same as that of the United States of America at the time of the Revolutionary war. The combined debt of New York was now greater than the debt of all the states in the Union combined, and yet more than half of it was self-sustaining through the revenues of the great Metropolitan enterprises, such as water works, docks, etc. He merely spoke of this so that his hearers, as accountants, might realize the tremendous size and importance of this great city.

Mr. Coler hoped that when the delegates had time away from the convention hall, they would visit some of the great institutions of the city, its museums, libraries, etc., which would be found to compare favorably with those of the great metropolitan cities of Europe. He hoped that none of the delegates would get run over by the New York horse cars. They were retained simply to show, by contrast, the great developments in street railroading. If the trolley cars would not wait for the delegates, he hoped that the delegates would wait for the great system of rapid transit, which was now in course of construction. The contract with that company provided that the road would go to the city at the end of fifty years. This was a new system of finance in street railroading and municipal control, and while he (the speaker) did not believe it was ideal, yet he did believe that in the end the city was going to get a far better system and far better results, and at the same time the

plan, even thus far was so far ahead of anything else that had ever been carried out, that it stamped a new era in municipal development and municipal control. In conclusion, Mr. Coler thanked the convention for the privilege of addressing it, and said that he took great pleasure in extending to the delegates the protection of the police department during their stay in the city.

Next followed the

## PRESIDENT'S ADDRESS.

We are now assembled in our fifth annual convention. As president, I welcome you all to this greatest city of New York, soon to be the metropolis of the world, and hope we may make this meeting worthy of the city in which it is held, the biggest and the best we have ever had.

As provided in our by-laws, our meeting is at the same time and place as that of the American Street Railway Association. We are again indebted to this association for its kindly courtesy and hearty co-operation, and I now desire to express officially our sincere thanks and appreciation. We feel that these meetings have been a means of bringing us closer together and promoting a greater degree of harmony between the operating and accounting departments, thereby increasing the efficiency of both.

Since we last met in Kansas City our position has been strengthened in many ways. We are now on a solid and permanent basis. If it were at any time necessary to seek for excuses for the existence of such an organization, that time has passed. Our association has justified itself by what it has done and is doing. When we look back to our first meeting in Cleveland less than five years ago and contemplate the growth of our association since that time in membership, standing and influence, we may well be proud of what it has done and confident that its future will be as bright as its past.

We started out with well-defined purposes, and to a considerable extent these purposes have been fulfilled. One of our first objects was standardization. At our first meeting a committee was appointed to prepare a standard classification of operating expenses and construction accounts, and what was more difficult, to secure its adoption. This committee consisted of Mr. Duffy, then of St. Louis, chairman; Mr. Calderwood, of Minneapolis, and myself then of Brooklyn. I have always considered it a privilege to serve on that committee. We came from widely separated sections of the country, and I remember when we first met our views were so radically different on many points that it seemed impossible to secure uniformity on the part of our committee of three, much less the Association as a whole.

This committee reported at Niagara Falls in 1897, at which time it was enlarged by the addition of Messrs. Wilson, of Boston, and Davies, of Cleveland, and made a permanent committee of the association. It again reported at Boston in 1898, and the classifications then submitted were adopted by the association, and since that time have been very generally used throughout the country.

To secure the adoption of its classifications, the committee recognized the desirability of securing the approval of the Railroad Commissioners in those states that require the filing of reports with them, and worked actively to bring this about. As a result our classification was approved more than a year ago by the National Association of Railroad Commissioners, and has since been prescribed for use in several states.

In this connection permit me to speak of the highly satisfactory relations existing between this association and the National Association of Railroad Commissioners. A year ago we were invited to attend its convention in Milwaukee. Again this year we received an invitation to be represented at the convention at

San Francisco on June 4th. I appointed as delegates to this convention Messrs. C. N. Duffy, F. E. Smith and H. C. Mackay, all of whom attended and can testify to the courtesies everywhere extended them. At this convention two things of great importance to our association were accomplished. The National Association of Railroad Commissioners adopted by-laws prescribing that our association should be represented at their conventions by three delegates, who should be entitled to the privileges of the floor on all questions in which we are directly interested. I esteem it a high honor for so young an association to gain this permanent recognition, placing us as it does on an equality with the association of American Railway Accounting Officers, a similar association of steam railroad accountants. The question of preparing and adopting a standard form of report was also considered, and referred to a committee to co-operate with a similar committee of this association. While the appointment of this committee will be left to my successor, permit me to express the hope that they will at the proper time devote to the subject the attention it deserves and work earnestly to secure the adoption of a complete yet simple form of report that will convey all needful information, without burdening the railroad companies with the preparation of useless statements and statistics.

From what I have said, gentlemen, you can judge of the progress that has been made towards standardization since our association was formed. Up to that time, with the exception of two or three states where the Railroad Commissioners prescribed the form of report, there was absolutely no such thing as uniformity. Ours was the first successful effort in that direction. To-day it is safe to predict that in a short time the classifications of this association, modified as we see fit to modify them, will be the standard throughout the country.

We have also made an effort to determine the most valuable unit of comparison. Two years ago Mr. Mackay, of Milwaukee, presented his views forcibly and convincingly on the advantages of the car-hour over the car-mile. The association was impressed with the importance of the subject and referred it to a committee, consisting of Mr. Mackay, Mr. Smith, of Chicago, and Mr. Ford, of New Orleans, for further investigation. Acting upon their report submitted last year the association recommended "the adoption of the car-hour as a standard unit of comparison, with the understanding that it is to be put to a practical test by each company represented in the membership of this association, either in connection with the car-mile or not, as they may see fit, and that the committee report back at the 1901 Convention." Their report now to be submitted should be the subject of earnest consideration and discussion. Aided, as we now are, by the practical experience of the past year, we are in a better position to determine the relative value of the two units. Let me observe in passing that preference for the car-mile unit is deeply rooted in the minds of operating men accustomed to it alone, and we can only change their opinion by positive proof that the newer unit is more valuable.

Another of our objects was to bring about uniform accounting methods. Here we are met with the objection that local conditions prevent uniformity, an objection that gains force for the reason that the "local conditions" are often beyond the power of the accounting officer to alter.

It is our purpose, nevertheless, to consider to what extent uniformity can be brought about, with which end in view a committee was appointed to report at this convention on a standard system of storeroom accounting. As finally constituted this committee consisted of Mr. Smith, of Chicago; Mr. Tingley, of Philadelphia, and Mr. Henry, of St. Louis. They have gone into the subject most thoroughly, devoting to it much time and thought, and will, I am sure, present a most valuable report. The association is indebted to them for their labors, and I personally wish to express my thanks and appreciation.

Other subjects will be taken up as fast as practicable with a view to securing uniformity wherever possible and desirable.

Our Department of Blanks and Forms, under the painstaking management of our able secretary, has been of great value and assistance to those members who have availed themselves of it, and is the means of bringing about greater uniformity in the use of blanks and forms, and consequently in accounting methods.

Another of our objects was to meet for the interchange of ideas and the improvement of the work of the accounting department. Have we not been successful in this? At our conventions we have discussed all kinds of questions relating to our work, each one presenting his views freely for the benefit of all. In addition to our formal meetings we have gathered socially and gone over with one another many a vexed point. I cannot conceive how any one who has attended these conventions, participated in the meetings and mingled with the other members could fail to be benefited by it, with the possible exception of the man who has a perfect system and "knows it all." We are all broadened by our contact with one another and go back to our desks better fitted for our work and more valuable to the companies we represent.

There was a time, not so long ago, that the accounting officer was considered a mere bookkeeper. I even recall an instance where a man of my acquaintance was classed as a fine accountant, because of his beautiful penmanship. To-day, however, the position of accounting officer of a large corporation is justly recognized as vitally important. He and his department are necessities despite the fact that they are non-producers. As consolidation has followed consolidation, as capital has become more and more centralized in immense corporations, his duties have become more necessary, more responsible, more arduous, more valuable.

He has many functions to perform. First, he must watch the incoming revenue and see that every penny is accounted for; he must watch the disbursements and know how every dollar is spent. Applying this to street railroads whose business is to carry passengers for revenue, he has to see that every fare collected is accounted for, a task of no mean proportions when we consider the immense number of passengers carried and the large number of employees handling the company's money.

This branch of the business has been so systematized that it runs almost automatically; and yet requires attention to see that the machine does not get out of order. In the handling of tickets, especially, grave dangers exist, and the accounting officer must be ever alert, ever watchful. He has to surround all disbursements with every possible check to insure accuracy and prevent dishonesty. He cannot perform his duties in a perfunctory manner, but must know for himself what is going on. He cannot do everything himself, but should so arrange it that everything essential comes under his eye.

Second—He must keep his accounts and records so as to reflect the true financial condition of the property; and

Third—He must separate, consolidate, analyze, dissect all that comes in and goes out in such a way as to present to the management intelligible, reliable and valuable information. He should not only present facts but explain causes. He should be a student, an analyst, a critic. He should have an intimate knowledge of all the workings of the property that he may draw correct conclusions. He should be able to take a broad view of things; must not be too technical and yet must have a great capacity for detail. In his relations with other departments he must be something of a diplomat. He must do his work intelligently, efficiently, simply, economically, and above all, promptly. In my own experience I have found that promptness is absolutely essential and that facts once stale from age lose their value and interest however presented.

Returning now to a consideration of his second function, to so keep his accounts and records as to reflect the true financial condition of the property. Are we doing this? When we present a statement of assets and liabilities, does it convey the information for which such a statement is primarily intended? If the accounts have been correctly kept such a statement of an individual shows what he is worth or owes; of a corporation, to what extent the capital is enhanced or impaired. Can this information ordinarily be obtained from the balance sheet of a street railroad or other corporation? The item of Plant or Cost of Road and Equipment may mean almost anything. It may mean actual cost price in dollars and cents of real and personal property; it may mean the cost of the same in depreciated bonds and watered stock; it may mean the value of the physical property based upon cost of replacement; or it may mean the same increased by the value of the franchise. Charges for depreciation may or may not have been made; cost of improvements and betterments or operating expenses even, may or may not be in-



cluded in cost of construction. To meet the varying requirements of the law-maker and tax gatherer on the one hand and the possible investor in securities on the other, charges to construction or to additions and betterments have been made not with a view to propriety, but to expediency; to such an extent that for the purpose of determining the value of the property, the item of Plant in the balance sheet is in most cases incorrect and meaningless. That being so, some other item or items must be incorrect to balance, and for its primary purpose the whole statement is false.

Theoretically, there is in my mind no question as to what Plant account should represent, namely, value based upon cost of replacement of physical property with due allowance for the good will or right to do business represented by the charter or franchise. Value, not cost. Is this practicable or even possible? So far as the physical property is concerned there is no reason why its real value cannot be determined. To do this may require extensive calculations, in which there is a possibility of a considerable percentage of error; but there is no doubt that a fairly correct result can be obtained. In fact, we know of a recent instance of a street railroad company having so kept its accounts that the Plant account shown on its books very nearly balanced a compulsory and presumably impartial inventory of the physical property based upon actual cost of replacement.

As to the value of the franchise, recent efforts to determine this have been made in certain states for the purposes of taxation, in the calculations concerning which I consider the primary elements are net earning capacity and duration of franchise.

I am not prepared to say whether it is practicable or not to show on the books the value of the property on the lines indicated; but to determine that value is essential from the standpoint of the investor, and the time is at hand when street railroads will be run in the interest of the investor rather than of buyer and seller.

In the past it has been a highly speculative business. The introduction and rapid development of electricity has added enormously to the net earning capacity of established lines and has made possible the construction and operation of roads otherwise not dreamed of. The tendency toward consolidation and centralization has also been a powerful factor in the readjustment of values.

Plant account has had to bear many burdens. Horses have been replaced first by the cable and later by the electric motor; tracks have been reconstructed, often more than once, to meet the new requirements; power stations have been dismantled to utilize more modern and economical appliances; cars have been replaced by others of newer and more attractive design. And generally speaking, all of this has been charged to Plant, so that measured by value of physical property alone, Plant account has been largely overburdened.

Here we come to the important point, namely, considering the value of the physical property alone, what has been improperly charged to Plant should properly have been charged against income and deducted in one way or another from the apparent profits. Had this been done, I question if one road out of ten would have had any profits; certainly the business would not have been the highly profitable one it is supposed to be. Under the conditions which have existed it has been well nigh impossible to determine the true operating cost, and I am fearful we do not yet know it or at least do not yet show it on our books.

These improper charges to plant offset by increased capitalization have only been possible because of the rapid increase in earning capacity, and thereby in the value of the franchise. Were it not for this, Plant account would have been greatly overburdened. As it is, the depreciation in value of physical property has been counterbalanced by appreciation in the value of the franchise, and the final result expressed on our books, though reached by faulty steps, may be approximately correct. This, however, cannot continue indefinitely. After the marvellous expansion of the last decade we have now reached a resting place.

Electricity has developed to a point where such rapid leaps and bounds as it has made in the past are not at all likely in the future, nor is it likely that any other force more economical than electricity will be discovered to again revolutionize the business. Progress in the future is likely to be normal. We cannot continue to look for the same enormous increases in earnings, but

will have to be content with the increase that comes from increased population and more efficient management.

Under such conditions, electric railroading will have to be conducted on the same principles as any other established business, and the accounts must be kept intelligently, honestly and conservatively. The investor will require information as to the actual expense of conducting the business, and as to the real value of the property.

Individually, if not as an association, these are matters which should command our attention. Let us study the situation carefully and intelligently. Let us stand, as far as we may, for honesty and integrity in accounting methods. Let us not deceive ourselves nor allow others to be deceived. Mere accountants that we are, we may be the humble means of saving street railroad properties from the throes of insolvency and reorganization, to which so many steam roads were subjected a few years ago, partly from a failure to observe correct accounting methods.

In closing let me express my thanks to all those who were invited to present papers at this meeting for their ready and willing response; to those who have served on committees for their unselfish and laborious efforts, to Mr. Brockway, our esteemed secretary and treasurer, for his valuable assistance and co-operation; to all those who have had a good word for the association; lastly, let me thank you most heartily for selecting me a year ago as president of this association. It is an honor I esteem most highly, and when at the close of this convention I surrender the chair to my successor I shall feel that it has been a great privilege to have served for a time in the position of the greatest dignity you have to bestow.

The president announced that the Executive Committee had not, as yet, been able to prepare a report, and that with the permission of the convention that order of business would be deferred until Friday.

The report of the secretary and treasurer was then read by Mr. Heminway.

#### SECRETARY'S REPORT.

The secretary's report was then read. It showed that there had been a net gain in membership of fourteen members during the past year, making the present membership at this time 110.

The new members are:

Washington Water Power Co., Spokane, Wash.  
Ottawa (Ill.), Railway, Light and Power Co.  
Indianapolis (Ind.) and Greenfield Rapid Transit Co.  
Citizens' Electric Co., Eureka Springs, Ark.  
Toledo (O.) and Western Railway.  
Erie (Pa.) Electric Motor Co.  
St. Louis, Belleville and Suburban Railway.  
Syracuse (N. Y.) Rapid Transit Co.  
Birmingham (Ala.) Railway, Light and Power Co.  
Cincinnati Traction Co.  
Tacoma Railway and Power Co.  
Dallas (Tex.) Consolidated Electric Street Railway.  
York (Pa.) Street Railway.  
Everett (Wash.) Railway and Electric Co.  
Utica (N. Y.) Belt Line Street Railway.  
Owensboro (Ky.) City Railway.  
Camden (N. J.), Gloucester and Woodbury Railway.  
Rockland (Me.), Thomaston and Camden Street Railway.  
Southern Traction Co., Pittsburg, Pa.  
Terre Haute (Ind.) Electric Co.  
Youngstown (O.) and Sharon Street Railway.  
Chicago Electric Traction Co.  
St. Louis, St. Charles and Western Railway, Wellston, Mo.  
Central Rapid Transit Co., Pittsburg, Pa.  
Ohio River Electric Railway and Power Co., Pomeroy, Ohio.

The receipts for the year were \$2,070.40, and the disbursements \$1,381.66. The balance October 1 was \$1,583.68.

On motion duly seconded, the report was received, and ordered printed in the proceedings.

The president congratulated the association on the satisfactory report presented by the secretary and treasurer, and urged the members to use every effort to increase their numbers, during the continuance of the two conventions and suggested that the circular, No. 16, which was published last spring, might be put in the hands of those with whom it would be effective.



The president announced that the appointment of the committees on resolutions and on nominations would be made at the afternoon session to-day.

Next came the following paper:

#### CAR MILEAGE AND HOW TO ARRIVE AT IT EASILY.

By J. M. Smith, Comptroller Toronto Railway Co., Toronto, Can.

"Up to date" is a term used by most business men of the present day, whether it be the merchant in his store, the manufacturer in his shop, the steam or electric railways, with their plant and equipments, or whatever business you choose to name, all are agreed to keep pace with the times they must be "up to date" in all of the various branches of their respective enterprises.

While this is so fully admitted, it is surprising how many electric railway companies neglect so important a matter as the keeping of a record of their car mileage, especially in such the case among many of the smaller companies.



J. M. SMITH.

A number of the larger companies go very minutely into the question of mileage, and rightly so, as too much care cannot be exercised to arrive at the correct mileage run, as the same forms a basis for comparison of income and operating expenses, one year with another, and one system (similarly situated) with another. To arrive at their car mileage they require their division superintendent to keep data of all deviations from their schedule or time card, to make all calculations and to report to the accounting department each day the mileage run on the various lines, on a form showing the number of cars, the number of full and short trips on each line, making mention of the points of starting and finishing of such short trips. As a check on this report, the accounting department being in possession of the daily schedule or time card, showing the number of trips to be run upon each line, can by deducting the number of trips lost, ascertain the exact number run; the lost trips are in some cases reported by the division superintendent, and in others by the conductors themselves on their trip sheets, and by having a duplicate of the engineer's measurements of the different lines they are enabled thereby to calculate the mileage and thus check the report sent in.

It will readily be seen in such large cities as New York, Boston, Chicago and many others, to arrive at the correct car mileage run, entails considerable clerical work; more especially is such the case where the mileage of each individual car is recorded.

The progressive manager or superintendent will not overlook the importance of seeing that his statistics are as complete as possible, among the first of which should be record of car mileage, for by this unit of comparison will he be enabled to compare the operation of his company with the records of others similarly situated, as well as follow more closely the cost of maintenance of his own system, by comparing the life of the various lines of materials as purchased from different manufacturers, such as car wheels, (usually purchased under a guaranteed mileage), trolley wheels, gears, pinions, armatures, bearings, etc.

The calculating of car mileage does not take as much time as some may suppose, the time occupied figuring the total mileage run on the Toronto system, where we have sixteen different lines

in operation, and calculating and recording the mileage of each individual car, there being on an average 300 cars, including extras per day, is about two hours daily. Much time is saved by having prepared tables of measurements giving the mileage of from one to any number of trips. As a rule the schedule number of trips on a line does not change very often, the trips are usually the same each day, unless it be Saturdays or special days when a number of extra cars are added, thus increasing the total trips run; in such cases it is only necessary to deal with the increased number of trips, adding the mileage of same to the mileage of the schedule number.

To illustrate my meaning we will say that the schedule calls for 1,000 trips on a certain line; by reference to your table for this line you find the mileage for this number of trips equals 5,000 miles; if there should have been ten trips lost during the day, by referring again to your table you will find the trips lost would equal fifty miles, leaving the exact mileage for the line to be 4,950 miles.

The same table of measurements above referred to is used for ascertaining the mileage of the individual cars.

#### RECORDING MILEAGE.

The recording of car mileage statistics comes properly within the sphere of the accounting department, and this department fails greatly in its duties if it does not see to the proper recording of car mileage, not only to see that the total mileage run is recorded, but also to see that proper books are kept that will show the mileage of each individual car, and that the same be in such a form as will enable the manager or superintendent to ascertain readily the total car mileage, or the mileage of any individual car for any given period.

I feel certain the larger companies have realized the necessity of keeping record of car miles for the purpose of comparison, and have worked out a system more suitable to their circumstances that will enable them to compute their mileage, than can possibly be suggested by a person unfamiliar with the conditions under which their systems are operated; therefore, in dealing with this subject, I will confine myself more to suggesting a method that, I think, will be simple and yet suitable to the smaller companies, the greater part of which method is followed out by the company I represent.

I have here some of the forms in use by the Toronto Railway Co. that will assist me in explaining the system.

First, let me say that all car mileage is calculated and recorded in the accounting department with us, where a table of measurements of the different lines is filed, which table also includes dead-end measurements. I mean by dead-end measurements the distance between the car house and the starting point of the different lines.

Form No. 1.—This form is filled out, one for each of our lines by our car starter, or division superintendent, in so far as to the badge numbers of the conductors, car numbers, numbers of the fare boxes, and the number of the trips as per time card. After all cars are dispatched these forms are sent to the accounting department to be in readiness for the recording of the contents of the fare boxes used on the respective lines as they are counted next day.

On this form you will notice the fifth column is headed "Trips Per Card," meaning the schedule number of trips to be run; the sixth column headed, "Lost Trips," meaning trips not run for any reason during the day; the seventh column, marked "Trips Run," represents the actual number run after deducting those lost from the number as per schedule. This form therefore becomes the foundation as it were upon which the total mileage of the line and of the individual cars running each day is computed.

Form No. 2.—This form is used as a summary, showing the total number of cars and trips run, mileage and earnings for the day, of the different lines as calculated on Form No. 1.

Form No. 3.—This form is used by the conductors in reporting lost trips during the day. Forms are to be found at the different car houses, so that as each conductor is relieved or goes off duty, he makes record of any trips lost and cause of same. These reports are forwarded to the superintendent's department at the close of each day, when a clerk next morning attends to the entering of the lost trips in the column for that purpose on Form No. 1 in the accounting department.

Form No. 4 is a page from our earnings' register. Each page represents a different line or route, and is ruled for thirty-one days. It is entered up daily and gives the record of one of our lines, such as the cars, trips, mileage, earnings, passengers and transfers for one month. A summary is made of the different lines at the close of each month on a page at the back of the register, thus constituting a complete record for the month.

Form No. 5 is a page of our "Individual Car Mileage Book." The mileage of each car is here entered from Form No. 1 each day, and each page is ruled to record 100 cars. As our car numbers run up to close on 900 it would therefore require nine pages each month, but the company has adopted a plan to distinguish between the open and closed cars, numbering all closed cars even numbers and open cars odd numbers, thus you will see it is only necessary to bring forward the mileage of the closed cars during winter months and of the open cars during summer months, thereby reducing the number of pages to about five.

These constitute all the forms bearing on this subject used by our system, and we find them sufficient to enable us to arrive at both full and individual car mileage.

In conclusion let me say, if all electric railway companies would adopt a system whereby they would be enabled to make comparison, if for no other purpose than to follow the cost or life of material purchased for maintenance, they would certainly appreciate the benefits derived therefrom.

Mr. Henry, of St. Louis, said that his company used a system similar to that described by Mr. Smith, with the exception of reporting the individual car mileage. They did not see that there was much benefit to be derived from going into that detail. In reply to President Ham, Mr. Henry stated that they did not find any trouble on account of variations from schedule. In a city like New York he could imagine there would be a great deal of trouble from that source. Their roads, running uniformly, they had no difficulty in that respect.

President Ham stated that, in his mind, the greatest trouble in ascertaining car mileage would be where there were variations from the standard or regular schedule, with cars turning back at points which were not known in the office. In many cases he thought it would be necessary to have something on the manifest of the conductor to show just where he ran on each trip or half trip.

Mr. Henry thought perhaps that would be necessary where there was much of that deviation from schedule.

President Ham thought the one important thing to consider was, what is a car-mile, and he would like to know how they counted a train of four or five cars in Chicago.

Mr. C. N. Duffy, of Chicago, said that would be counted as four cars, four car-miles.

The president thought that for the purpose of making comparisons, it would be necessary to adopt a uniform plan in that regard, because many places, including Washington, D. C., counted a train as a single car. Another important thing was as to just what value was possessed by records of car-mileage, whether it was worth the trouble to ascertain it. If, in Toronto, they could, with 300 cars, ascertain both the total mileage and the individual car mileage in two hours' time, it would seem to be well worth the trouble, but that was a very much shorter time in which to get that information than he (the speaker) had heard mentioned before.

In reply to Mr. Duffy, Mr. Smith said that the two hours referred to mean the time of one person for that period. There were no deviations from schedule with them and that possibly accounted for their ability to compile the information so quickly. The information was kept in such a way that it involved merely the keeping of a card without any calculation whatever. The mileage of each car was recorded each day and calculations were made at the end of the day or at the end of the month, as the case might be.

Mr. White said that in Hartford the conductor made out a list every day of how many trips he made and issued a white card for that. Shorts and overs were accounted for by the conductor himself, and showed just what trips he made. They also computed their car mileage from the schedule and made comparisons between the two.

In reply to the president, Mr. Smith stated that the purpose of the car mileage was to use it in connection with wheel records. All their wheels were bought on a guarantee to run thirty thousand miles, and he (the speaker) had suggested to his officers the

advisability of its use in relation to other supplies. His officials had not made use of the car mileage record other than as applied to car wheels.

President Ham pointed out that the individual car mileage would become of far greater value if the mechanical department kept records of just what the equipment of each car was.

Mr. C. L. Campbell, of the People's Tramway Co., of Putnam, Conn., said that they kept the individual car mileage. Theirs was a small road, and the time involved in keeping the mileage was not great. They kept a record for everything. In one case the car wheel manufacturer had replaced car wheels four times through the making of a proper mileage report. In their experience it paid to keep the mileage.

Mr. Smith pointed out that the situation in Toronto was somewhat different from that of most places, because the municipality practically controlled the franchise; they were under the direction of the city engineer and the running of their trips was subject to the regulation of the city officials.

In response to a request by the president, the representatives of eleven companies stood up as indicating that they kept the individual car mileage.

Adjourned to 2.30 p. m.

### WEDNESDAY AFTERNOON SESSION.

President Ham called the meeting to order at 2:45 p. m. and the following paper was read:

#### CAPITAL ACCOUNTS FROM THE VIEWPOINT OF INVESTORS AND THE PUBLIC.

By Col. T. S. Williams, Vice-President Brooklyn Rapid Transit Co.

Some recent catastrophes in railroad finances deserve particular discussion in a convention of railroad officers and accountants.

The Third Avenue Railroad Co., of New York, in February, 1900, passed into the hands of a receiver, its stock having declined from \$242 per share to \$45 within a year preceding an annual dividend averaging 8 per cent. having been paid in the five preceding fiscal years. So violent a decline in the market value of what had been regarded as a conservative investment stock shook public confidence, depressed prices of other securities, and produced conditions of financial panic. To those who had studied intelligently the annual reports of this company these results were not surprising; the wonder was that in the face of such reports investment buying could have raised the stock to so high a figure—for Third Avenue stock had not been a speculative one and, therefore, had not been the subject of market manipulation. A comparison of the reports of the company to the State Board of Railroad Commissioners for the five years preceding the receivership reveals clearly the cause of the company's downfall and makes almost incredible the apparent confidence which its friends had in the worth of its stock. In 1895 the change of motive power from horse to cable had been completed, the company had no floating debt except for current accounts, the outstanding capitalization (including both bonds and stock) was \$13,600,000, the cost of road and equipment, including permanent investments, was \$13,499,629, and the net income applicable to interest on capitalization was \$1,129,994, or 8.3 per cent. On June 30, 1899, the capitalization outstanding had risen to \$17,000,000, a floating debt had been incurred of \$13,385,122, the cost of road and equipment and permanent investments (stock of other companies) had risen to \$30,424,990, and the net income applicable to interest on capitalization was actually less than in 1895, being \$1,116,469, or 3.6 per cent. Yet during those four years all the net income above the interest on \$5,000,000 of bonds was diverted to dividends on the capital stock and not a dollar was appropriated to interest on the remaining capitalization represented by \$13,385,000 of floating debt. Presumably the interest on loans was charged to investment account, so as to leave net income enough to insure the continuance of dividends on capital stock. In brief, the company's directors in four years added to capital account nearly \$17,000,000 (more than 100 per cent. increase), without increasing the net income by a single dollar. The additions were gradual and are vividly shown by the following table, which gives data for June 30th of each year:



Capitalization.	1895.	1896.	1897.	1898.	1899.
Stock .....	\$ 8,600,000	\$ 9,000,000	\$10,000,000	\$10,000,000	\$12,000,000
Bonds .....	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Loans .....	...	1,875,000	1,675,000	9,693,347	13,385,122
Total .....	\$13,600,000	\$15,875,000	\$16,675,000	\$24,693,347	\$30,385,122
Cost of road and equipment, including other permanent investments.....	\$13,499,629	\$15,638,592	\$16,662,517	\$24,885,739	\$30,424,930
Net income applicable to interest on capitalization.....	1,129,994	1,062,945	1,077,864	1,069,921	1,116,469
Per cent. of capitalization.....	8.3	6.7	6.4	4.3	3.6
Part of income applied to dividends on stock.....	624,000	880,000	875,000	800,000	830,000
Part applied to interest on bonds.....	252,300	253,600	250,000	250,000	250,000
Part applied to floating debt.....	...	...	...	...	...

An analysis of the operating expenses shows only \$1,127 charged to maintenance of roadway and track during the year 1896, and only \$888 in 1897. Of course, with such financing bankruptcy was certain, unless dividends were suspended, and bankruptcy came because the dividends continued. The initial mistake was in making the company pay excessive prices for railroad properties, the possession of which brought no additional net income; it was repeated in charging the interest on moneys borrowed for such purposes to capital account, instead of to expense account; and it became almost criminal in diverting to stockholders income which belonged to creditors.

For many years the stocks of the Baltimore & Ohio Railroad Co. were in high repute, and because of their reliability as dividend payers had found their way into strong boxes and the income from them supported families, charities and educational institutions, but in 1896 this company went into the hands of a receiver, and an examination of its accounts by Mr. Stephen Little showed that in seven years there had been an overstatement of income of \$11,204,000 by improper charges to capital accounts. Making allowance for this, substantially no surplus earnings remained for the common stock, yet dividends on that class of stock were paid at an average rate of 4 per cent. for several years. Had operating expenses been properly stated and dividends conservatively paid, there probably would have been no occasion for receivership, and much distress among investors would have been avoided.

Another comparatively fresh illustration of the improper swelling of capital accounts is the story of suspension of dividends by the Long Island Railroad Co., following a change in the control of the stock in 1897. For five years prior to 1897, dividends had ranged between 4 and 5 per cent., and the price of the stock was not far below par. But while the capital stock remained the same, each year's reports showed constant and considerable additions to cost of road and equipment, being paid for by new issues of bonds or by loans. From 1892 to 1896 the increase was over \$2,200,000. Then came the change in control, an overhauling of the books, and an absolute excision of over \$1,700,000 from this account, and of \$278,000 from the permanent investment account, charges to those amounts being regarded as operating expenses and improper additions to capital. It so happened that during the four previous years there had been paid in dividends \$2,130,000, and it would, therefore, appear that if the revision of the company's accounts was accurate, these dividends were never earned, but were in effect paid out of capital funds. That something was wrong might have been surmised from the company's reports, for the additional capitalization of nearly \$3,000,000, all told, brought no additional earning capacity, and the net income applicable to returns on capitalization actually decreased from \$1,208,000 in 1892, to \$1,104,000 in 1896.

These instances of the creation of dividends out of capital instead of surplus earnings are extreme, but they illustrate a tendency and a temptation which exist in greater or less degree in all corporate accounting. If capital account, representing original investment and cost, could remain forever fixed, charges only being made to supply deductions for depreciation, railroad bookkeeping would be a comparatively simple affair, a demonstration of receipts on one side and expenses on the other, and the bills payable account would be a very effective indicator of any attempt to swell net earnings by withholding proper charges to expenses. But capital accounts, whether called investment account, cost of road and equipment, advances for construction on account of lesser companies, or betterments and improvements (the more diverse the accounts, the greater the opportunity), must fluctuate with the development of business, and are too often employed to hide legitimate operating expenses and thus to display a fictitious earning capacity. One railroad company's reports show an average operat-

ing expense of 70 per cent. of gross receipts; another, in a similar locality, operating under not very dissimilar conditions, shows 50 per cent. Is the difference entirely one of management and conditions, or partly one of accounting?

Not all, or most, of questionable bookkeeping results in disorder, as it did with the Third Avenue Railroad Co., and, of course, every addition to capital account must sooner or later be paid for out of fresh supplies of capital, borrowed money or surplus earnings, and many a railroad, by bookkeeping devices, is able to conceal its true condition until improving business encourages a return to conservative methods; but now and then the extreme is reached and there follows discovery, shock and receivership. Shall such things be prevented, and how? Is the suffering investor himself to blame, or the corporation and the state? What is needed—more law or more morals, or both?

Nowhere can such questions be more bravely faced or more frankly discussed than among railroad men. This association has rendered great service to the cause of clean bookkeeping in its efforts for the establishment of a uniform classification of accounts. Its further concern should be that such classification, where used, shall always state the full facts, and that neither the desire of stockholders, the ambitions of railroad officers or the demands of speculation shall induce any withholding of the truth. Of



COL. T. S. WILLIAMS.

Photograph by Dampf &amp; Co.

course, the most accurate accounting will not prevent mistakes in corporate financing or management; errors of judgment or bad motives will always make possible the misuse of corporate moneys; but the requirements of publicity ought to encourage conservative methods and official reports ought to be so full, clear and honest that the stockholders and the public can not be easily misled in their estimation of the value of a company's securities.

A discussion of capital accounts necessarily involves a consideration of the original issue of capital and its book representative of property assets, but I desire more particularly to speak of the yearly additions to capital charges, after original construction and installation are completed and the immediate earning capacity of the investment is demonstrated. The public and the average investor are no longer much deceived by what is called "watered" stock or bonds, and the nominal capital assets of a corporation are generally appraised in public estimation at their actual value, even though that actual value may be much below the nominal value of the securities outstanding. But after the original capital issues are made and the construction or investment accounts have taken shape, the investing public is often strangely indifferent to additions thereto—confiding apparently in the very sound, but not always accurate presumption that no additions to investment or construction accounts are made unless they represent substantial and permanent improve-



ments or additions to the property, resulting in increased net earning capacity. It is the lack of scrutiny into such additional charges and the absence of sufficient information regarding them in official reports, which permit the public to be deceived and then to learn sometimes at sad cost, that such charges represent no substantial improvements or additions, but only ordinary maintenance, with no resultant increased earning capacity, which sometime must be paid for out of surplus (this would not be so bad) or out of fresh issues of capital—meaning the distribution of the same or less net income among the holders of a greater number of shares or bonds. A perversion of facts, with the result of deceiving a corporation's stockholders is not to be justified under any circumstances, but how to protect them against such deception and enable them to see for themselves the company's actual condition is not entirely an easy problem.

I am not one of those who believe much in the efficacy of laws for the accomplishment of the most substantial reform. Men will not be good merely because to be bad is illegal, and may subject the evil-doer to punishment. The most thorough and wholesome reform springs from within and accompanies the evolution of conscience. And the development of conscience, as exemplified in the finer distinctions of right and wrong, has in no activity of society been so marked in recent years as in the conduct of corporate affairs. Never was the sense of responsibility so keenly felt among those who handle other people's money, as it is to-day, and never was there a higher standard of business honor. A wholesome public sentiment will eventually cure in a natural way most of the evils from which we may now suffer, and in the reflection of that sentiment and the correction of those particular evils which we are now discussing, there can be no more effective instrument than the earnest effort of those who are engaged in keeping the accounts of corporate transactions. You may not control their ultimate aspect; you may be compelled by direction of superior officers to make charges which your judgment and instinct do not approve; but if your advice and help are in the right direction, there can be no more potent influence towards conservative methods, and gradually that influence will establish a higher and higher standard of corporate accounting.

But while laws may not be a great reliance for good, they are helpful in accentuating public sentiment and in encouraging respect for higher standards. Restrictive corporate legislation has often gone to extreme and unwise lengths, but reasonable regulation of corporate powers and acts is conceded to be a proper exercise of governmental authority and such regulation, when intelligent and conservative, has undoubtedly done much to safeguard the interests of both investors and the public. I believe it is now quite generally a feature of state legislation that increases of stock or bonds of railroad corporations shall require the approval of the State Board of Railroad Commissioners, or corresponding authority. While such a power may be improperly or unfairly exercised, I am not aware that its exercise has been the subject of much adverse criticism. Yet, under such regulation, evils such as I have illustrated have existed, and I suggest whether it would not be advisable to change either the letter or the administration of the law so that more effective results may be obtained. My suggestion relates more particularly to the laws of New York, but is applicable where similar conditions exist.

The present defect in the regulation of capital increases is that it does not begin early enough and is one-sided. Until the application for increase in the issue of bonds or stocks is made, the subject is not officially before the Board of Railroad Commissioners, and in anticipation of approval, the money may have already been spent and charged to capital accounts. The board inquires generally into the propriety of the increase and the use to which it is to be applied, and usually grants the application, leaving the expenditure of the proceeds, if not already expended in advance, to the discretion of the company, as it should. But the defect is that regulation does not extend to the capital accounts as well as to the issues of capital. The Third Avenue Railroad Company applied for and secured increases of capital only to the amount of \$3,400,000 in four years, but during that interval its capital accounts increased nearly \$17,000,000 (passed unchallenged by Railroad Commission), of which \$13,385,000 was represented in floating debt, the incurring of which did not require official consent. If additions to construction and investments accounts are to be paid out of new capital and the issue of this new capital must be approved by the Railroad

Commissioners before it is valid, why should not the Railroad Commissioners pass upon the additions to construction accounts as they are made? These accounts, as pointed out above, are a gradual growth. They may contain many improper charges. Issues of capital against them may be long deferred or never made, the cost being represented by floating debt or surplus. But to the extent that they are improperly swelled, they give a false idea of the property's earning capacity and permit the payment of dividends out of moneys which should have gone to ordinary expenses. That was the Third Avenue, the Baltimore & Ohio and the Long Island case, and if regulation had been effective, it might have avoided those catastrophes.

There need be nothing radical and no hardship in the possession of such proposed powers, if judiciously exercised. While there is always room for honest differences of opinion as to the propriety of charges to construction, and the problem is further complicated by the conditions of long term leases as affecting advances for construction on leased lines, there is no more reason to expect arbitrary and unjust decisions from the official body in the matter of capital accounts than there is in the new issues of bonds and stock, and the fact of official supervision, exacting detailed knowledge of charges, would be a valuable check on reckless accounting and financing, a positive benefit to railroad officers, and an additional safeguard to investors. To-day, as I understand the law in this state, the Railroad Commission has the right to demand full information of all accounts and to insist upon the preparation of reports according to its classifications; but while its blanks call for detailed information of annual additions to cost of road and equipment, the Commission has no power, if convinced that any of the charges under this head are improper, to compel a transfer from construction account to operation accounts. Perhaps no compulsion may be necessary—a recommendation from such a body is usually equivalent to a compulsion—and all the good might be accomplished if sufficient investigation were made by the Board into the capital charges of each report, followed by suggestions of correction where correction was deemed necessary. But I think it would be a greater protection if the public could know that no addition could be made to construction accounts without having received the inspection and approval of the official board.

Of course certificates of public officers are not absolute. Banks have been known to fail without government examiners suspecting anything wrong—and railroads will still make statements which are not entirely true, no matter how stringent the regulations under which they are prepared. All harks back finally to the character and ability of the managers who conduct corporate affairs. To them and to their stockholders every influence which promotes honesty, straightforwardness and conservatism is a security against demagogic attacks. Nothing promotes radical and oppressive legislation so much as chicanery in corporate management. Compulsory publicity of accounts in sufficient detail, and wise official supervision, will do much to supplement individual effort for clean book-keeping, and to determine for the benefit of both investors and public the genuine earning power of corporate property.

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Mr. H. C. Mackay, comptroller Milwaukee Electric Railway & Light Co., said that they believed in creating depreciation accounts. In that way they made provision for any matter that might come up in the future. They charged to operating expenses, for instance, an amount which they thought would be sufficient to cover all expenses for that year, and the result was that they had a fund on hand. The same thing applied to insurance. They had an insurance reserve; and to cover the depreciation of maintenance of way and buildings, they charged in 10 per cent. of their gross earnings. Against this fund they charged all unusual expenses,—for instance, renewal of a mile of track—and they had a considerable fund for that. Ten per cent. of their gross earnings went to create this depreciation account for maintenance of way and buildings. In the injuries and damages account, they created that in the same way, on a smaller scale, 4 per cent. on gross earnings going into operating expenses to create that fund. The result had been that they were always on the right side of the ledger and always had a fund in place of a deficiency.

Mr. F. E. Smith, auditor Chicago Union Traction Co., chairman, then read for the committee on that subject, the following report:

## REPORT OF COMMITTEE ON STANDARD BLANKS AND ACCOUNTING FOR MATERIAL AND SUPPLIES.

F. E. Smith, chairman; C. L. S. Tingley, Frank R. Henry.

Your committee are of the opinion that the motion made at the Kansas City Convention, which led to their appointment, did not correctly state the real object desired to be obtained by their labor. We think the matter of blanks is secondary to a system of accounting for material and supplies, and once a system is laid down, the blanks to carry out that system could easily be prepared. We have therefore directed our efforts principally to formulating a system which we believe would be complete and meet the requirements of all roads. We shall assume that all material and supplies after their receipt, regardless of their being stored at different places, are under the care of one person who will be considered responsible for them. This person we shall designate in this report as the "Storekeeper."

In the preparation of the system, we have divided the subject into four general heads:

- A. Purchase.
- B. Receipt.
- C. Disbursement.
- D. Accounting.

Under each heading we have endeavored to explain the several steps necessary to accomplish the desired result, that is, the most complete accounting system for material and supplies it is possible to have.

### A. PURCHASE.

1. Requisition for Purchase.—The first requisition is a proper requisition for the purchase of material and supplies for stock or for immediate use. It should be made in triplicate, the original for the purchasing department, the duplicate for the accounting department, and the triplicate to be retained by the storekeeper. It should state for what purpose the material is needed, that is, whether for stock or for some specific work. If for stock it should state the quantity on hand as well as the quantity needed, and a description of the material required. The original and duplicate should be sent direct to the general manager, or some other official with equal authority, who should make on both copies such corrections as to quantity to be ordered as he desires, and after approving both send them to the purchasing agent. When this official has ordered the material he should note on the original and duplicate, in spaces which should be provided, the names of parties from whom he orders and his order number, and should then send this duplicate to the accounting department. It should be the duty of the accounting department to check bills that represent purchases made by the authority of this requisition before the bills are vouchered.

2. Order from Purchasing Department on Firms or Individuals.—This should be made in triplicate, the original for the party from whom goods are ordered, the duplicate for party to whom goods are to be consigned, and the triplicate to be retained in the purchasing department. These orders should be consecutively numbered, should bear the requisition number and contain full shipping directions. The original should also show the conditions of purchase, which can be made to suit the specific requirements of each company, and should be signed in the name of the company by a properly authorized person. If spaces are provided on the duplicate in which the receiving clerk can enter the date and quantities received, together with the lot number assigned to the goods, it will be found a great convenience. Such roads as have adopted the plan of sending out with orders blank bill heads to be used in billing goods bought by them, are unanimous in their opinion of the merits of the plan. It insures uniformity of size, which is a great convenience in filing, and it enables the roads to provide spaces for such data as may be needed for the proper checking of the bill instead of resorting to rubber stamps, which are often carelessly applied and efface the figures. We therefore favor the general adoption of this plan.

3. Order from Purchasing Department on Company's Shop.—This form is provided for the purpose of ordering from the shop something to be manufactured or furnished, for which a requisition has been drawn, something that is outside of the ordinary material manufactured in the shop, for which there is no requisition drawn and which is taken care of usually by what is known as the "Shop Order" or the "Job Order." This form should be practically

the same as No. 2, except that the original should contain, instead of the conditions of purchase, information as to the account or department chargeable. All labor and material used by the shop in filling this order should be entered on the back and the form returned to the purchasing department. It would be well to assign numbers to this class of work to enable the purchasing department to order by them, should duplicates be required.

4. Record of Bills Approved by Purchasing Department.—This department should be required to keep a record of all bills approved by it. It should be in such form that the total of bills approved will be shown, and should contain the following information: Bill Number, Date, Bought of, Order Number, Total Amount, Rate of Discount, Amount of Discount, Deductions (for freight, express or switching charges), Net Amount, Charge to Material and Supplies, Charge to Other Accounts, and Date Delivered to Auditor.

This record should be sent to the accounting department as soon as the entries for the month are closed. The accounting department should check the charges to material and supplies on the voucher record by this record.

### B. RECEIPT.

1. Assignment of Lot Numbers.—For the proper identification of all material and supplies put into stock, a lot number should be assigned. A record should be kept of the lot numbers and their assignment. Having assigned a lot number to some specific material, a notation should be made on the duplicate order for it that these goods have been assigned such a number. Then, should this particular order be delivered in several installments, the same number follows until the order is completed. A card should be provided to remain with the material, so far as this is practicable, which should show a description of the material and the lot number. This card may also be used as a stock card and show dates and quantities received and issued, or such information may be kept in the lot number record, which would then in a great measure become a stock journal and ledger, provided it is concluded that the result to be obtained will warrant the labor and expense. The lot number record should be in charge of the storekeeper. Where material is to be shipped direct to branch storerooms, it will probably be found more convenient to have a series of numbers for each branch.

2. Handling of Bills.—We recommend the following plan: Upon receipt of a consignment of material at stores, the receiving clerk should check it by the duplicate order. When goods are received at a branch storeroom or other point where it is not convenient to have these on file, he should be provided with convenient blanks on which to enter the material received. These he should attach to his daily report, mention of which will be made later, and forward to the storekeeper. Consignors should so far as possible, be required to make a bill for each order and send it to the purchasing department as soon as the order is filled. If, however, a part of the order remains unfilled at the end of the month, a bill should be sent for such material as has been delivered, in order that the storekeeper may have the necessary data to complete his record. Upon receipt of bills by the purchasing department they should be checked by the order and certified as to the correctness of prices. They should then be entered on the purchasing agent's record, giving them the first open bill numbers, which numbers should then be placed on bills to thereafter identify them. They should then be sent to the storekeeper who should check them by his memoranda made on the duplicate order, enter on bills the lot number and department to be charged with the bill, should certify to the receipt of the goods in good order, noting any exceptions for which a counter-bill or deduction should be made, and return to the purchasing department which will enter on the record the date sent to the accounting department and send them. In cases where it is desired to take advantage of special discount for quick payment, we recommend the use of a printed notice to be attached to the bill when first received, which will show the date on which the bill must be paid. Departments receiving bills with these slips attached should be required to give them immediate attention. The accounting department upon the receipt of bills should check them by the requisition and file such bills as are to be paid monthly until the receipt of statements from consignors, which they should be required to send on the first of each month, covering all the unpaid bills of the month and any of previous months which may remain unpaid. The bills should be checked with the statements, missing ones looked up and the statements vouched. If the original bills are retained



or filed in the accounting department, it will be found unnecessary to give much detail on the voucher.

3. Recording.—A record of all material and supplies received should be made as soon after the receipt of goods as is practicable. All material and supplies received, of whatsoever nature, whether new, secondhand or scrap, whether returned to stock after having been charged out and used, or whether manufactured material, that is, material made up in the shops of the company, should be entered on this blank, which should embody the following: Date, Quantity, Articles, Description (underneath distribution "New, Secondhand or Scrap"). From, Order Number, Cost, Amount, Total, Bill Number, Lot Number, Where Stored, and Remarks.

The department of subdivision of the storeroom may be designated by letter thus: "A" might cover the track department, "B" the line department, etc.

4. Stock Ledger.—In order to have a complete and perfect system, which will show at a glance at any time the quantity and value of any particular class of material which is in stock, it will be found absolutely necessary to use a ledger. This ledger may be in book form or in the library index card form. Whether this information is of sufficient value to warrant the expense of maintaining the record is for each individual member to determine for himself. This ledger need only contain the description of articles, which would be the account heading. On the debit side would be the Date, Lot Number, Quantity and Value; on the credit side would be the Date, Requisition Number, Quantity and Value.

In connection with this branch of the subject we quote from a paper entitled "Material Accounts" prepared by Mr. A. D. Parker, general auditor, Colorado & Southwestern Railway Co., for the meeting of the Association of American Railway Accounting Officers, held in Denver in May, last. He says under the heading "Store Accounts":

"It has already been hinted that many, if not most, railroads carry large stock registers at their several stores, and it would appear to the observer, and possibly to most storekeepers, a necessity. On the other hand, voluminous books of this character often become statistical, and have little practical value. The storekeeper who is alive to the interests of his company, handles his material in the same manner that a merchant does his stock. He is in touch with his material every day, and the careful distribution of the articles themselves, either on the shelves or along the floor and platforms, answers the question of requirements. Indeed, the stock registers become misleading at times, and frequently a glance at the material itself is required to check an item or items recorded in the ledger. For this reason it is more practical for minute accounting, paradoxical as it may at first appear, to have as little clerical work as possible at the store, and carry the registrations to the audit office. Instead of making a diversified classification of material, it should be divided into thirty or forty practical headings which will give the requirements necessary."

The plan suggested by Mr. Parker has much to recommend it. "Material and Supplies" can be subdivided into as many headings as may be found necessary or desirable, and the value of the different classes of material by this method can be readily shown. It should of course be understood, however, that the information as to quantities and description of material that would be shown by the stock ledger previously referred to and recommended, could not be shown by this method; however, we believe if the stock cards are properly kept it will be found to meet all requirements.

5. Handling of Secondhand Material and Scrap.—Under this subject it is difficult to map out a system that will be applicable to all roads, but we shall endeavor in a general way to give our ideas as to the proper method of procedure.

If this class of material is entered on the stock books at a value when it is stored for future use or sale, it comes under the care of the storekeeper and more importance will attach to it than if it were simply dealt with when sold. Another advantage to be gained by this plan is that the expense or other accounts to be credited with scrap, will receive the credit at the same time they receive a charge for the material which replaces the scrap. Any discrepancy which may occur between the price obtained for the scrap and the value placed upon it, would have to be adjusted proportionately between the accounts credited. When obsolete material is scrapped, stock material account should be credited with the scrap value and the difference charged to the proper expense account or to the depreciation account, if one has been provided, or to profit

and loss direct. We do not favor the plan of aiding a percentage to all material charged out, to provide a fund to which this shrinkage may be charged. It is mere guess work—none of the expense accounts containing material are accurate, and it is at variance with the true principles of accounting.

### C. DISBURSEMENT.

1. Distribution and Charge of Material.—a. Regular Requisition.—Regular requisitions should cover the needs of a department for a specific period, being made but once a month if practicable. They should be drawn in duplicates, the original to be submitted to the general manager, or some other official of equal authority, for approval before being filled, and the duplicate to be retained by the person drawing the requisition. They should be numbered consecutively.

b. Emergency Requisition.—The emergency requisition is designed to provide for material for emergency use, which could not be anticipated or covered by the regular requisition, and should be honored by the storekeeper without the same approval as surrounds the regular requisition, with the understanding, however, that a regular requisition will be drawn later, covering such emergency requisition honored. They should be drawn in duplicate, the original to go to storekeeper, and the duplicate to be retained by the person drawing the requisition. They should be numbered consecutively.

c. Request for Material and Supplies.—This form provides for the drawing of material by employees of the shop, track, electrical, or other departments after the request has been signed by the foreman in charge of the employee and the goods should be delivered to the employee upon presentation of the request. The request is honored by the storekeeper with the understanding that the head of the department making the request will sign a manifest for the material so delivered, or requisition the request later, if so desired by the storekeeper. This form is put up in blocks, is drawn only in original, not numbered, and operates as a sight draft on the storekeeper.

2. Manifesting. a.—A regular manifest should accompany each shipment of stock from the storerooms. This should be in triplicate, the original and duplicate going with the goods, the original to be receipted and returned to the storekeeper, the duplicate to be retained by the person receiving the goods, and the triplicate to remain in the storekeeper's book. They should be consecutively numbered and contain the following information: To whom, By Whom and Where Delivered, state the number of requisition upon which this material was issued, besides the date, Quantity, Articles, Cost, Amount, the Account Chargeable and the Lot Number.

b. A blank to be used for one or all of the following cases: Material transferred from one storehouse or department to another storehouse or department. Secondhand material transferred to storehouse. Scrap material transferred to storehouse. Material transferred from storage yards to the place where it is to be used. For example, the handling and distribution of rails, ties, paving blocks, etc., to the place where they are to be used.

This form should be in duplicate, should be consecutively numbered and contain the quantity and description of the articles, and be receipted.

c. A blank which may be called "suspense." Being a manifest designed to cover the issuance of material which cannot be intelligently charged out when issued. For instance, the delivery by the storeroom of material for line repairs which is to be used on the emergency or tower wagons. These blanks should be consecutively numbered and be in duplicate, the original to be retained by the person responsible for the material issued upon it, until every article is accounted for on a place provided on the blank, and the duplicate to be retained by the person sending out the material. All material which has been issued upon this manifest which is unused on the last day of the month, must be returned to the storekeeper for inspection; the storekeeper will receipt for it and re-manifest it. The person to whom the material is issued shall report upon this blank the use to which the material was put, giving all particulars regarding it.

3. Reporting.—A blank should be provided to report to the storekeeper daily, material and supplies that have been taken from the stock of the branch storerooms and used. It should be drawn in duplicate, the original going to the storekeeper and the duplicate being retained by the person making report. It should be consecutively numbered and should have the following printed upon



it: Lot Number, Quantity, Articles, Used for and Chargeable To, and blank columns for the storekeeper's record, to insert cost and value.

#### D. ACCOUNTING.

1. Abstract.—A blank designed for abstracting all forms of manifests or reports covering material and supplies disbursed, second-hand or scrap material put into stock, or material manufactured in the shops of the company, showing the accounts properly chargeable or creditable, with the value of the goods.

2. A monthly report to the accounting department by the storeroom department, being a recapitulation and covering the abstracts of material and supplies disbursed, and which will show the accounts and amounts chargeable, the footing of which amounts will be the credit to material and supplies. The receipted manifests should accompany these reports and be checked by the accounting department.

3. A report from the storeroom department to the accounting department which is a recapitulation of the abstracts or reports of material which had been charged out and subsequently returned to stock; all manufactured material made in the shops of the company which had been added to stock, or scrap material which had been put into stock, and the accounts to be credited with these amounts, the total of which makes the debit to material and supplies, and should agree with the amount shown on the report sent in by the purchasing department.

The committee trusts the convention will thoroughly discuss this report and that some system which shall have the approval of the Association may be adopted at this meeting. There are roads that are waiting for this Association to act on this matter before they revise existing storeroom methods. Our Association is held in high esteem by most, if not all, of the members of the American Street Railway Association, and any system which receives our endorsement as a body, we feel would meet with their approval.

The committee desires to thank those members who forwarded blanks and kindly explained their systems.

Mr. Smith stated that the committee had not prepared any blanks, believing that the expense would be too great to attempt that unless it was determined to adopt the report, in which case, it would be time enough to devise the rulings necessary to carry out the plan proposed.

In reply to Mr. Mackay, Mr. Smith stated that the discount of Bills would be handled under the plan proposed by being taken off each item. As to the possible necessity for back entries when bills were not discounted, the committee had not attempted to devise a system that was labor saving merely, or cheap, but a system that was good. It would entail less labor to credit up discounts on bills to some account, but the committee did not think of that at the time the report was written.

President Ham asked if a payment of 25 cents or so for freight on a bill of three or four dollars, covering several items, would be spread over the several items.

Mr. Smith replied that in his opinion that ought to go into store room expenses.

President Ham thought that was not consistent, that the freight should go into the store room, but that the credit represented by the discount should be taken from the price of the goods.

Mr. Moore, of Pittsburg, thought that discounts arising from the operations of the treasury department should be eliminated entirely from the store supply account and credited to the treasury department as it were.

Mr. Smith said that since writing the report he had had some further light on the subject, and he was inclined to think that it would be well to establish a fund from the cash discounts to take care of obsolete material, and give the treasurer, if desired, credit for building up that fund.

Mr. C. L. S. Tingley, secretary American Railway Co., Philadelphia, agreed with the proposition that the treasurer should have credit for the discounts shown on his books. Even if the discount was secured in part through the efforts of the purchasing agent, the treasurer must be in condition to make payment with the promptness necessary to take advantage of the operation.

Mr. Duffy thought the discount question was receiving undue attention. He believed that anything purchased at \$1.00, two off,

was bought at 98 cents and not at \$1.00. The cost of the material, however, should receive the benefit of the discount. The treasurer had nothing to do with it. He (the speaker) had never heard of a discount bill not being discounted. It must be assumed that the discount bills would be paid.

Mr. Wilson, of Boston, thought it was a matter that did not apply to one more than the other. If the treasurer was unable to pay those discount bills the purchasing agent was unable to buy the goods at a discount.

President Ham thought it was a comparatively small matter, and yet the theory should be determined upon. In his judgment the storekeeper had nothing to do with it. If a company bought 60 new cars, and instead of getting a discount for cash, had to pay interest on notes given in payment, that interest would certainly not be charged to the cost of the new cars.

Mr. P. V. Burlington, of Columbus, O., said that discount was clearly a matter of purchase and entered into the cost of the material, while the matter of interest on deferred payments was simply a question of finances.

In reply to the president Mr. Smith stated that the question of combining the purchasing agent and the storekeeper in one individual had been considered by the committee, and their conclusion was that one should act in the two capacities and run them as two separate departments, just as was done when the same person was treasurer and auditor. As to the use of duplicates, in that event, instead of the triplicate mentioned in the report, Mr. Smith stated that there would be some one in the storeroom proper, such as a chief clerk, and he ought to have the data.

Mr. O'Connor, of the Brooklyn Heights system, stated that the original, duplicate and triplicate requisitions proposed in the report were used in the Brooklyn Heights system at the present time, and he invited any one interested to call at 52d St., when he would be pleased to show the modus operandi of the scheme.

Mr. Moore, of Pittsburg; Mr. Duffy, Mr. Schurtz and Secretary Brockway each reported the use of the same thing.

The respective merits of the lot number plan and the keeping of a stock ledger were discussed at great length and developed quite a decided diversity of practice and opinion as to methods. Many illustrations were given of cases in actual practice, to bring out the advantages or the defects of the plan proposed by the committee, as bearing upon its usefulness in indicating most readily the information to be desired through supply accounts, at the conclusion of which discussion Mr. Smith asked for an expression of opinion from the meeting as to the advisability of using the lot number system. A call for the ayes and noes upon the question showed 12 companies in favor of, and 16 companies opposed to, its adoption.

President Ham: I suppose we are not to understand that the whole thing hinges upon this?

Mr. Smith: Oh, no; you can kill it by inches.

President Ham appointed the following committees:

On Resolutions: Messrs. Hibbs, of Jersey City; Boyle, of Louisville, and Goodrich, of Omaha.

On Nominations: Messrs. Henry, of St. Louis; Barnaby, of Brooklyn, and White, of Hartford.

A meeting of the Executive Committee was announced at the Fifth Avenue Hotel at ten o'clock on Thursday morning.

Mr. H. J. Davies, well known to the Association as one of its active members in former years, and now an honorary member, having withdrawn from the street railway business, was invited by the president to address the convention, and responded briefly, expressing his pleasure at being able to meet with the Association once more.

On motion, adjourned until Friday, October 11, at 10 a. m.

—J. P. Sjöberg & Co., manufacturers of street car woodwork, present patrons of the exhibit very neat folders containing a photograph of "one mile of sky line of New York north from the Battery, taken from the North river; a most fascinating and interesting bit of New York."

Mr. E. H. Chapin is on hand to tell about the good wheels made by the Rochester Car Wheel Works. The next time you see Chapin ask him for one of his souvenirs. Like the Rochester wheels, they are desirable articles.

THOSE IN ATTENDANCE.

## A. S. R. A. DELEGATES.

B. Sherrill, Northern Ohio Traction Co.  
B. Allenton, Pa.—E. W. C. Austin, R. R. Nevins,  
Atlantic City Electric Co.  
Alton, Ill.—I. H. Reed, W. H. Coverdale, R. B. Marchant, C. O. Lentz, Alton Ry. Gas & Elec. Co.  
Asbury Park, N. J.—L. F. Haezings, J. B. Cod,  
C. E. Jones, Atlantic  
Atlanta, Ga.—W. H. Glenn, Atlanta Railway &  
Power Co.  
Aurora, Ill.—D. B. Dyer, R. R. Conklin, Augus-  
ta Railway & Elec. Co.  
Altosna, Pa.—C. A. Buch, S. S. Crane, Altoona  
& Erie Ry. Co.  
Altamont, Ga.—S. E. Simmons, J. G. Rossmann,  
Atlanta Rapid Transit Co.  
Ashtabula, Ohio—Theo. Fricker, Thos. McGovern,  
P. W. Harris, Ashtabula Traction Co.  
Baltimore, Md.—P. O. Calholt, United Rail-  
ways & Elec. Co.  
Baltimore, Md.—J. B. McClary, Wallace  
McClary, Robt. Jenison, Birmingham Ry., Light  
Power Co.  
Boston, Mass.—H. L. Wilson, Edw. Maples,  
Chas. H. Bigelow, Boston Elevated Ry.  
Bridgeport, N. J.—C. L. S. Tingley, Bridgeport  
Traction Co.  
Brookton, Mass.—John R. Graham, Daniel Valen-  
tine, Brookton, St. Ry.  
Buffalo, N. Y.—O. C. Lewis, C. A. Coons, H.  
P. B. Harris, Buffalo Traction Co.  
Camden, N. J.—H. H. Adams, M. C. Ludlow,  
Camden, Gloucester & Woodbury Ry. Co. W.  
E. Scull, G. G. Browney,  
Camden & Suburban Ry.  
Charleston, S. C.—T. W. Gassalague, H. L.  
Jackson, Charleston Consol. Ry. & P. Co.  
Chicago, Ill.—R. E. Benson, J. L. Colier, H. C.  
Moore, A. S. Jack, Chester Traction Co.  
Cincinnati, Ohio—J. B. Forkner, Robert L. Todd,  
S. W. Brown, Cincinnati Union Ry. Co., Miller,  
Cincinnati Traction Co., G. R. Scruggless, H. H.  
Brooks, J. M. Kennedy, Ellis G. Kinread, Cin-  
cinnati & Eastern Electric Ry.  
Chicago, Ill.—N. E. Penington,  
Richmond McCulloch, C. E. Wilson, H. B. Elern-  
ing, M. O'Brien, L. Jewell, C. E. Lund, Chicago  
City Ry. Co., Henderson, P. Needham, J. B.  
Johnson, John M. Sloan, Chicago Union  
Traction Co. B. Murphy, Chicago Consol. Tra-  
ction Co. H. M. Sloan, Calumet Elec. St. Ry.  
Cleveland, Ohio—J. S. Smith, Wm. Winter,  
Cleveland City Ry. Co. R. E. Danforth, F. J.  
Stout, Lake Shore Elec. Ry. Ira C. McCormack,  
Charles W. Johnson, Cleveland Traction Co.  
G. McDole, Cleveland Elec. Ry. E. P. Roberts,  
Chas. W. Wason, Cleveland, Painesville & Eastern  
Ry. Co.  
Columbus, Ohio—M. S. Hopkins, P. V. Puring-  
ton, Columbus Railway Co.  
Council Bluffs, Iowa—W. B. Tarkington, Omaha  
& Council Bluffs Ry. Co.  
Dayton, Ohio—Valentine Winter, Dayton &  
Western Traction Co. H. S. Johnson, Peoples'  
Railway Co.  
Denver, Colo.—Wm. G. Evans, S. M. Persy,  
Denver City Tramway Co.  
Denison, Tex.—Fred H. Fitch, H. T. Morrison,  
Denison Traction Co.  
Elgin, Ill.—L. J. Wolf, F. M. Zimmerman, Elgin  
Aurora & Southern Traction Co.  
Elmhurst, N. Y.—F. R. Easty, Wm. Chas. Ches-  
ter, Elmira Water, Light & Ry. Co.  
Edgewater, N. J.—A. M. Taylor, F. R. Ford,  
C. C. Bacon, W. Bacon, C. F. Vebekeker, New  
Jersey Hudson River Ry. Co.  
Fall River, Mass.—Wm. H. Tucker, Globe St. Ry.  
Co.  
Finley, Ohio—G. B. Rasper, Chas. F. Smith,  
Finley St. Ry. Co.  
Fond du Lac, Wis.—F. F. Groves, Fond du lac  
St. Ry. Co.  
Grand Rapids, Mich.—G. S. Johnson, Grand  
Rapids Railway Co. A. L. Parker, Wm. D. Hay,  
Grand Rapids, Holland & Lake Mich. Rapid Ry.  
Co.  
Hamilton, Ohio—Will Christy, L. J. Wolf, L.  
M. Sheldon, Southern Ohio Traction Co.  
Hamlet, N. C.—H. Green, F. B. Griffith,  
V. H. Dalaine, W. T. Griffin, Hamilton Elec.  
Light & Traction Power Co.  
Hartford, Conn.—A. Marsh, G. W. Thompson, C.  
A. Howe, Hartford Electric Co.  
Hoboken, N. J.—David Young, C. D. Baldwin,  
W. S. Jackson, S. C. Stevens, Jersey City, Hobo-  
ken & Hudson River Ry. Co.  
Indianapolis, Ind.—Chas. Runcieus, Albert Her-  
ring, Indianapolis St. Ry. Co.  
Irvington, Mich.—John R. Oakley, C. D. Wy-  
man, Houghton & Southfield Ry. Co.  
Jersey City, N. J.—E. D. L. Geo. F. Chap-  
man, H. H. Adams, E. N. Hill, Thos. Spallato,  
H. H. Boylan, Chas. Dunton, North Jersey St.  
Ry. Co.  
Johnstown, Pa.—E. H. Elliott, C. B. Entwish,  
Johnston & A. Kibbie, John Ry. Co.  
Kalamazoo, Mich.—W. W. S. Butler, D. A.  
Fogarty, W. R. Benson, R. S. Grand, Michigan  
Tram Car Co. Walton H. Holmes, H. C.  
Conzelmann, W. E. Finkbeiner, H. Boardley,  
J. J. Smith, Kalamazoo & Indianola St. Ry. Co.  
Kalamazoo, Mich.—W. W. S. Butler, H. Blair,  
J. S. Miller, Jay's Sub. Lk. Ry. Co.  
Kansas City, Mo.—Thos. Robt. Knudsen, Kansas  
City Traction Co.  
Kenosha, Wis.—W. Arnold, R. G. Arnold,

[illegible]

Lous & S. L. Ry. Co. J. Boyle Price, M. R. Griffith, St. Louis Transit Co.  
 Syracuse, N. Y.—E. G. Connette, Syracuse Rapid Transit Co.  
 Toledo, Ohio—Porto Rico—S. G. Averall, H. S. Collette, Maurice Hooper, H. C. Lardner, J. S. White, G. H. Walbridge, San Juan Light & Transit Co.  
 San Antonio, Texas—E. H. Jenkins, J. B. Cahoon, H. B. Wilson, San Antonio Trac. Co.  
 Louisville, Mo.—Geo. J. Kohusch, W. C. Gootchall, M. Brammitt, St. Louis & Illinois Sub-  
 rr.  
 Terre Haute, Ind.—G. E. Trip, Carl A. Cudien, Terre Haute Trac. Co.  
 Toledo, Ohio—Albion E. Lang, L. E. Berstein, F. J. Collins, E. J. Bechtel, Toledo Trac. Co.  
 Topeka, Kas.—Clifford C. Saker, F. G. Willard, Topeka Trac. Co.  
 Toronto, Canada.—J. M. Smith, Toronto Ry. Co.  
 Trenton, N. J.—H. C. Moore, John A. Riggs, Trenton & Camden Trac. Co.  
 Troy, N. Y.—John W. McNamara, Edgar S. Fassett, United Trac. Co.  
 Venice, Ill.—Fred E. Allen, Geo. D. Rosenthal, H. Beckwell, Venice, Madison & Granite City Trac. Co.  
 Washington, D. C.—W. F. Ham, Jas. B. Sockey, Washington & Annapolis Trac. Co.  
 Waterbury, Conn.—W. T. Aviatt, F. S. Terry, J. R. Webb City, Mo.—L. & P. Power Co.  
 Elce. Ry. Co.—C. E. Baker, Southwest Mo. Ry. Co.  
 West Haven, Conn.—Albert E. Pond, Winchester Ave. Ry. Co.  
 Westfield, Mass.—A. D. Gore, Norfolk, West-  
 on St. Ry.  
 Wheeling, W. Va.—W. A. Shirley, Wheeling, R. Co.  
 Wilkes-Barre, Pa.—John A. Rigg, H. C. Moore, F. L. Fuller, F. A. Wright, J. C. Clifford, J. S. Fagan, Wilkes-Barre & Wyoming Valley Trac. Co.  
 Williamsport, Pa.—Chas. J. Herrick, Williams-  
 port Pass. Co.  
 Wilmington, Del.—John A. Rigg, H. C. Moore, F. L. Fuller, C. R. Van Trump, Wilmington City Ry. Co.  
 Worcester, Mass.—R. J. Laffin, J. W. Lester, M. C. Geaner, John N. Akarman, Worcester, Mass. Ry. Co.  
 Youngstown, Ohio—A. A. Anderson, Mahoning Valley Ry. Co.  
**STREET RAILWAY MEN NON MEMBERS.**  
 B. W. Baldwin, Penna. & Ohio Ry. Co., Jefferson, O.  
 C. E. Brady, S. W. Mo. Elec. Ry. Co., Webb City, Mo.  
 Frank Bourne, La Capital Trac. & Electric Co., New York.  
 J. B. Clevary, Penna. & Ohio Ry. Geneva, O.  
 F. B. Musser, Harrisburg Trac. Co., Harrisburg, Pa.  
 W. H. McAlister, Cincinnati Trac. Co., Cincinnati, O.  
 Francis G. Maloney, Elmira W. L. & R. R. Co., Elmira, N. Y.  
 L. B. B. B. & A. Trac. Co., Norfolk, Va.  
 A. E. Meixell, Fairmount Park Transportation Co., Philadelphia.  
 J. Rossman, Atlanta Rapid Transit Co., Atlanta, Ga.  
 Albert S. Richey, Union Trac. Co. of Ind., Anderson, Ind.  
 Arthur C. Crater, Norfolk, Va.  
 D. H. Goodrich, Omaha, Street Ry. Co., Omaha, Neb.  
 Edgar S. Gardner, Bay State Elec. Heat & Light Co., Boston.  
 C. K. Green, Hamilton Street Ry. Co., Hamilton, Can.  
 F. H. Griffith, Hamilton Street Ry. Co., Hamilton, Can.  
 W. T. Nary, H. V. Street Ry. Co., North Adams, Mass.  
 E. A. Hathaway, Los Angeles, Railway Co., Los Angeles, Cal.  
 M. P. Jones, Portsmouth & New York News Ry. Co., Portsmouth, N. H.  
 Thomas C. Fricke, Penna. & Ohio Ry. Co., Ash-ta-bu-la, O.  
 H. T. Munson, Denison-Sherman Ry. Co., Denison, W. T. C.  
 G. Gotsback, New York & P. C. R. R. Co., New York.  
 Arthur T. White, Brooklyn Elevated and Bridge Div., Brooklyn, N. Y.  
 W. F. Toppam, The Bay State Trac. Co., New York.  
 W. H. Tucker, Old Colony Street Ry. Co., Fall River, Mass.  
 Charles H. Taylor, M. H. & F. St. Ry. Co., Hollis-ton, Mass.  
**ACCOUNTANTS.**  
 D. B. Dyer, Augusta, Ry. & Elec. Co.  
 C. E. Tingley, American Ry. Co., Phila.  
 C. E. Sargent, Edw. Mahler, H. L. Wilson, Boston.  
 W. B. Langway, W. M. Barnaby, W. J. O'Con-nor, Brooklyn Rapid Transit Co.  
 H. E. Poché, C. F. Bryant, Bridgeport (Conn.) Trac. Co.  
 H. M. Pease, Buffalo Railway Co.  
 C. C. Cooper, W. H. Mueleiro, P. V. Buring-ton, Cincinnati.  
 S. T. Colby, Camden & Suburban Ry.  
 F. F. Smith, Union Trac. Co., Chicago.  
 F. E. McKham, Cleveland & Eastern R. R. Co., Cleveland.  
 J. E. Moore, Consolidated Trac. Co., Pitts-burg.  
 James R. Schnitz, Camden, Gloucester & Wood-



Irwin Fullerton, Albert H. Stanley, Detroit  
 United Ry.  
 H. M. Beardsley, Elmira (N. Y.) Water, Light  
 & Power Co.  
 Robert N. Wallis, W. W. Sargent, Fitchburg  
 & Lowell, St. Ry.  
 Elmer M. White, Hartford Street Ry.  
 S. C. Stevens, Jersey City, Hoboken & Paterson  
 Street Ry.  
 Chas. O. Evans, Kansas City & Leavenworth Ry.  
 Samuel Doyle, Louisville, Ky.  
 H. C. Mackay, Milwaukee Elec. Ry. & St. Co.  
 E. D. Hibbs, North Jersey Street Ry.  
 Frank L. Brown, Omaha & Council Bluffs Ry. &  
 Bridge Co.  
 D. H. Goodrich, Omaha Street Ry.  
 James D. Fraser, J. E. Hutchison, Ottawa Electric  
 Ry.  
 Louis S. Kite, Ohio River Elec. Ry. & Power Co.  
 W. S. Dimmock, Richmond Passenger & Power Co.  
 T. C. Kimball, St. Louis & Suburban Ry.  
 J. J. Magilton, Schenectady Ry.  
 Frank Henry, St. Louis Transit Co.  
 G. E. Tripp, Seattle Electric Co.  
 John M. Bramlette, St. Louis, Belleville & Subur-  
 ban.  
 J. M. Smith, Toronto Ry.  
 C. L. Campbell, E. N. Sanderson, People Tram-  
 way Co., Pittman, Conn.  
 W. B. Brockway, New Orleans & Carrollton R. R.  
 C. S. Mitchell, United Traction Co., Pittsburgh.  
 Geo. L. Radcliffe, R. G. Young, A. L. Linn, Jr.,  
 Utica (N. Y.) Belt Line Street Ry.  
 W. F. Ham, Washington Traction & Electric Co.  
 S. C. Rogers, J. E. Derrick, Youngstown & Sharon  
 Street Ry.  
 W. B. Weaver, Buffalo, official stenographer.

## MISCELLANEOUS.

Adams, F. O., Mark Equipment Co., Chicago.  
 Angerer, Victor, Wm. Wharton, Jr., & Co., Inc.,  
 Philadelphia.  
 Atkinson, J. M., J. M. Atkinson Co., Chicago.  
 Atkin, G. H., J. M. Atkinson & Co., Chicago.  
 Armstrong, A. H., Gen. Elec. Co., Schenectady,  
 N. Y.  
 Alfred, W. H., The M. Ohmer's Sons Co., Dayton, O.  
 Arnold, W. L., Arnold Elec. Power Sta. Co.,  
 Chicago.  
 Arnold, W. L., Arnold Elec. Power Sta. Co.,  
 Chicago.  
 Ackley, John W., Thayer & Co., Inc., New York.  
 Anthony, Willis H., New Haven Car Register Co.,  
 New Haven, Conn.  
 Ackley, Charles S., Sterling-Meaker Co., New York.  
 Albright, W. B., The Sherwin-Williams Co., New  
 York.  
 Flood, John Balch, Blood & Hall, Boston.  
 Blewett, Scott H., Am. Car & Fdy. Co., St. Louis.  
 Baker, Walter H., National Lead Co., St. Louis.  
 Barr, Wm. H., Bierbaum & Merrick Metal Co.,  
 Buffalo.  
 Bragg, H. Lee, Sterling Varnish Co., Pittsburgh.  
 Dean, D. B., J. G. Brill Co., Philadelphia.  
 Beadle, Edward, Ry. Reg. Mfg. Co., New York.  
 Bowers, C. H., W. H. Coe Mfg. Co., Providence.  
 Briggs, Paul T., Westinghouse Co., Syracuse.  
 Brown, R. S., Westinghouse Co., Boston.  
 Boyd, P. M., Lorain Steel Co., Lorain.  
 Brackett, L. C., Parrott Varnish Co., Bridgeport,  
 Conn.  
 Brown, P. Wesley, New York.  
 Blank, Jos., Christensen Eng. Co., New York.  
 Barr, James C., Weber Ry. Joint Mfg. Co., New  
 York.  
 Byrns, R. A., Ohio Brass Co., New York.  
 Burns, Wm. J., Wm. Wharton, Jr. & Co., Phila-  
 delphia.  
 Berg, Max A., Ohio Brass Co., Chicago.  
 Bragg, C. A., Westinghouse Co., New York.  
 Bigelow, H. T., Hale & Kilburn Mfg. Co., Chicago.  
 Bigelow, Geo. S., Chicago Varnish Co., Chicago.  
 Bailey, Geo., John A. Roebings Sons, Chicago.  
 Bates, C. T., National Ticket Co., Cleveland.  
 Brager, Wm. C., New York.  
 Breidenbach, Wm. F., Ohmer Car Register Co.,  
 Dayton, O.  
 Buchler, J. G., Columbia Mach. Works, Brooklyn.  
 Boyd, J. K., National Lead Co., New York.  
 Bowman, Wm. W., Pearson Jack Co., New York.  
 Barry, John G., General Electric Co., Schene-  
 cady, N. Y.  
 Bibber, Chas. E., Stanley Elec. Manufacturing Co.,  
 New York.  
 Bibber, Thos. H., Thos. H. Bibber & Co., Boston.  
 Buell, Jas. W., General Electric Co., Chicago.  
 Barnard, Blecker S., Am. Vitified Conduit Co.,  
 New York.  
 Baker, Frank B., Am. Electrical Works, Providence,  
 R. I.  
 Bacon, C. G., Jr., Corning Brake Shoe Co., New  
 York.  
 Basse, Chas. O., J. W. & A. Bird & Co., New York.  
 Barney, C. H., Monarch Fire Appliance Co., New  
 York.  
 Blizard, Chas., Elec. Storage Battery Co., Phila-  
 delphia.  
 Brill, Jno. A., J. G. Brill Co., Philadelphia.  
 Bolles, Frank G., Bullock Elec. Mfg. Co., Cincin-  
 nati.  
 Brown, J. P., Western Electrical Inst. Co., New  
 York.  
 Conklin, H., The Chas. Moser Co., New York.  
 Coleman, Chas. E., Eugene Munsell & Co., Chi-  
 cago.  
 Colwell, N. H., R. Bliss Mfg. Co., Pawtucket, R. I.  
 Castle, Chas. C., Hildreth Varnish Co., New York.  
 Clark, D. W., Flood Conklin Co., Newark.  
 Colby, K. Safford, Pittsburgh Reduction Co., New  
 York.  
 Cook, Charles, Eureka Spring Co., New York.

Chapin, E. H., Rochester Car Wheel Wks., Roches-  
 ter.  
 Curtis, E. A., Chicago Truck Co., Chicago.  
 Cline, A. R., Wm. Wharton, Jr., & Co., Inc.,  
 Philadelphia.  
 Cutts, Frederic, General Elec. Co., Atlanta.  
 Calisch, J. C., General Elec. Co., Buffalo.  
 Cheve, N. D., Okonite Co., New York.  
 Chur, Walter, Am. Ry. Supply Co., New York.  
 Carpenter, E. E., N. E. Construction Co., Wor-  
 cester, Mass.  
 Chamberlain, E. G., Standard Pole & Tie Co.,  
 New York.  
 Chitz, Leopold, Lorain Steel Co., Lorain, O.  
 Conklin, Franklin, Flood & Conklin Co., Newark.  
 Cameron, Fred, Brady Brass Co., Jersey City.  
 Crockett, F. P., Star Brass Works, Kalamazoo,  
 Mich.  
 Davis, Arthur V., Pittsburgh Reduction Co., Pitts-  
 burgh.  
 Devereaux, Jos. C., Cambria Steel Co., New York.  
 Dean, D. B., J. G. Brill Co., Chicago.  
 Denton, James H., Christensen Eng. Co., New  
 York.  
 Doyle, J. F., Sherwin-Williams Co., Cleveland.  
 Dalby, Archibald B., The Hipwood-Barrett C. &  
 V. Fender Co., New York.  
 Dodd, Samuel T., Stanley Elec. Mfg. Co., Pitts-  
 burgh, Mass.  
 Dorsey, G. D., National Lead Co., New York.  
 Delaney, W. H., Fowler & Roberts Mfg. Co.,  
 New York.  
 Driver, Wilbur B., Driver-Harris Wire Co., New-  
 ark.  
 Davey, Geo. B., Giles S. Allison, New York.  
 Davies, Henry J., National Carbon Co.  
 Dixon, Jos. F., Jr., Christensen Eng. Co., New  
 York.  
 Dick, H. C., Flood & Conklin Co., Newark.  
 Donner, H. C., The Donner Truck & Fdy. Co.,  
 Logansport, Ind.  
 Drake, F. S., St. Louis Car Co., Philadelphia.  
 Dutton, W. A., The Van Dorn & Dutton Co.,  
 Cleveland.  
 Dodd, Wm. C., The National Lock Washer Co.,  
 Newark.  
 Du Barry, J. N., Jr., Edward J. Etting, New  
 York.  
 Entwistle, Edward B., Lorain Steel Co., Johnstown,  
 Pa.  
 Evans, D. J., Lorain Steel Co., Chicago.  
 Evans, H. C., Lorain Steel Co., New York.  
 Eldred, J. E., Jr., Christensen Eng. Co., Louis-  
 ville, Ky.  
 Eckert, A. P., The Safety Ins. Wire & Cable Co.,  
 New York.  
 Escip, F. A., R. D. Nutall Co., Pittsburgh.  
 Ellis, S. P. S., The Lorain Steel Co., Pittsburgh.  
 Elliott, W. H., Van Don Elliott Elec. Co., Cleve-  
 land.  
 Freed, George F., The Duff Mfg. Co., Pittsburgh.  
 Floyd, W. T., St. Louis Car Co., New York.  
 Fechteln, Frank, Palm, Fechteln & Co., New  
 York.  
 Ferguson, J. A., Translucent Window Sign Co.,  
 New York.  
 Fullwell, S. Seymour, R. W. Blackwell & Co., Ltd.,  
 New York.  
 Falk, Otto H., The Falk Co., Milwaukee.  
 Fulton, William H., Consolidated Car-Heating  
 Co., Albany.  
 Freede, M. S., Pearson Jack Co., New York.  
 Ford, O. R., Chicago Varnish Co., New York.  
 Foote, D. S., Chicago.  
 Griffin, T. M., Wheel Truing Brake Shoe Co.,  
 Detroit.  
 Gier, C. R., Jr., New York.  
 Griffiths, De Witt C., Globe Ticket Co., Philadel-  
 phia.  
 Grier, H. M., Pantasote Co., New York.  
 Gray, Willis E., Compressed Air Co., New York.  
 Greene, Stanley, Crescent Brake Shoe Co., Phila-  
 delphia.  
 Grauten, Wm. A., Christensen Eng. Co., Mil-  
 waukee.  
 Gold, Edward E., Gold Car Heating Co., New  
 York.  
 Goldey, Paul R., General Equipment Co., Camden.  
 Gargem, H. E., Universal Safety Tread Co., New  
 York.  
 Hodgson, Percy, Pittsburgh Reduction Co., Boston.  
 Hilton, A. A., St. Louis Car Wheel Co., St. Louis.  
 Harten, P. F., Electric Railway Equipment Co.,  
 Cincinnati.  
 Honnold, O. A., Lachine Rapids Hydr. & Land Co.,  
 Ltd., Montreal.  
 Hanna, J. A., Electric Railway Rolling Stock,  
 New York.  
 Hoyt, Daniel, Nat'l Lock Washer Co., Newark.  
 Hancock, John, National Lead Company, New  
 York.  
 Hoan, J. B., Nat'l Conduit & Cable Co., New  
 York.  
 Hurd, W. R., Standard Traction Brake Co., Bos-  
 ton.  
 Hoffman, R. C., Penna. Steel Co., Baltimore.  
 Heilig, E. R., American Elec. Works, New York.  
 Hayden, E. F., Railroad Supply Co., Brooklyn.  
 Harrington, S. H., Railroad Supply Co., New York.  
 Hunter, L. J., Hunter Illuminated Sign Co., Cin-  
 cinnati.  
 Hawkins, E. L., The Hunter Illuminated Sign Co.,  
 Cincinnati.  
 Hastings, Geo. S., Christensen Engineering Co.,  
 Milwaukee.  
 Hughes, T. E., Standard Underground Cable Co.,  
 New York.  
 Hammond, S. T., Pernsy Wania Elect. & Ry. Sup-  
 ply Co., Pittsburgh.  
 Hoffmann, Aron, Castweld & Construction Co.,  
 Milwaukee.  
 Hart, Orlando W., Union Stop and Signal Co.,  
 Fall River, Mass.

Hirtzel, O. C., Eureka Tempered Copper Works,  
 North East, Pa.  
 Ingalls, F. A., Budar Foundry & Mach. Co., New  
 York.  
 Issertel, Henry G., Syracuse Electric Co., New  
 York.  
 Jens, W., Lichter & Jens, St. Louis.  
 Jennings, C. S., Sawyer Man Electric Co., New  
 York.  
 Jackson, W. B., Stanley Electric Mfg. Co., Pitts-  
 burgh, Mass.  
 Johnson, Charles F., Dallett & Co., Philadelphia.  
 Johnston, A. R., Clarence Brooks & Co., Newark.  
 Kasson, Robert, Taylor Electric Truck Co., Troy,  
 N. Y.  
 Kellogg, Henry F., Frank Ridlon Co., Boston.  
 Kuhn, Henry J., Flood & Conklin Co., Newark.  
 Kingston, Wm. W., The Lorain Steel Co., Atlanta.  
 Kaul, Andrew, Jr., Steel Carbon Co., St. Mary, Pa.  
 Kleinschmidt, H. F. A., Lorain Steel Co., Johns-  
 town, Pa.  
 Koch, Karl, Christensen Eng. Co., New York.  
 Knoblock, Otto M., Miller Knoblock Mfg. Co.,  
 South Bend, Ind.  
 Kittredge, A. K., Universal Tread Safety Co.,  
 New York.  
 Krunkerbrecker, C. K., Streeter Brake Shoe Co.,  
 Chicago.  
 King, C. H., Brady Brass Co.  
 Leidenger, Joseph, Dayton Mfg. Co., Cincinnati.  
 Lindgren, William, N. Y. E. & C. Co., New  
 York.  
 Lichter & Jens, St. Louis.  
 Leidenger, P., Dayton Mfg. Co., Dayton, Ohio.  
 Luther, H. R., Barbon Stockwell Co., Cambridge-  
 port, Mass.  
 Lockwood, Jos. E., Electric Storage Battery Co.,  
 Detroit.  
 Laughlin, H. M., Pa. Electrical & Ry. Supply Co.,  
 Pittsburgh.  
 Mandy, W. O., General Electric Co., Schenectady,  
 N. Y.  
 Moon and Hogg, Macomber & White Rope Co.,  
 New York City.  
 MacMorton, J. P., Ohio Brass Co., Mansfield,  
 Ohio.  
 McCordell, J. R., McCordell & Co., Trenton, N. J.  
 McGinley, J. R., Duff Mfg. Co., Pittsburgh.  
 Mathias, Robert, Frank Ridlon Co., Boston.  
 Mead, G. A., Ohio Brass Co., Mansfield, Ohio.  
 Merrill, Josia L., Gen. Ry. Supply Co., Pittsburgh.  
 Marks, F. R., Metal Sales Co., Cleveland.  
 Murray, T. M., Protectus Co., Philadelphia.  
 MacDonald, M., Olmer Car Ry. Co., New York.  
 Mastersson, Frank D., Chase Shawmut Co., Boston,  
 Mass.  
 McCloy, R. C., William Wharton, Jr., Co., Phila-  
 delphia.  
 Manson, Geo. C., Okonite Co., New York.  
 Mead, Geo. A., Ohio Brass Co., Mansfield, Ohio.  
 Meek, J. Emory, H. W. Johns Mfg. Co., New  
 York City.  
 Mason, F. C., Kings Co. Elec. Equipment Co.,  
 Brooklyn.  
 Moore, R. C., General Elec. Co., Philadelphia.  
 McVae, S. H., New York.  
 Murphy, Philip J., Frank Ridlon Co., Boston.  
 McBirney, A. J., National Lead Co., Chicago.  
 Meloon, Ivan L., Atlantic Shore Line Ry., Sand-  
 ford, Me.  
 Meckey, R. K., National Carbon Co., Cleveland.  
 McQuade, Jas. P., National Conduit & Cable Co.,  
 New York.  
 Meek, S. Glenn, H. W. Jones Mfg. Co., New York.  
 Marsh, H. C., Westinghouse Co., Cincinnati.  
 Merrick, Frank Anderson, Lorain Steel Co., Johns-  
 town.  
 McMahon, J. P., Rochester Hose Bridge Co.,  
 Rochester, N. Y.  
 Meachem, T. G., New Process Raw Hide Co., Syra-  
 cuse, N. Y.  
 Merguiondo Carter, de, F. H. Newcomb Co., New  
 York.  
 Mastersson, Frank D., Chase Shawmut Co., Boston.  
 McGill, J. H., J. H. McGill Co., Chicago.  
 McDonald, C. H., J. A. & W. Bird & Co., New  
 York.  
 Miller, W. H., Erie Exploration Co., New York.  
 Moulton, Jos. C., Stanley & Patterson, New York.  
 Maycock, Joseph, Robt. Ingham Clark & Co., Ltd.,  
 New York.  
 McVicker, Wm. B., Dearborn Drug & Chemical  
 Works, New York.  
 McMichael, J. G., Atlas Railway Supply Co.,  
 Chicago.  
 Metzelaar, Anthony H., The Knell Air Brake Co.,  
 Little Rock, Mich.  
 Nourse, Frank O., Sherburne & Co., Boston.  
 Nutty, G. R., National Lead Co., Cincinnati.  
 Nethercut, Edgar S., Paige Iron Works, Chicago.  
 Newcomb, F. H., New York.  
 Olney, Geo. H., Eugene F. Philips Elec. Works,  
 Montreal, Canada.  
 Owen, H. C., Western Electric Co., New York.  
 Oberlander, Martin A., Western Electric Co., New  
 York.  
 Ohmer, John F., The Ohmer Car Register Co.,  
 Dayton, Ohio.  
 Phillips, O. C., Hunter Sign Co., New York.  
 Partridge, Arthur S., Street Railway Supplies, St.  
 Louis.  
 Farmer, Geo. A., Farmer Life Guards, Cam-  
 bridgeport, Mass.  
 Porter, J. W., Ohio Brass Co., Chicago.  
 Powell, C. S., Westinghouse Elec. & Mfg. Co.,  
 Cleveland.  
 Pongenhusen, Albert P., Green Engineering Co.,  
 Chicago.  
 Partridge, James, Partridge Carbon Works, San-  
 diego, O.  
 Pels, Henry, Henry Pels & Co., Berlin, Germany.  
 Pierce, R. H., Pierce, Richardson & Neller, Chi-  
 cago.



Pendleton, D. D., Westinghouse Elec. & Mfg. Co., Pittsburgh.  
 Parker, Robt. B., General Electric Co., Harrison, N. J.  
 Perry, James W., H. W. Johns Mfg. Co., Philadelphia.  
 Pratt, Geo. E., Niles Car & Fender Co., Niles, O.  
 Probasco, Wallace M., The Westinghouse Co., New York.  
 Parrott, H. R., Parrott Varnish Co., Bridgeport, Conn.  
 Provost, Geo. W., Gen. Ry. Supply Co., Pittsburgh.  
 Passalunghi, T. W., Charleston, Conn. Ry. & Gas Elec. Co., Charleston, S. C.  
 Priest, E. D., General Electric Company, Schenectady, N. Y.  
 Roche, D. S., Charles Scott Spring Co., Philadelphia.  
 Rideout, Herbert L., Walworth Mfg. Co., Boston.  
 Reynolds, Edward L., Electric Storage Battery Co., Philadelphia.  
 Rowe, A. E., Malleable Iron Fittings Co., Bradford, Conn.  
 Robert, Louis E., U. S. Projectile Co., Brooklyn.  
 Robertson, John H., N. Y. Est. Eng. Co., New York.  
 Russell, F. D., Wheel Works, Rochester, N. Y.  
 Robinson, John C., Harrington Robinson & Co., Boston.  
 Romeick, Henry, New York.  
 Richardson, Arthur H., Pearson Jack Co., Boston.  
 Robinson, Wm., Robinson Electric Truck & Supply Co., Brooklyn.  
 Richardson, E. M., Sherwin Williams Co., New York.  
 Record, E. A., Vacuum Oil Co., Boston.  
 Reed, William B., Jr., White Mfg. Co., New York.  
 Randall, F. C., Christensen Eng. Co., New York.  
 Reid, John H., American Electric Telephone Co., Chicago.  
 Seguin, W. P., Frost Nevers Seeding Co., New York.  
 Smith, Wm. M., Chicago Insulated Wire Co., Chicago.  
 Sachs, Joseph, Johns-Pratt Co., Hartford, Conn.  
 Sachs, Joseph, E. E., H. W. Johns Mfg. Co., New York.  
 Suckow, Gus, Vose Spring Co., New York.  
 Singer, J., Sherborne, Duff Mfg. Co., New York.  
 Snow, Philip C., Globe Ticket Co., Philadelphia.  
 Scudder, Chas. Jr., Western Electrical Supply Co., St. Louis.  
 Stevens, J. F., Keystone Electrical Inst. Co., Philadelphia.  
 Schumacher, H., Christensen Eng. Co., New York.  
 Sheldon, L. M., Cleveland Construction Co., Hamilton, Ohio.  
 Stockwell, Fred, F., Barbours Stockwell Co., Cambridge, Mass.  
 Scudder, Chas., Ohio Brass Co., St. Louis.  
 Steadman, S. H., Rochester, N. Y.  
 Solomon, John L., General Electric Co., Harrison, N. J.  
 Sias, F. S. V., National Conduit Cable Co., Boston.  
 Spangler, John H., Pittsburgh.  
 Sprague, C. E., General Electric Co., Boston.  
 Sanford, G. H., Platt & Washburn Refining Co., New York.  
 Strieby, F. H., General Electric Co., Cincinnati.  
 Silver, Wm. S., New York.  
 Spring, E. A., National Battery Co., Buffalo, N. Y.  
 Swift, Edward S., New Haven Car Register Co., New Haven, Conn.  
 Sargent, F. W., American Brake Shoe Co., Chicago.  
 Smith, D. D., F. H. Lovell & Co., New York.  
 Spiro, J., Stewart Hartshorn Co., New York.  
 St. John, William, Safety Car Heating & Lighting Co., New York.  
 Schenck, S. C., The Sterling Varnish Co., Pittsburgh, Pa.  
 Stott, A. J., Norway Iron & Steel Co., York, Pa.  
 Spiro, J., Stewart Hartshorn Co., New York.  
 St. John, William, Safety Car Heating & Lighting Co., New York.  
 Tate, Bertram M., Magnus Metal Co., Buffalo, N. Y.  
 Taylor, John, Taylor Electric Truck Co., Troy, N. Y.  
 Tupper, A. G., Taylor Electric Truck Co., Troy, N. Y.  
 Tolman, Chas. P., Christensen Eng. Co., New York.  
 Tate, H. F., The National Conduit & Cable Co., New York.  
 Thomas, W. H., The Indianapolis Switch & Frog Co., Springfield, Ohio.  
 Tupper, Geo., Aubrey, Taylor Electric Truck Co., Troy, N. Y.  
 Tolman, C. T., Christensen Engr. Co., Boston.  
 Toole, Henry W., Magnolia Metal Co., New York.  
 Traiwick, S. W., General Electric Co., Atlanta, Ga.  
 Thayer, Rodney, Thayer & Co., Inc., New York.  
 Taylor, Albert, Electric Storage Battery Co., New York.  
 Treppe, H. J., Meyers Mfg. Co., New York.  
 Tilden, Philip S., Franklin H. Kallisch Co., Chicago.  
 Titus, J. V. E., Garrison & Co., Kosciusko, N. Y.  
 Vosburgh, A. C., The New Process Raw Hide Co., Scranton, N. Y.  
 Work, F. H., Universal Safety Tread Co., New York.  
 W-Ington, A. G., The Maryland Car Wheel Works, Baltimore, Md.  
 Wilbur, P. L., Monarch Fire Appliance Co., New York.  
 Wood, Chas. N., Frank Ridlon Co., Boston.  
 Watson, W. J., American Electrical Works, New York.  
 Wernig, F. A., Cook Spring Co., New York.

Woodbridge, J. Lester, Electric Storage Battery Co., Philadelphia.  
 Williams, Frank Haywood Bros. & Wakefield Co., Boston.  
 Wentzel, N. T., New York.  
 Woodbridge, J. Lester, Elec. Storage Battery Co., Philadelphia.  
 Wilcoos, E. W., General Electric Co., Harrison, N. J.  
 Whitted, Thos. B., General Electric Co., Denver.  
 Weistras, R. L., National Lead Co., New York.  
 Wissing, W. H., Crocker-Wheeler Co., St. Louis.  
 Wooster, J. E., Pearson Jack Co., New York.  
 Wiener, Ernst, Henry Pels & Co., Berlin, Germany.  
 Ward, John L., Gold Car Heating Co., New York.  
 Watson, Fred B., Benjamin Watson, New York.  
 Watson, Benjamin, New York.  
 Wurster, E. A., Falk Co., Milwaukee.  
 White, Edward C., White Mfg. Co., New York.  
 Williams, E. M., The Shewin-Williams Co., Cleveland.  
 Wiener, Ernst, Christensen Eng. Co., New York.  
 Washburne, W. A., Cambria Steel Co., New York.  
 Watters, James F., Rand Avery Supply Co., Boston.  
 Whipple, A. L., Curtain Supply Co., Chicago.  
 Winchering, E. F., Prady Brass Co., New York.  
 Whipp, Geo. S., U. S. Projectile Co., Brooklyn.  
 Walser, Edward L., Elec. World & Engineer, Boston.  
 Walker, Chas. T., Elec. World & Engineer, Philadelphia.  
 Wickwire, E. F., Sterling-Meaker Co., New York.  
 Yardley, John Howard, Keystone Car Wheel Co., Philadelphia.

## PRESS REPRESENTATIVES.

F. S. Kenfield, Street Railway Review, Chicago.  
 Daniel Roysse, Street Railway Review, Chicago, Ill.  
 H. J. Kenfield, Street Railway Review, New York.  
 C. B. Fairchild, Jr., Street Railway Review, New York.  
 William Padgett, Street Railway Review, Chicago.  
 Samuel Durham Roysse, Street Railway Review, New York.  
 W. G. Thomas, Street Railway Review, New York.  
 T. C. Martin, Electrical World and Engineer, New York.  
 F. E. Stochka, Western Electrician, New York.  
 W. Norman Collins, Western Electrician, Chicago.  
 M. L. Godkin, Western Electrician, New York.  
 H. W. Blake, Street Railway Journal, Philadelphia.  
 W. K. Beard, Street Railway Journal, Philadelphia.  
 Alfred E. Cornfield, Engineering News, New York.  
 W. J. Johnston, Mining and Metallurgy, New York.  
 W. S. Scott, Pittsburgh Despatch, New York bureau.  
 G. W. Elliott, Elec. World & Engineer, New York.  
 Charles H. Perrine, Tramway & Railway World, Chicago.

## LADIES IN ATTENDANCE.

Mrs. H. M. Hair.	Miss Bessie Ham.
Mrs. C. A. Harrington.	Miss Emma Ham.
Mrs. B. J. Hunter.	Miss Allie Ham.
Miss Dunkin.	Miss A. H. Ham.
Miss Brody.	Mrs. K. H. Ham.
Mrs. C. E. Hubbard.	Miss H. Lawless.
Miss Polly Wells.	Miss F. E. Stebbins.
Mrs. C. F. Hunter.	Miss Daisy R. Stebbins.
Mrs. C. P. Francis.	Mrs. John Breten.
Mrs. Harry Sanderson.	Mrs. Reed.
Mrs. A. H. Richardson.	Mrs. Irwin Fullerton.
Mrs. Frank Wells.	Mrs. Albert Stanley.
Mrs. J. M. Jackson.	Mrs. John S. Brodrey.
Mrs. W. P. Casper.	Mrs. Jennie L. Foster.
Mrs. A. Reed.	Mrs. E. D. Gibbs.
Mrs. S. E. Willen.	Mrs. A. O. Dunk.
Mrs. Edgar S. Nethercub.	Mrs. F. Almy.
Miss Fanny B. Clark.	Mrs. J. G. Michel.
Mrs. J. W. Willie.	Mrs. W. E. Harrington.
Mrs. L. E. Pelste.	Mrs. Carrie H. Reichard.
Mrs. Chas. W. Casson.	Mrs. W. H. Alford.
Mrs. Will Christy.	Mrs. Andrew Kaul, Jr.
Mrs. H. R. Trepe.	Miss Della Long.
Miss Randall.	Mrs. W. H. McAlister.
Mrs. Randall.	Mrs. Henry Pels.
Miss Newcomb.	Miss Gray Price.
Miss Reed.	Miss Pierce.
Miss Wells.	Miss Johnson.
Mrs. G. M. Haskall.	Miss D. J. Evans.
Mrs. R. Stewart.	Mrs. George C. Ewing.
Mrs. M. Miller.	Miss Ward.
Mrs. George Starr.	Miss H. Lawson.
Mrs. W. A. Christensen.	Mrs. A. F. Callanere.
Mrs. C. E. Crozman.	Mrs. C. B. Benson.
Mrs. C. Benson.	Mrs. W. S. Dimmock.
Mrs. W. L. Jacques.	Mrs. S. W. Fowler.
Mrs. George E. Pratt.	Mrs. R. N. Monte.
Mrs. H. B. Abbott.	Mrs. G. W. Lanch.
Mrs. E. P. Sharp.	Mrs. J. G. Reed.
Miss Mary Estep.	Mrs. R. D. Apperson.
Mrs. Charles Richardson.	Mrs. James F. Wauke.
Mrs. George A. Andrews.	Mrs. W. C. Poor.
Miss Edith Clarke.	

## RECEIVED TOO LATE FOR CLASSIFICATION.

Bain, Wm. Gibbs, Providence Engineering Works, Philadelphia.  
 Barbours, F. F., General Electric Co., San Francisco.  
 Broadus, J. G. Henry R. Worthington, New York.  
 Baldwin, Stephen W., The Pennsylvania Steel Co., New York.  
 Boyles, T. D., Gen. Elec. Co., Schenectady, N. Y.

Berry Bertram, Heywood Bros. & Wakefield Co., New York.  
 Boyer, Warren, Packham Mfg. Co., New York.  
 Clark, Chas. S., The Pennsylvania Steel Co., Boston.  
 Cheeves, H. Durand, The Okonite Co., Ltd., New York.  
 Cunningham, J. T., Christensen Eng. Co., New York.  
 Clifford, A. E., American Electrician, New York.  
 Clark, Lyman, Gen. Elec. Co., New York.  
 Cadwell, Geo. J., Christensen Eng. Co., Milwaukee.  
 Chaoman, W. D., Westmoreland Ry., Pittsburgh.  
 Gallagher, Joseph D., Lappin Brake Shoe Co., Bloomfield, N. J.  
 Hawkins, F. M., Crouse-Hinds Elec. Co., New York.  
 Huggins, Houlder, New York Herald.  
 Hall, George L., Weber Ry. Joint Mfg. Co., New York.  
 Henry, F. H., Heywood Bros. & Wakefield Co., Mansfield, Mass.  
 Herschmann, Arthur, New York.  
 Jackson, J. Meredith, American Car & Fdy. Co., Wilmington, Del.  
 Jones, Gordon E., U. S. C. I. P. & Fdy. Co., Addyston, Ohio.  
 Kopf, C. F., Griffin Wheel Co., Chicago.  
 Knoedeker, C. K., Griffin Wheel Co., Chicago.  
 Flock, W., Gotsch, C. R., N. Y. & P. C. R. R.  
 Gilman, E. E., Philadelphia.  
 Goddard, Stephen, Elec. Review.  
 Grum, Sen. Geo. E.  
 Hoffmann, P., Knell Air Brake Co.  
 Hoadley, A. G., J. G. Brill & Co.  
 Harding, B., Westinghouse Co.  
 Hunter, L. J., Hunter, Ill. Sign Co.  
 Hawkins, E. L., The Hunter Ill. Sign Co.  
 Johnson, G. J., Grand Rapids, Mich.  
 Welling, Wm., Hunter, Ill. Sign Co., Cincinnati.  
 Kibrennen, Wm. H., Kibrennen New Century Sand Box.  
 Lect, Chas. N., Christensen Eng. Co.  
 Martins, W. F., Sawyer Mann Elec. Co.  
 Marsh, C. J., Standard Underground Cable Co.  
 Maize, F. E., Philadelphia.  
 Mathias, Robt., Frank Ridlon Co., Boston.  
 Moore, W. C., Rockford, Ill. Power Co.  
 Patterson, O. J., Street Railway Journal.  
 Phillips, O. C., Hunter Ill. Sign Co.  
 Winters, Valentine, Dayton, O.  
 Conant, R. W., Cambridge, Mass.  
 Dodd, L. F., Hipwood Barrett Car & Veh. Fender Co., New York.  
 Doud, Charles H., Sawyer-Mann Elec. Co., New York.  
 Davis, I. A., Pennsylvania Steel Co., Baltimore.  
 Dallet, Frank, Dallet & Co., Philadelphia.  
 Dougherty, M. C., Erie Exploration Co.  
 Elser, Max, International Fire Appliance Co., New York.  
 Hawley, Cornell S., Con. Car Heating Co., New York City.  
 Leidenger, Peter, Dayton Mfg. Co., Dayton, O.  
 Chapman, C. H., Chapman Double Ball Bearing Co., Putney, W. I.  
 Holahan, William H., Chapman Double Ball Bearing Co.  
 Wilson, H. C., Chapman Double Ball Bearing Co.  
 Eyre, Robert, Chapman Double Ball Bearing Co.  
 Young, H. M., Woonsocket St. Ry. Co., Woonsocket, R. I.  
 Register, W. Westinghouse Co., Pittsburgh.  
 Tschentscher, R., Sawyer-Mann Elec. Co., New York.  
 Aulenbach, M. C., United Traction Co., Reading, Pa.  
 Arnold, B. J., Kenosha Street ay. Co.  
 Ammon, George M., United Traction Co., Reading, Pa.  
 Beattie, T. S., Street Railway Review.  
 Holles, Frank G., Bullock Elec. Mfg. Co.  
 Boylan, M. K., N. Y. Street Ry. Co.  
 Bostwick, William S., Magnus Metal Co.  
 Barton, C. A., N. Y. Elec. Vehicle.  
 Ired, F. Rice & Sargent Engine Co., Providence, R. I.  
 Bourne, Frank, La Capital Tramway Co., Buenos Aires.  
 Bailey, Theodore P., General Electric Co., Chicago, Ill.  
 Bryan, W. J., Ramapo Iron Works.  
 Bates, Putnam A., Crocker-Wheeler Co.  
 Brown, Harry N., Globe Ticket Co., Philadelphia.  
 Buch, C. A., Altoona, Pa.  
 Burgett, G., Ramapo Iron Works.  
 Barrows, W. N., N. J. & Hudson River Ry. & Ferry Co.  
 Bacon, W. F., N. J. & Hudson River Ry. & Ferry Co.  
 Bacon, J. W., engineer, N. J. & Hudson River Ry. & Ferry Co.  
 Clark, W. H., N. J. & Hudson River Ry. & Ferry Co.  
 Dallet & Co., 201 Walnut Pl., Philadelphia, Pa.  
 Dean, D. B., J. G. Brill Co., Philadelphia.  
 Erie I. Philip, Erie Traction Co.  
 Entwistle, E. B., Johnston Passenger Ry. Co.  
 Knight, F. S., Wayne Eng. Co., Fort Wayne, Ind.  
 Martin, H. A., Sawyer-Mann Elec. Co., New York.  
 Masson, J. H., Simplex Elec. Co., Boston.  
 Mercer, Richard S., Lappin Brake Shoe Co., New York.  
 O'Brien, L. W., R. D. Nuttall Co., Pittsburgh.  
 Philadel, N. Y. New York.  
 Peters, R., Pennsylvania Steel Co., Philadelphia.  
 Pulver, G. W., Westinghouse Elec. Co., Sprague, N. Y.  
 Parshall, A., Gen. Elec. Co., New York.  
 Renshaw, F. W., Strecker Brake Shoe Co., New York.  
 Reynolds, Edw. V., Electric Storage Battery Co.  
 Robinson, E. J., Laclede Car Co.

Richey, A. S., Union Trac. Co. of Indianapolis.  
 Roche, D. S., Charles Scott Spring Co., Philadelphia.  
 Russell, F. D., Rochester Car Wheel Works.  
 Shaw, Pierce G., Heywood Bros. & Wakefield Co., New York.  
 Singer, I., Sherhorn, Duff Mfg. Co., New York.  
 Smith, W. N., Westinghouse, Church, Kerr & Co., New York.  
 Sharpleigh, M. S., Elec. Storage Battery Co.  
 Serrin, C. H., American Telephone Co.

Saurman, A. B., Standard Underground Cable Co.  
 Sutton, William, American Car Co.  
 Stewart, William E., Lykens & Williams Valley St. Ry. Co.  
 Taylor, A. M., New Jersey & Hudson River Ry. Co.  
 Tate, Bertram M., Magnus Metal Co.  
 Tucker, W. H., Old Colony Street Ry. Co.  
 Vechelbacker, C. F., Jr., J. & Hudson River Ry. & Ferry Co.  
 Viehholz, Pierre O., United Ry. D. & Elec. Co.

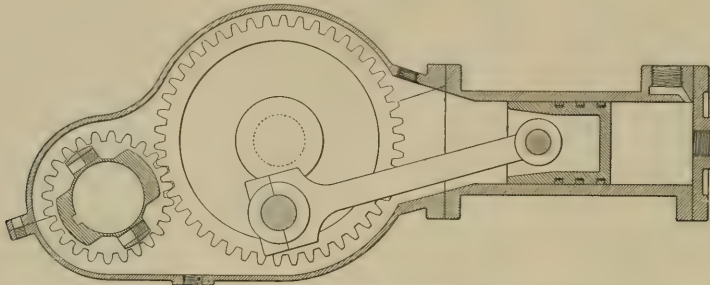
Van Slyck, C. H., Gen. Elec. Co.  
 Wharton, William, Jr., Philadelphia.  
 Watts, De Lancy, Hapwood-Barrett Car. & Veh. Fender Co., New York.  
 Webb, A. T., Hugo Reisinger "Lectro Cor."  
 Wingate, C. G., Doylestown & Eastern St. Ry. Co.  
 Whipple, A. L., The Currian Supply Co.  
 Woodward, A. H., The International Register Co.  
 Wundsen, W. O., Electric Storage Battery Co.  
 Wilmerding, E. F., Brady Brass Co.  
 Wingerter, W. B., The Jennett Car Co.

### NEW AIR BRAKE COMPRESSOR.

The Knell Air Brake Co., of Battle Creek, Mich., has recently placed upon the market a new type of the Knell compressor especially designed for use in city and suburban service where the cars are equipped with maximum traction trucks.

The machine is adapted for trucks with pony wheels of any di-

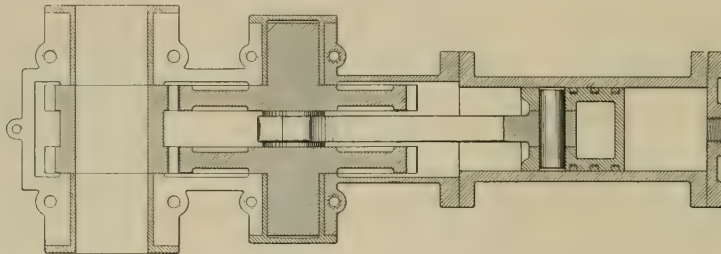
well as all brake parts. For the past year it has made exhaustive tests of its new electric driven air-compressor to meet the demands for four motor cars not having sufficient space upon which to place the axle driven compressor. The results have been extremely satisfactory and the company intends to push this electric device on the market as soon as it can catch up with orders in hand.



KNELL AIR COMPRESSOR FOR MAXIMUM TRACTION TRUCK.

mension in use. The former type of Knell compressor, all parts of which except the gear case are interchangeable with the present type, is adapted to all styles of trucks upon the market and is successfully used upon maximum traction trucks with wheels as low as 18 in. in diameter. The new type, however, raising as it does, the compressor farther above the roadway and reducing the

The company has recently closed an order with the Birmingham (Ala.) Railway Light & Power Co. for 32 axle driven compressors. This is the third order received from the Birmingham company within the past year. The brakes have also recently been placed on the Omaha & Council Bluffs Rv., and the Charles-ton (S. C.) Consolidated Ry.



HORIZONTAL SECTION OF COMPRESSOR.

piston travel in cases where the drive wheels are small is especially recommended where maximum traction trucks are in use.

The company also calls attention to its automatic suction and pressure regulating valve, which is described in a recent catalog. It is stated this valve is very quick acting, cutting in and out instantly, which enables it to maintain an ample supply of air storage for all service and emergency stops for the busiest city haul of any of the largest cities.

In the Knell system the entire weight of the compressor complete, with the valves, tanks, piping, etc., is usually but 365 lbs., making this compressor extremely light and efficient.

The Knell Air Brake Co. reports that with its increased facilities, it is now in a position to make stationary air compressors as

The Knell company has an exhibit at the Garden which will be described in subsequent issues of the "Daily Review."

### UNDER-FEED STOKERS.

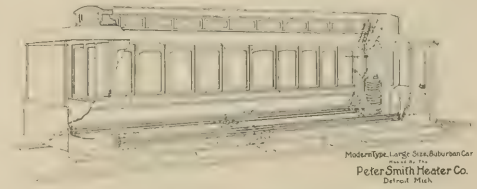
Among recent sales of Jones Under-Feed Mechanical Stokers, Manager Fred A. Daley, of the Under-Feed Stoker Company of America, Chicago, Ill., reports those to the following: Fabrico de Hielo, Manila, P. I.; Ashland Iron & Steel Co., Ashland, Wis.; American Engineering Co., Chicago; Ireland & Mathews Mfg. Co., Detroit, Mich.; Uniontown National Bank, Uniontown, Pa.; Minnesota Soap Co., St. Paul, Minn.; Aquarium, Belle Isle, Detroit, Mich.

## BRILL NARRAGANSETT TYPE CAR.

One of the novelties at the convention this year is the Brill "Narragansett" type car, of which a full sized sectional model is shown in the Brill exhibit. It was named after the first cars which were built for the Narragansett Pier line. Its inception was the result of a desire to use No. 27-G trucks with wheels of equal size under an open car and at the same time to keep the width within the usual limits of 8 ft. 2½ in. over the posts, while bringing the step down within the standard distance from the head of the rail. In this way the trucks are available for use under both open and closed cars.

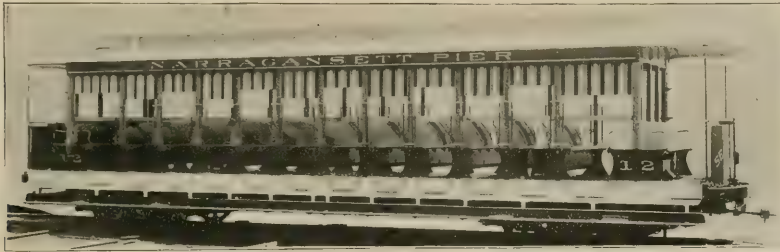
The end to be accomplished is one which has for a long time seemed desirable, and much effort has been expended on attempts to use a truck having equal sized wheels under an open car without an increase in width or a decided elevation of the car body. In the present design the side sill is made Z-shape and is formed from two angle irons, the vertical side of one forming the sill proper. Below this a smaller angle gives support for the step or running board. The posts are carried in specially formed pockets on the outside of the upper part of the sill, so that the width of the body is considerably reduced. The strength of the car is correspondingly in-

running full length along the bottom side of the car. After making the complete length of the car four times on the one side, the hot water crosses under the bottom of the car in the center, and journeys four times again the full length of the car on this side, connecting with the feed pipe, and again being forced through the



coil pipes in the heater, where it is reheated, and continues to circulate through the car indefinitely, keeping all the pipes in the car uniformly heated.

The coil is 36-foot, 1-4-inch, extra heavy pipe, in two sections, operating as one, but the top coil being smallest the lower coil



BRILL CAR NARRAGANSETT TYPE.

creased. The pockets and the panels, which are of the round corner seat end type, are combined so that the post is practically held in a pocket which extends from the level of the seat to a point six or seven inches below the top of the sill. As at the lower pocket the post is completely enclosed, it may be said to be a tenon of the full size of the timber. The posts are provided with double grab handles and the step is so low and broad that when the passenger is fairly upon it he is in a safe position and practically within the car, although another step may be necessary to place him at the seat.

The car is of the usual reversible seat type. Those built for the Narragansett Pier line had a guard rail inside the posts and cross seats without a centre aisle. They were provided with bulkheads, curtains and sash. The curtains came all the way to the floor.

The trucks were of the No. 27-G type, and, with the heavy motors employed, are capable of almost any speed which is practical on the line. This type, although quite new, has been favorably received and several orders have been placed for cars of this kind since the first car was shipped.

serves as a firepot, and thus every part of the entire pipe coil receives the full force of a direct fire.

At the top of the coil heater is an ingenious gas damper which turns the gas and smoke into the escape flue.

H. M. Shaw & Co. have incorporated the Westchester Traction Co., which will take over the Ossining Electric Railway and build extensions. H. M. Shaw is secretary and treasurer, and will make all purchases of supplies required. The directors are: H. C. Willis, Edward E. Shaw, Philip Ackerman and C. J. Harrington. Mr. Harrington has lately taken an interest in the firm of H. M.



C. J. HARRINGTON.

## HOT WATER HEATING SYSTEM FOR STREET CARS.

The Peter Smith Heater Co., of Detroit, Mich., is making preparations for the winter business which promises to be very satisfactory. In this system the coil heater is situated in the vestibule, where the minimum of space is utilized. However, the location of the coil heater in the car is a matter of choice, as the system is equally satisfactory, regardless of the location of the coil heater. As will be seen, the water is first put into the feed pipe under the center of the car, and following the lines of the arrows marked on the pipes, across the bottom of the car and along the side into the bottom of the coil heater. Thence it passes through the heated coils up through the top to the expansion chamber, where all the air is forced out and the hot water returns to the pipes,

Shaw & Co., and is well known to the electrical trade, having had years of experience as an electrician and salesman. The firm is also interested in the Ballston Construction Co., which will soon take over from the receivers the Ballston Terminal Railway. Extensions will be made.

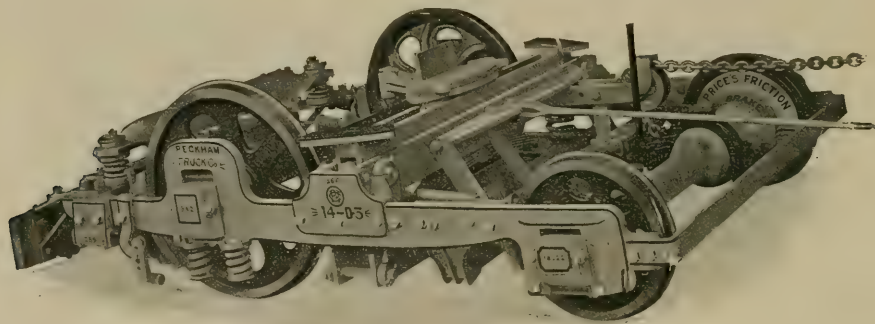


## THE NEW PRICE BRAKE.

The Price Brake proper consists of a disc wheel, which may be separate or (as ordinarily used) forms part of one of the wheels of the truck, with a corresponding loose disc located upon the axle. This loose disc is preferably made in two halves (so that it can easily be removed) and bolted together around the axle. It is provided with and supported upon the axle by self-oiling brass bearings. This loose disc is provided with an extended sleeve, to which is attached one end of a chain, the opposite end being secured to the centre sway bar (of the double truck) or to one of the brake levers when a single truck is used.

Recent improvements have been made in the method of applying the Price brake; these changes comprising the addition of a hydraulic pressure pump, in combination with a hydraulic clutch for operating the brake.

The pressure pump is located on the floor of the platform at each end of the car, and is operated by means of a vertical shaft to the upper end of which a ratchet handle is attached. The moving of this handle drives the plunger into the barrel of the pump and makes it possible to put the desired pressure upon the liquid contained therein. Only one quarter of a turn of the ratchet handle is required to operate the pump.



IMPROVED PRICE BRAKE AS APPLIED TO A MAXIMUM TRACTION TRUCK.

From the back end of the pump cylinder a pipe leads down through the platform and thence beneath the floor to the opposite end of the car, where a similar connection is made with the other pump.

At a point over the truck a flexible connection is made between this pipe and the cylinders of a hydraulic clutch that is located upon the axle and operates the disc, thus doing away with the upright telescope pipe, wire cables and all adjusting springs used in the original type of friction clutch.

In order that there may be a gradual application of the friction disc to the wheel, the pipe beneath the floor of the car is provided with an air chamber. This air chamber serves to cushion the application of the power and permits the motorman to make the brake application as rapidly or as slowly as the requirements of the case may demand, and to make a perfectly smooth stop. It also serves to do away with all sudden grippings of the discs, prevents sudden jars and tremors, and the skidding and flattening of wheels.

In construction, the mechanism is exceedingly simple. There are two hydraulic cylinders with their plungers on the axle, by which the friction disc is pressed against the wheel. The liquid is sent into these cylinders from the pump, whose plunger is moved to and fro by means of a crank arm attached to the lower end of the vertical shaft.

An excess supply of liquid is carried in a chamber and it automatically flows into and fills the space behind the plunger through a special check valve, to replace any possible losses due to leakage or evaporation.

Dust is effectively excluded from the casting by a shield and the lubrication of the lower end of the vertical shaft is insured by the capillary action of the bushing through which the shaft passes and which has its lower end submerged in the liquid.

## AMUSEMENTS TO-DAY AND EVENING.

ACADEMY OF MUSIC—Arizona.

AMERICAN—Siberia.

BIJOU—Dave Warfield in The Auctioneer.

BROADWAY—Castle Sq. Opera Co. in Cav. Rusticana and I Pagliacci.

CASINO—Florodora.

CRITERION—William Faversham in A Royal Rival.

DEWEY—Burlesque, "A Wise Guy Co."

DALY'S—James T. Powers in The Messenger Boy.

EDEN MUSEE—Wax Works, etc.

EMPIRE—John Drew in Second in Command.

FOURTEENTH ST. THEATRE—John E. Kellard in The Cipher Code.

GARDEN—E. H. Sothorn in Richard Lovelace.

GARRICK—Charles Hawtrey in Message from Mars.

GERMANIA—The Land of the Free.

GRAND OPERA HOUSE—Heart of Maryland.

HAMMERSTEIN'S VICTORIA—(Beginning Thursday evening), Russell Bros., in Sweet Marie.

HARLEM OPERA HOUSE—Agnes Burroughs in East Lynne.

HERALD SQUARE—Dan Daly in The New Yorkers.

HURTIG & SEAMAN'S—Vaudeville.

HUBER'S—Curiosities and Vaudeville.

IRVING PLACE THEATRE—Maria Stuart.

KEITH'S—Continuous performance, Cinquevalli and 30 others.

KNICKERBOCKER—Rogers Bros. in Washington.

LYCEUM—Bertha Galland in The Forest Lovers.

MADISON SQUARE—Liberty Belles.

MANHATTAN—Mrs. Fiske in Miranda of the Banquy.

METROPOLIS—Rose Coghlan in Peg Woffington.

MURRAY HILL—A Trip to Chinatown.

NEW YORK—The King's Carnival, etc.

PASTOR'S—Continuous performance.

PROCTOR'S THEATRES—Comedy, variety.

REPUBLIC—J. H. Stoddart in The Bonnie Brier Bush.

SAVOY—Louis Mann and Clara Lipman in The Red Kloof.

THIRD AVENUE—A Royal Prisoner.

WALLACK'S—James K. Hackett in Don Caesar's Return.

WEBER & FIELDS—Hoity Toity and Diplomacy.

## DAILY STREET RAILWAY REVIEW

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VOL. XI.

FRIDAY, OCTOBER 11, 1901.

No. 3.

Do not fail to preserve each copy of the "Daily Review." It is necessary in order to make your yearly files complete.

It will be of great assistance to the "Review" if all supply men in attendance at the convention, who are not connected with any of the companies having an exhibit here will leave their cards at the "Street Railway Review" booth, at the head of the main aisle in the Exhibit Hall. We will thus be able to make mention of all those who are in attendance, even though they may be late in registering.

The advisability of setting apart the second day of the convention as supplymen's day was emphasized yesterday by the increased attendance and the livelier interest shown in the exhibits. Sandwiched between two meeting days, it made an agreeable change for the street railway men, visitors as well as exhibitors were less tired and things went along with a vim that has been lacking in the past.

Early in the forenoon the crowd began to come in and all day kept accumulating in a way that made the hearts of the exhibitors glad. Everything was in the smoothest running order and the halls presented an animated appearance with the constantly moving throngs and the gay trappings about the booths and overhead.

It is interesting to note that there were quite a number of street railway employes among the visitors, many of whom took great interest in the various exhibits. It was also a pleasure to see so many ladies present. The distribution of souvenirs was quite general and served to enliven the occasion. Last evening, with the many vari-colored electric lights, the scene was grand.

## THE A. S. R. A. CONTINUES TO GROW.

As further evidence of the energetic and satisfactory way in which the affairs of the American Street Railway Association are being cared for by the present executive management, it is a pleasure to announce that some 20 new member companies have been added to the association roll since the present meeting opened.

## MR. BROCKWAY ARRIVED.

It was a pleasure to the many friends of Mr. W. B. Brockway, the energetic secretary of the Accountants' Association, to be able to welcome him to the convention Wednesday. It had been feared that Mr. Brockway would be prevented from attending the meeting by matters arising from the recent consolidation of the New Orleans properties with which he is associated.

## LATER EXHIBITORS.

Since the list of exhibitors was published in our issue for Wednesday last the following companies have secured space and installed exhibits:

Armspear Manufacturing Co., New York.  
American Wrecking Frog Co., Indianapolis.  
Crescent Brake Shoe Co., Philadelphia.  
Cook's Sons, Adam, 313 West street, New York.  
Stephenson Co., John, Elizabeth, N. J.

## PROGRAM.

## American Street Railway Association.

FRIDAY, OCTOBER 11TH.

Convene at 10 a. m. Election of officers for ensuing year.

"The Adoption of Electric Signals on Suburban and Interurban Railways, Single or Double Track, and Their Economy of Operation." By William Pestell, superintendent of motive power, Worcester Consolidated Street Railway Co., Worcester, Mass.

"The Values of Storage Batteries as Auxiliaries to Power Plants." By W. E. Harrington, vice-president and general manager, Camden & Suburban Railway Co., Camden, N. J.

"The Best Manner and Mode of Conducting the Return Circuit to the Power House." By E. G. Connette, vice-president and general manager, Syracuse Rapid Transit Railway Co., Syracuse, N. Y.

"The Economies Resulting from the Use of Four Motors Instead of Two on Double Motor Equipments."

"Practical Results Obtained from Three-Phase Transmission and Rotary Transformers or Motor Generators in Transmitting Power on Railway Lines."

"The Modern Power House, Including the Use of Cooling Towers for Condensing Purposes." By J. H. Vail, Philadelphia.

11.30 a. m. Automobile ride for the ladies. Automobiles will leave Madison Square Garden at 11.30 a. m. sharp for a trip about the city. All ladies in attendance and gentlemen accompanied by ladies are cordially invited to attend this ride. The trip is made through the courtesy of Mr. Henry Sanderson, president of the New York Vehicle Transportation Co.

7.30 p. m. Annual dinner at Sherry's, 44th St. and Fifth Ave., New York City.

Installation of officers-elect, at the dinner.

SATURDAY, OCTOBER 12TH.

Through the kindness of the Bethlehem Steel Co., the Association offers to members in attendance a delightful trip to the works of the Bethlehem Steel Co., at South Bethlehem, Pa. Special private cars will be provided for the members, and will be attached to the regular train, leaving Jersey City at 8 a. m., with which the ferry from New York connects from the foot of West 23d St. at 7.40 a. m., and from the foot of Cortlandt and Desbrosses Sts., at 7.50 a. m.

## Accountants' Association.

FRIDAY, OCTOBER 11TH.

Madison Square Garden—10.00 a. m.

Paper: "Consumers' Accounts, Electric Lighting Companies." By S. E. Moore, comptroller, United Traction Co., Pittsburg, Pa.

Report: "Standard System of Accounting for Electric Light Companies." By G. E. Tripp, general auditor, Stone & Webster's Cos., Boston, Mass., chairman.

Annual Report: "Standard System of Street Railway Accounting." By C. N. Duffy, auditor, Chicago City Railway, Chicago, Ill., chairman.

2.30 p. m.

Paper: "Conductor's Accounts." By Elmer M. White, cashier, Hartford Street Railway, Hartford, Conn.

Report: "Standard Unit of Comparison." By H. C. Mackay, comptroller Milwaukee Electric Railway and Light Co., Milwaukee, Wis., chairman.

Reports of Convention Committees.

Election of Officers.

The Rand Avery Supply Co., of Boston, is represented by Mr. James F. Wattles, who is presenting their many customers with a very handsome gentleman's pocketbook.

The Western Electrical Supply Co. is making its headquarters with the American Brake Shoe Co., in the Annex, and is represented by Mr. Charles Scudder, Jr., manager of the railway department.

## TWENTIETH ANNUAL MEETING

## AMERICAN STREET RAILWAY ASSOCIATION

New York City—Oct. 9–11, 1901.

Afternoon Session, Wednesday, October 9, 1901.

President Holmes: Gentlemen, we will now resume the discussions.

Mr. E. P. Roberts, of Cleveland: Mr. President, I have hurriedly made a few notes in regard to several points, but unfortunately have not had an opportunity to carefully read Mr. McCormack's timely paper. It is a very important matter to have a basic principle on which to base a traffic arrangement between a city and an interurban road. The first question I would consider is there a basic principle, and if so, what? And after that, what are the factors entering into the determination of the exact amount equitable in any given case and the determination of the value of each factor for such case.

Relative to the first: How does the operation of the interurban road affect the city road, and what is the benefit to the interurban road?

In this case the city road has something to sell, the interurban to buy; and it is also generally the case that the city company realizes that the presence of an interurban road is beneficial, and is willing to treat on an equitable basis. In many cases it is compelled to do so by the terms of the franchise.

My opinion is, first, that it is desirable that the cars of interurban roads, while on the city road's track, be directly under the control of the city road. Secondly, pay a percentage of the fares from passengers outside of the cities delivered to or received from the city road, and also either a percentage of the fares for city passengers, or instead of such percentage, a rental fee for each car mile of the interurban cars in the city. My preference is for the former as to passengers, and the latter as to freight, at least if carried in cars for freight only.

My reasons are relative to the first, that it is objectionable to have conflict of authority in the matter of operation, and possible, and often probable, conflict of interest in damage cases.

Relative to the second, it is questioned by very few, if any, that even if the city road furnishes track and power, it should also pay the interurban something for delivering passengers to or received from them. What form the payment should take is a question, but it seems to me that the per capita basis is the fairest, although the argument may be advanced that it makes practically no difference to the city company how many passengers are carried. Nevertheless, I think that the receipts should be considered.

Of course it is possible that the interurban company might bring so few passengers to the city limits that the excess cost of operating the heavier cars would more than balance the increased receipts. This is not likely, but a minimum flat amount could be agreed upon if considered advisable.

Whether the suburban company should have a percentage for local fares is more questionable. In my opinion, it should, at least generally, provided, of course, car mileage is not paid. This will be materially affected by the times between cars on the local road and also on the interurban.

For example, I know of one case where an interurban company operates over a city road which previously operated a 30 minute service on this line (which was a suburban one), and when the interurban started, the city road took off half its cars. It is an extreme case and often the addition of the interurban cars does not materially decrease the receipts of the city cars.

It is also a fact that local passengers will sometimes wait for interurban cars. For example, personally I always endeavor to catch the interurban car in winter and the city open car in summer.

This is from a smoker's standpoint. I know others in my neighborhood who always endeavor to take the interurban car, and this is an argument in favor of the city company not paying the interurban. If passengers take the interurban car in preference, it becomes a question whether the city road should receive the entire fare, because it would appear that the interurban offered better facilities. On the other hand, the city road would say that if the interurban was not there, the passenger would take the city line, and this raises the question of the effect of the character of service on travel.

So much as to the basis, though I have stated my preference for the basis of divided receipts, nevertheless there are good arguments in favor of the car-mile rental.

Having arrived at a basis, the next point to determine is the equitable amount. I started to write out some of the facts, but did not finish. The following are, at least, some of them: First, the length of haul in the city. It makes a difference whether it is a 3 or 4 mile haul, or a mile less.

Second, whether the city track operated over practically a short interurban road connecting the city with practically another town; whether or not it is in the same corporation limits. For example, there is a certain city where we have an interurban line which operates over four miles of city track, and another that operates two miles, the first being practically an interurban road and the second a suburban. This is with reference to the portion of city road operated over. Third, in some cases the interurban may operate over three miles or more in a large city, and the city company giving frequent service, and in other cases only a short distance in a small town having very infrequent service.

For example, we are now considering a case of one mile in a city of 15,000 people, and another of 1-2 mile in a town of 30,000 people. Fourth, what expenditures must the city road make to allow

- (a) The operation of the cars.
- (b) Furnishing power for operation.
- (c) How will it affect the operating expenses.

Possibly the weight of rail must be increased; possibly the special work must be changed; possibly some girder rail must be ground out or changed; possibly some bridges must be strengthened or rebuilt; and possibly machines furnished for the power house and feeders erected.

There are many other factors, and I have not time to present all which I even now think of, but if a basis can be arrived at, the value of each factor can be decided and an agreement reached.

Relative to special tracks, this is desirable, but the desirability increases with the size of the city and the length of the haul. The larger the city, the more expensive the property per mile. Therefore the overhead or underground will generally be the only practicable solution; but this is only to be considered in the case of large cities, and not for the large towns to and through which the interurban roads operate. The tendency of interurban roads is to provide private rights of way not only for the country, but also to a considerable degree for the town lines; and at least a number of lines are now being planned where, instead of running through the urban portion of the town, an effort is made to get right into the heart of the town and not take the thoroughfares and get there as quickly as possible, and not to make an effort to run through miles of village streets as the earlier roads did.

In one case which we are now planning the first survey took in for one town about a mile of village street, and we finally changed that and got a private right of way which brings us through the town at a high speed and within 1,000 feet or less



of the principal business center of that town. In connection with the matter of higher voltage outside of towns as compared with the voltage desirable for operating in the suburban portions of the city, that often works to advantage. For example, in Cleveland we have several roads, and one of them was referred to by Mr. Gray this morning, stating he had gone over that road and was apparently pleased with it. That road on a test made at that time showed a maximum of 43 miles an hour with a schedule of 20.5, and at times when the cars were moving 32.4, the schedule including 1.11 stops per mile. This was outside of the city.

On another road we have a maximum speed of 55 miles per hour, a schedule speed of 26.2, and an average speed in operation of 40.2 miles per hour.

I also have other figures for similar roads, and all these cars are geared to high speed at a comparatively high voltage. They receive in the country from 175 to 600 volts. In the city they receive from 450 to 500, sometimes more, sometimes less; but they receive a voltage more than sufficient to operate in series, and it is very seldom that they do or should run on "multiple."

Therefore it seems to me that the fact that there is a difference of voltage is not at the present at least of importance except possibly as to the lighting, and a resistance could be used for the lamps when in the country, if considered desirable, and if the motorman would remember it.

I do feel that this matter of a "basis" is most important. If we can get at an equitable basis and one which receives the approval of this body, it will be of great service to the companies, and especially if it has to go to the court of arbitration, the court can take the basis and work out the factors which determine the exact amount; at least they can make an effort.

There is no question that no uniform agreement can be made, much less a uniform price, but it is a fact that there is a general proposition which is applicable to all cases, and if it can be formulated and approved, it will, I believe, prove of value to many members of this organization.

Mr. McCormack: It has been unfortunate—at least, I feel so—that this paper was not distributed and the members given an opportunity to read it through and become conversant with the different subjects mentioned. This morning I have had to answer a number of questions, and a number of points were brought up that I feel were covered in the paper.

Mr. Roberts brings up the question here of the city road paying so much per capita to the suburban road. Now, there are local conditions that must be considered. You might have a suburban road that would strike your city road where you would have to run over 20 miles of track for a 5-cent fare, and it would require additional power to cater to the suburban road. They should not be overcrowded and must have additional seating capacity, and that does not make a paying car in the city for long distances. I have in mind a road that don't run over three-quarters of a mile; Mr. Davidson has one in mind also, and to pay per capita there might be one on a more equitable basis. But I have tried to cover the different cases by giving different agreements with the suburban company, and tried to deduce something from them that would be of benefit to the members.

In regard to voltage, there has come up a question altogether different from the one I suggested, of having a handle so that the city motorman could not run in parallel. And I will ask if Mr. Crosby or Colonel Heft knows something of that because they have made some study of it lately.

Mr. Crosby: I do not recall that there has been any specific case in practice in regard to the point raised, which I understand to be this, that in order to control the speed of the car in city lines, it should be made in some way impossible for the motormen on those lines to throw the motors into parallel. The subject was very carefully considered five or six years ago when I was on the manufacturing side of the business, instead of the operating side, and had much to do with the question of handling; and it comes back to me in this way, that it is not a difficult proposition to meet. You can make a rigging which will perform the function desired, and at the same time not impose upon the mechanism or the man who handles it any too great labor; and if nothing else were in the way of accommodating the situation, I should say that would be the best course.

A Member: I should like to ask Mr. Crosby if the motorman

could not go on instead of going into parallel so that that matter could be taken care of.

Mr. Crosby: Yes, that has been accomplished. A large resistance has been thrown in the circuit so that when the heavy motors are thrown in parallel they will yet not receive more than their proper amount, looking to both themselves and the station. But all those are, of course, burdens upon the cost of the car and of the mechanism. It can be done; there is nothing at all in the way; either one way or the other would serve.

President Holmes: Mr. Crosby, I would like to ask you if it is not possible and perfectly practicable to have an independent resistance controlling speed through the voltage while the car is running in series inside of the city limits, cutting that out after leaving the city line and using the regular resistance for the series after leaving this line.

Mr. Crosby: That is, of course, practicable.

Mr. Wason: Possibly Mr. McCormack was not aware that on two of the lines in Cleveland the General Electric Co. was authorized to put in additional resistance; but the difference in the voltage on the suburban road and in the city was sufficient to reduce the speed of the cars inside of the boundaries of the city, and I think without exception, all of those cars running in this city have a larger resistance than is ordinarily supplied with the equipment put on other lines for that purpose.

Mr. Hopkins: We have had some trouble at first with our own suburban cars where they come in over city lines, principally on the city circuit breakers. To overcome that, we have had the resistance made just twice the carrying capacity originally furnished and arranged to adjust the circuit breaker on the car, so that if the motorman throws the parallel notch, or, at least, throws it too quickly, it will throw the circuit breaker in the car, instead of the circuit breaker at the station. We found that by making a very simple arrangement changing the operation on the car circuit breaker on coming into the city lines, and as they leave the city vice versa, the difficulty was obviated.

Mr. Connette: I have been very much interested in this discussion, because there have been several lines projected to enter Syracuse, one from Rochester, one from Utica, and another from Auburn, and several less important lines, and our company controls all of the city lines; and we have adopted the policy of standing at the end of our line with our arms wide stretched to welcome our bucolic friends, so that we may get their nickels and increase our receipts, and the basis upon which we are willing for these roads to enter Syracuse is that when the suburban cars crossed the junction point of our line, they become cars of the Syracuse Rapid Transit Railway Co., and the passengers shall pay 5 cents the same as if they were upon our own cars. The passengers then brought to the terminus, which will probably be in the center of the city, and that passenger will then be entitled to a transfer which will carry him one way or the other as the case may be to any other point within the limits of the city; and we feel that this transfer privilege is a decided advantage to the suburbanite who may come in upon the suburban road; we of course to pay a reasonable price per car-mile for the use of the car, and pay all of the expenses for operating the same. In Cleveland they pay 2 cents per car-mile, and a number of agreements are on that basis. The price should be regulated by the circumstances of the case.

Mr. Haggerty: I think most of the gentlemen talking to-day are looking from the city standpoint and not from the interurban standpoint. I do not mean to criticize the remarks upon passenger traffic that come from the interurban roads that the city would not get otherwise. It is no more than fair that they should divide upon a fair basis. In Michigan that is the way we are doing it on roads coming into town, the interurban traffic. We would not get it otherwise.

In regard to running into town on the car-mileage basis we also pay so much for the amount of power used for propelling cars into town, that is to the center of the town, and when they go out the other side of the town they pay in accordance with the mileage they make on a basis of what appears to be satisfactory; but as far as stopping outside of the town and changing crews coming into town, and the city line taking all the fares, we tried that, and the suburban road said it wouldn't stand it, either transfer the passengers or let the car stand. We found that killed the traffic on the interurban road, and then we used this basis of

dividing the fares and letting them have their proportion.

Mr. Connette, Syracuse: Perhaps when the difficulties of securing rights of way and the privilege of entering a city and the expense of constructing a line in the streets of a city, the expense of paving the streets and the interest on the investment are considered, besides the maintenance of the city line, the city companies are certainly entitled to good compensation.

So far as changing cars at the end of a line is concerned, I do not think that would be perhaps the thing to do. My idea has been that the conductor and motorman of the suburban car, when they reach the junction should become the employees of the city line and bring the car right into the city.

Another fact must be considered. When a suburban car of another company that has no rights of way is running its cars upon the tracks of the city company, the city company is responsible for all accidents that may occur in connection with their cars.

Mr. Parker, of Detroit: I am identified with several interurban companies that run into different stations, and I believe that local conditions change the whole basis of the question in different places. I recall one road where we had a trackage of six miles in a certain city, furnishing power and immunity from accident and everything of that kind in that place we turned over the whole fare and then took a rebate on mileage, the crews being furnished us by the city company.

At another place where we had a trackage perhaps of two miles, we divided the fares, and that was more equitable I think. I do not think you can lay down any hard and fast rule, but our brother over there, without desiring to criticize, is taking up a very large question. The interurban company had 2 cents, and the city company 3 cents. We ought to be a little on the order of the golden rule and try to be kind of white and decent, and get together and settle on some basis and then let the local conditions determine.

Mr. Davidson: It might be understood from what I said this morning that the case stated by me would not be upon the same lines as those of the gentleman who had just spoken.

As I understand, nearly all the cases of the companies that you have been considering are cases where the interurban line comes to the city line and at those points on attempting to enter the city the city line would have been in this position that they were to collect a 5 cent fare from the city lines to the business portion of the city; when the interurban lines come to the city line they come there with a full fare of their own, no matter whether it is 5, 10, 15 or 20 cents, or whatever it may be. In that case the business can stand the city fare of 5 cents, just what the city company gets on its own business. That is in cases where it would seem to be equitable and right that the city company should get all of the 5 cent fare, assuming the expense of the power, crew and everything else.

Now, the case, as I stated this morning, was a little different from that in that incoming lines met the city line at a point more than half way between the city line and the business portion of the city where the cars were running. Now, in that case, there could only be one charge of five cents from the city line to the business portion of the city, and the two companies divided the five cents. That was practically on the basis of the mileage that was operated by the two different companies, the city company standing the expense on its own portion of the line, with the exception that the interurban company gave the city company the advantage of the use of the cars. This amounts practically to the city company getting all the fare, and is an equitable division.

Mr. Myers: I am talking solely from the interurban standpoint; perhaps it did not sound so this morning, when I said the city company should keep to itself the local business. In dealing with these properties in various places throughout the country and making traffic contracts, where I am associated with the property, I have not found any two conditions similar. I am not prepared to say that I would not duplicate any contract I have made, but I do say that I would not be willing to duplicate them without a thorough investigation, to ascertain whether that former contract or that basis of agreement is best adapted to the situation there. I have a case in mind where we have made a traffic contract in a city of upwards of 50,000 people. We are paying there the lowest practical universal rate and are allowed car-mileage for the use of our cars. At the very end of this line we were met with a similar proposition, which I declined for the reason that in the first instance we were provided

with a very good double track and very good service; there was nothing to interfere with our interurban service so far as speed was concerned. In the other instance, in the smaller towns we found a single track poorly operated, and a decrepit car plant and the probabilities were that our service would be seriously interrupted if we used those tracks jointly. It finally came to a point where we were offered three cents for the universal transfer, but the transfer was not worth anything, they did not go anywhere. Therefore, I say every one of these cases has got to stand on its own bottom. Naturally the city officials feel that if the interurban company is going to come into town it will bring business beyond the city lines; but there are no two cases alike, and while this is a very interesting discussion, we won't get anywhere on it finally.

The physical conditions which I think Mr. Roberts gave priority to and said that when the physical and electrical conditions were provided for, the others would work themselves out, I do not agree with. I think if we settled the financial question we can meet the physical conditions, because we can take care of them with the earnings, if we have them; at least that has been my experience. There are no two cases alike, but I would like very much if this were brought up a year from now with the benefit of the experience we would then have.

Mr. Fuller: I would like to have the secretary read the resolution from the minutes.

Mr. McCormack: I would like to say one word before that resolution is read. I do not like to have a misunderstanding. The gentleman spoke as though the paper under discussion was written from the standpoint of city roads. The company I am identified with probably owns as large a mileage of suburban roads as any other company in the country, something over 1,300 miles, and the question of contracts between suburban roads and city roads is certainly of vast importance to it.

I will say further that the suburban roads, with the exception of one of those running out of Cleveland are owned by the same people that own the Cleveland Electric Railway Co., and the traffic agreement made there was thought to be an equitable one in that city. And I want to call your attention to my paper, where I have tried to get these traffic agreements of the different companies in the different cities throughout the United States, and comparatively few of the traffic arrangements in the various cities are exactly alike. There are almost invariably local conditions which have their effect, and frequently agreements which would be satisfactory in one place would be unfair in another. There are many reasons why the city company in one city should receive a higher rate for handling the cars of the interurban company than those in other places. Another thing, the courts of the state of New York have held that the suburban company has no rights and the city company cannot make a traffic agreement with it to let it in over the city streets; but the suburban company can get a franchise over the same streets in which the city company operates, and then can enter into a traffic agreement. I think the same thing is done in Pittsburgh.

Mr. Chamberlain's paper on "The Best Form of Car for City Service," was then presented. This paper will be found in the "Daily Review" for October 10, 1901, page 667 et seq.

President Holmes: I am going to call on Mr. John I. Beggs, of Milwaukee, to open the discussion on the up-to-date street car.

Mr. Beggs: The question of cars is one, I presume, upon which every street railway manager has opinions, and they are the results of his individual experience and observation, and, as with the subject which we have discussed for the past two hours, we shall probably not reach any conclusion after criticizing or commending Mr. Chamberlain's paper.

As to the general principle involved and attempted to be accomplished by the car which Mr. Chamberlain has discussed, I fully agree with him; in fact, in our own system we have for five years past been developing a car which would meet the requirements of that service every day of the year.

There again comes in the question of geography. What would be possible in Milwaukee, on Lake Michigan, where we have a very short summer season and no very extreme heat, would not be possible in the Ohio Valley cities like Cincinnati, Louisville, St. Louis, and all the way down the Mississippi to New Orleans



where a very different condition exists, and what I might consider a car that would suit us all the year around would not fit in those localities. Therefore we must consider the conditions surrounding each company that may attempt to adopt this car.

We are gradually abandoning as fast as they are worn out, all our open cars. We adopted some five or six years ago a double truck, cross-seated car with the idea that we could make that answer our service. When the experiment was first made it was doubtful whether it would succeed, but after five years of operation and gradually changing the conditions of the line, we have now nearly our entire equipment of that standard, and in our climate it suits very much better than the double equipment of partially closed or partially open cars for the reason that we have very sudden changes, many times a drop of 30 degrees in 30 minutes when an open car would be very uncomfortable. To certain features of Mr. Chamberlain's car I am not ready to subscribe. The general principle of the car differs very little from that that has been adopted by quite a number of roads throughout the country, among which our own was possibly among the first. I appeared here for four or five years past, the first to defend a double truck long closed car that four or five years ago was combatted by a much larger number of this association than would combat it to-day.

In Mr. Chamberlain's car while he has a very good (and possibly to the general public a desirable) form of seat, there is considerable question in my mind as to its durability. I think there is too much complication under the seat and I understand that is one of the particular features of this car.

So far as the facility for converting it into an open car is concerned, I really see no advantage in it over that embodied in cars which we have had built for five years past, where the sash drops under the floor of the arm rail. We have doors in the front and that gives the largest possible opening in the front and rear; therefore we have comparatively an open car.

One of the disadvantages in Mr. Chamberlain's car so far as I am able to see with a hasty and rather cursory examination of his admirably written paper, is the fact that in our cars in practically the same space we are able to place more seats, which is a very important element; in fact, one of the strong arguments against the cross-seated car is that it is not capable, during the crowded hours of crowding so many people in. We, in a body of 29 ft. seat 44 passengers. The car under discussion has a body over corner-post of 28 ft. and seats 36 passengers, a difference of 8 passengers in its seating capacity.

Furthermore, there are many of these things that are very nice in theory, throwing these seats at congested hours longitudinally along the sides of the cars, is one of them. But we all know that in actual practice about as many of them would be turned over by the passengers as would be permitted to remain in that condition. There is nothing to do but touch a lever and you have confusion in a very short time. This method of seating, I think, would prove troublesome. These criticisms I extend because I have a great deal of respect for Mr. Chamberlain's mechanical skill and the manner in which he runs the shops of the Brooklyn Rapid Transit Co.; and I know he appreciates the spirit with which I speak in regard to this car; but I assumed, Mr. President, that I had to perform a duty to you in finding some fault with this car in order to provoke a discussion of it. In this matter of cars, as I have stated, I have listened with a great deal of interest to the discussions during the past two or three hours regarding the relations between interurban and city roads. Vitality connected with that is the character of the equipment to be used. Upon the two roads in our company we have gradually, in fact, persistently attempted to keep as close as possible to the same class of equipment upon the interurban roads as could be reasonably operated on our city line.

Mr. McCormack referred in his paper to a manager that had written to him that he didn't have any traffic agreements on his road and as far as it was possible for him to prevent it there would be none; that was myself. And I am more thoroughly convinced after listening to the arguments to-day, that the policy is good as far as it can be pursued, because this matter of equipment is bound to come up, there will come the conflict. We see the question cropping out here now as to which road is producing the revenue. There are very few cities where the conditions

exist that have been referred to to-day, where by only traversing about 1,000 ft. of the city they get to the center. To my mind it is impossible to reach the center of a city without coming over at least three, four or five miles of city streets, and the interurban car must be brought over those streets. Otherwise we have lost all the advantages that are claimed for electrical interurban service. The traffic will soon be gravitating back to the steam road if you require a transfer at the city line or even annoy passengers by collecting another fare. In our system we try to collect a fare to wherever passengers are going and they are not annoyed after they reach our city line, they are carried through; there are transfers given them to any point in the city. For that reason the question as to whether a company is operating interurban lines will have a very important bearing upon the quality of the equipment that should be placed upon their tracks and that has a very considerable influence. In our new specifications for cars we have simply specifications for 100 cars and we tried to make them so that they will answer for either service, and the passengers do not really know the difference so far as the equipment is concerned. The tendency on every interurban road is for local passengers to wait for the higher speed interurban car. They know it makes better time and makes fewer stops, and therefore we try as far as possible to eliminate any distinctive difference between the interurban and the city car.

I have no doubt Mr. Chamberlain will be ready to convince us that this mechanism under his seat, the seats of his new car, is not likely to get out of order. Well, we have heard that regarding electrical apparatus for the past 15 years. I think we will have considerable difficulty when it comes to put in his car heaters, with that mechanism under his seat with the turning and jerking; I think he is very likely to have short circuits and trouble. I think the mechanical swinging apparatus will, after a very short time, begin to shackle and give an unpleasant noise of which we have enough, with the best devices we can get.

These are the objections that occur to me in my very casual examination of the car in question. I do not like his door to one side. We are now considering extending our car which is 41 ft. over all. After five or six years of careful operation and observation, we are now considering adding 5 ft. to our city car in order to put the space of two more car seats in it; but instead of putting in transverse seats, I propose to equip them with the longitudinal seats at the end, in other words, put at each end a longitudinal seat that will seat two persons, thereby giving greater ingress and egress facilities. We use double doors in the center of the car, so as to fill it during the summer season as far open as possible. We have 200 open cars which we are wearing out. We use them for special occasions, but we have many of our patrons that will wait until the standard car comes along, even in the hottest days of summer because of the greater comfort there is in riding.

President Holmes: Mr. Sergeant, I would like very much to hear you on the subject of the up-to-date street car. I am sure you can give us some information.

Mr. Sergeant: I had not expected to say anything on this question, though I believe as I think, Mr. Beggs stated, the type of car is purely a local condition. I think the people of one community have habits different from the habits of other communities and want a different type of car. A good deal depends upon the way those people have been educated, what kind of facilities they have become accustomed to. On the question of double equipment, I suppose that everybody for years has been trying to and hoping to see some kind of a car constructed that would be a summer car and a winter car and some of our builders have developed very ingenious devices. I think Mr. Chamberlain's car is also an ingenious device, but is it really a substitute? Is it really a box car and an open car?

I do not hesitate to say that if in hot weather in summer we had that sort of a car on our streets and also were running our ordinary open car with cross benches, that Mr. Chamberlain's car would get a few old people and old ladies that were afraid to be outdoors in the open air, but the public would take the other car, the open car, and at the same time if the thermometer dropped, as it might, they would seek that car. We have always been put to a large expense to provide a double equipment and we have it so duplicated—we have about 70 per cent. of our box cars always ready for use, even in the summer season when we



are running local cars; if the weather changes and a shower comes up we make it our practice as far as possible to substitute the box car for the open car. The reason we do this is to please the passengers, and that means to make them ride. I am quite sure that if one reckons the capacity of the open cars, the additional motors and trucks, the enormous car house area which is involved in the storage of those open cars and reckons as near as he can estimate the additional business that he gets because of the open cars, that it would be very difficult to show a profit on the open cars. But that is not the question with us. The question with us is that the people have been accustomed to the open cars and they demand them, and while it would undoubtedly seriously curtail our gross earnings, I have no doubt if we had not investigated and the profit had not been computed there will be a greater readiness to take the compromise car something after this pattern.

I do not feel really qualified to make criticisms on this car. There was one thought suggested to my mind upon seeing the seat immediately in front of the other seat, that it was a natural place for the arm to be thrown behind the other seat, and that might be offensive if the parties were strangers, and one was a fellow with dirty clothes and the other a lady of nice dress. I think there is a great deal in the too intimate association of passengers as we find them associated in street cars. In cross seats it is very comfortable and nice for two friends, but, as we have to deal with all classes in the community, I am rather inclined to think that until cars can be classified that we ought as far as possible to avoid anything that tends to the intimacy of association by the immediate proximity of two passengers; there is a sort of moral protection in the longitudinal seat. People can sit there in very close proximity without being associated in that particular manner that they are when they have a seat that is practically two people together. There may be nothing in this criticism, but there is some prejudice against that form of seat. I have lived in hopes that the time might come when one car available equally for summer and winter use would manifestly be available, but I think, as far as I have seen, all compromise cars have introduced additional mechanism and additional parts which must necessarily make the maintenance of the car very much greater; and that is one reason why I think such cars will never come into very general use. We know very well what the longitudinal car may cost us to maintain. When we add mechanism to the car I think we are adding trouble and expense.

Of course I speak from the point of view of my narrow experience in one locality with very particular people. I think the Boston people have been kickers ever since they threw the tea overboard, and a car that would please them I do not think could be found, and what I say probably would not have any application elsewhere.

President Holmes: I would like to hear from some gentleman not representing Boston, Philadelphia or New York City, but some small city like my little town out West. Those are the kind of people that I always like to hear discuss these subjects at the convention.

Mr. Wason: In Cleveland we had an attempt a number of years ago to make a combination car take the place of a summer and winter car, but after several years of experience with the attempt we found it impossible to make one car answer both purposes. We were very anxious to get rid of the double equipment and built a cross-seated car with a door on one side, and since, we have changed those and taken the seats out and put them longitudinally; and it almost seems to me impossible, at least in certain localities, to make a car that will answer for both summer and winter. It would surely be a most useful arrangement if such were possible, but I doubt whether the state of the yard will admit of that at present. A combination of a claw hammer and a driver is about the maximum of utility. If you combine any other types or devices you are liable to spoil the attempt made. I believe the two cars will have to be used in most of the localities; local conditions purely will govern that.

Mr. Crosby: I should like to ask if we rightly understood Mr. Peggs. I think he said that in Milwaukee the people will wait for the standard car, which I think we will understand as a compromise or convertible car. Mr. Sergeant has stated that his experience in the past was quite to the contrary, and so is Mr. Wason's. My own experience would coincide with the two gen-

tlemen last named, and I think the merits of this question as to whether you can get as much riding with a compromise car as with the open car has much to do with what is to be the determination. The question could be put in two ways.

Let us suppose, in the first place, that you have no competition; that you are to give to the public such facilities as it can get during the summer; and in the second place, suppose you have competition. I would like if Mr. Peggs would say what he would advise in those two cases.

Mr. Peggs: Possibly my statement would be better understood if qualified or explained. All of our open cars are single truck cars. All our standard cars, as we call them, which are not what would be called in a sense a convertible car—but they are the standard cars we use year around, with the sash dropping into the sill to the arm rest, which are within the control of every passenger on the car; with the simple exception that in winter we put on a winter strip so that the sash cannot be opened at that time. In other respects they are the standard cars with double doors at both ends, giving the greatest amount of opening so as to get the air in the face of the passengers, giving the same effect by our cross seats as the open car; if you take the longitudinal-seated car and attempt to make it serve the purpose of the open car. It is a fact in our city that with our standard double truck cars, with a much easier riding more comfortable than the other, there never has been that objection. It may be that the community is different, but this assembling of passengers in twos has not been thought an unnecessary or undue familiarity. I do not see what difference there is whether they are brushing against each other at the side, as in the longitudinal seats, where it is possible to crush persons very much tighter than in a cross-seated car, where only two people ever attempt to get in them.

Of course I qualify my answer by saying that possibly that would not be the case in Cincinnati, St. Louis or New Orleans, but where the temperature keeps down to a reasonable degree as in Milwaukee, that is the fact. After the closest observation of five years the statement is made positively, and we shall not be sorry when our entire open-car equipment is gone. The only advantage, so far as we are concerned, in the open car, is to take care of a baseball game, for instance; you can pack about twice as many in them as in the standard car, and we largely use those cars for that particular purpose.

Mr. Davidson, of Pittsburgh: I would like to say a few words as to one of the things Mr. Peggs has referred to. One of the roads I represent has an equipment of 125 open cars and about 70 closed cars. The closed car equipment is taken off the line entirely during the summer months.

I was somewhat interested in what effect the open cars had on the traffic, and early in the season this summer, before the weather was very warm, I selected one of our roads. It was a Sunday, when travel was expected to be quite good, and I put on the box and the open cars, so that every other car was an open car. The result of the day's business was that, notwithstanding the fact that the seating capacity of the open cars was just 50 per cent. of the closed car seating capacity, the business done by the open cars was somewhat more than twice that of the closed cars. I am satisfied that if I had continued that experiment for one month, I would have had very little traffic in the box car, and the summer cars would have gone on loaded to the guards, as they say.

Mr. Fuller: What kind of cars were those?

Mr. Davidson: Those cars are single truck cars, and the seats in the closed cars are longitudinal seats. The summer cars have the cross seats the full width of the body. I have ridden in box cars such as Mr. Peggs describes, with the ends largely open on account of the large doors and small windows, and I always found that I perceived a difference in the draft. It may be imaginary on my part, but the draft through the front door was something that I thought was more uncomfortable than that of the open car with a free draft, that is open on all sides. It may be imaginary, but I think there is something in it; and on hot summer nights the car that is open on all sides is certainly very much more agreeable.

Mr. Watson: I think Mr. Peggs, before he concludes with the open car, should strike some long 14-bench open cars, and he probably will have an opportunity of testing that will be to his advantage. I do not believe there is a very large difference between the changes of temperature in Milwaukee and Cleveland. We change as rapidly as he suggested, namely, 30 degrees in 30 minutes; still, we have our long bench open cars.

Mr. Beggs: I shall not attempt to combat the arguments that have been offered. In a single truck longitudinal seat car I am surprised that people ride at all. It is a very different proposition from what I call our standard car, with nothing whatever to interpose to the atmosphere except the posts other than getting the air around the feet, which it can in an open car. We have just as much air space in our standard car as in any open car that is built; that is all the difference. You have got the side posts. We have the sash swing down to the arm rail the entire distance. The ventilators are open. We do not get the draft that has been suggested by simply the doors, because it is open all around.

I think the argument that Mr. Sergeant made would possibly meet Mr. Wason's suggestion as to the 14-bench car.

I do not care about the gross receipts; it is the net receipts that I am after. We can afford to sacrifice something in gross receipts to avoid the multiplicity of equipment and the trouble and expense which it means to take care of it and the investment in it. I seriously question whether a car can be built that will suit in all localities. It, to a very great extent, depends upon views of the population you are dealing with; there is very much in that. What would be considered excellent service in one community, possibly would not be tolerated in another; and therefore I think that question needs to be very carefully noted as to whether at the end of the year, particularly if they pay the attention that the Boston company appears to, that in case of a cold squall coming up, there isn't every company that can immediately transfer, take off open equipment and put on closed; it is impracticable from operative standpoint, and I think very many times in your open cars out on the street in inclement weather people would prefer to use an umbrella rather than get in that open car and get drenched. I have seen people walk in preference. I myself at times would prefer to take a raincoat and an umbrella rather than take an open car.

Our short summer season in Milwaukee is not more than 90 days, and we cannot afford to keep the double equipment for that short season. It makes a very different condition. I think my friend will find if he had cross-seated cars built for the specific purpose of using them for summer use as well as winter, he would probably find different conditions from what he has stated.

As to what Mr. Wason has said, in Milwaukee, when the country was sweltering we were in fact having a very temperate climate, and we did not have a half-dozen days that it was uncomfortably hot. We could not begin to afford the double equipment and the means of maintaining it.

Mr. Chamberlain: Just a word. The greatest pleasure of to-day is to hear this sound criticism. It is simply delightful. A man that comes into the market with such a thing as this must expect to be criticized, and I wanted to hear what you had to say about it and especially to hear from Mr. Beggs. He says he seats 44 people in a 29 ft. car, I think.

Mr. Beggs: Yes, in a 29-ft. body.

Mr. Chamberlain: Your seats are transverse?

Mr. Beggs: Yes, sir; 18 are transverse, and two on the end.

Mr. Chamberlain: What is your aisle space?

Mr. Beggs: Our aisle space is about 22 in., as I recall it. Our cars are somewhat wider than yours, Mr. Chamberlain; we get 8 ft. 5 in. into our car.

Mr. Chamberlain: The conditions that obtain at this particular part of the country are somewhat different. We have a car of 7 ft. 1 in. on the inside. We would have very considerable difficulty in getting our passengers in New York streets through the loops and getting the passengers and conductors through an narrow aisle. Somebody would be squeezed; it would be practically impossible to get through. We have to use the concave panels on account of the narrow streets.

Mr. Beggs: We have concave sides.

Mr. Chamberlain: I regret Mr. Beggs did not read the article very carefully. I stated in that article that no novelty was claimed for the construction of this body. I wish to say the car you see downstairs was operated for eight months. The seats, the particular seats, were operated for six months. There has not been one penny spent during those six months for maintenance or repairs to those seats. Those seats in operation being in longitudinal position, are changed by the conductor, and no seat has

been changed in six months by a passenger.

Now, we have some cars very similar to Mr. Beggs'. We go down the street, and sometimes our track gets comparatively rough; Mr. Beggs' does not, I think. The band plays all the way down town with the drop window; they not only furnish a receptacle for newspapers but for tobacco quids and cigar butts, which we find when we overhaul the cars.

As to the proposition of Mr. Sergeant, I am sorry that he thinks that the cars are immoral. He did not exactly say that, but that is about what it would amount to, the proposition of getting your hand around behind your neighbor. It is a question whether you can get any more familiar with your neighbor in those seats than you can in the other in going to Coney Island. I think that settles a few of the criticisms made.

Mr. Hopkins' paper on "Alternating and Direct Current Transmission on City Lines" was next presented. This paper was published in the "Daily Review" for Oct. 10, 1901, page 669, et seq.

President Holmes: I am going to ask Mr. Crosby to open the discussion.

Mr. Crosby: Mr. President, it has been impossible during the few minutes the pamphlet has been in my hands to note whether the distances involved are stated in this paper or not. In order that any general rule might be worked out, this should be detailed; I think the elements involved would necessarily have to be known. In other words, where a city is a very compact one, it will rarely arise that you will need the alternating current. It would have been I think helpful if the author had, after stating his case, carefully given an indication of what distances would suggest the proper use of the alternating current. It would be an exceedingly difficult discussion to carry on in this sort of a convention perhaps. It is perhaps too technical for any proper treatment here and would require a careful examination. I think it, therefore, almost impossible to add anything of interest.

In a city of the general size of Utica the use of alternating current for railway service did not at all seem desirable until the question came up of suburban roads, which roads in one case were sixteen miles, in another case twelve miles, and in another case eleven miles from the center of the city, and when those cases arose it did seem to be the fact that the alternating current should be used for transmission on those outside lines; in the meantime keeping all the inside business within the direct service. I think that this paper may throw some light on the subject.

Mr. Hopkins: It would seem desirable to use this voltage on transmission lines, consisting of three No. 4, B. & S. feeders from the Spring street power station to Milo, a distance of two miles. That sub-station was to take the place of a steam station. We have two steam power plants, which we operate most of the time. Our idea was to locate one rotary at a distance of two miles, to take the place of the present steam station.

President Holmes: Is there any one that cares to discuss this subject? If not, we will close the discussion of the papers for the day. I will announce the nominating committee to select the place for the next convention, also to select an executive committee for the ensuing year.

The following gentlemen have been selected to act as your nominating committee, and recommend the place for the next meeting:

Charles S. Sergeant, of Boston, chairman; Albion E. Lang, of Toledo; Frank L. Fuller, of Wilkes Barre, Pa.; H. M. Sloan, of Chicago; W. W. Wheatly, of New York.

To-morrow we set apart to inspect the exhibits. There will be no meeting in this hall until Friday morning, in view of the fact that we have a large amount of unfinished business. We will adjourn until Friday morning at 9.30.

#### AN INVITATION TO ROME.

President Henry D. Cooke and Vice-President Willis E. Gray, of the Compressed Air Co., of New York, extends an invitation to delegates and others interested to inspect its factory at Rome, N. Y., as its guests, any time it is convenient. Attention is particularly called to an improved air motor, with which the Rome City Street Railway is equipped. Free transportation and all information will be furnished upon application at the New York office, 621 Broadway.

## EARLY NEW YORK ROADS.

An Interesting Letter from Ex-Mayor Abraham S. Hewitt, of Cooper, Hewitt & Co.

Editor "Street Railway Review": I am in receipt of your letter asking me to give you some information in reference to the original construction of the street railways in the city of New York. All the grants originally made for the Second, Third, Sixth and Eighth avenue lines were offered without cost to Cooper & Hewitt, who at that time were the owners of the iron works at Trenton, where special rails had been made for many years. The late Peter Cooper was at that time the controlling power in our firm, although he was not a member of it. It had been his policy all his life to refrain from having any interest in grants made by the city of New York for public improvements. He was a man of great public spirit and, as all the world now knows, of singular disinterestedness of character. He was not willing that either he or the members of his family should be placed in the false position of being charged in the future as having profited by public grants. Other parties finally availed themselves of the opportunity offered to us. Our connection with the enterprise, was, therefore, limited to the manufacture of the rails, which was conducted at Trenton for all the lines referred to, and later for the Ninth avenue line. The original groove rail was designed by me. The center bearing rail, subsequently used, was also designed by me, the object being to prevent trucks from traveling in the groove.

After the construction of these railroads had commenced, there was great pressure to secure the rails, and the price, which was originally about \$65 per ton, was advanced to \$90 per ton, which was the price paid by the Second Avenue Railroad Co. for its rails. In these days of cheap steel, these prices will seem to be very high, but at that time and in the state of the iron business they did not yield more than a fair profit.

The late George Law, who associated with him Oliver Charlick, conducted the Eighth and Ninth avenue lines, and showed much foresight in reference to the investment, which he personally superintended. The cars did not differ materially from those which have been used during the whole term of the existence of these railroads. They were smaller at first, and were, I think, all constructed by John Stephenson.

I think the roads all paid from the start, except possibly the Second avenue line, which, for a considerable time, had to struggle against serious difficulties.

I do not think that there is anything else of interest connected with the matter, except to call your attention to the fact that these grants originally went a begging and the companies, which took them up certainly did not at the outset find that they had secured very profitable investments. The growth of population, however, was rapid, and undoubtedly greatly promoted by the construction of these roads, which, so far as their extensions to the northward were concerned, were always made in advance of the actual existence of paying traffic. I think the early builders of these roads are entitled to grateful recollection, because at the time they were supposed to take a considerable risk, measured by the volume of the business as it then existed. They were men of much foresight, however, and the final results certainly justified their confidence in the success of the railways.

Sincerely yours.

ABRAM S. HEWITT.

## FLEXIBLE POLE BRACKETS.

The accompanying illustrations show two styles of flexible pole brackets made by the Ohio Brass Co., which have become very popular. Fig. 1 is the Wood's type, style A for wood poles, and in this a peculiar form of pole socket and hook casting is used for attaching the bracket to the pole. These castings, which are well shown in the enlarged view, in conjunction with the brace arm, admit of a vertical adjustment of the horizontal arm and give the additional feature also of allowing the bracket to be easily swung into position on the pole, the pole castings having been previously put up. The flexible end at the outer extremity of the bracket is designed to form a yielding support for the wire, allowing the car

to be operated at a high rate of speed without any evil results. The trolley wire hanger is suspended on steel strand cable between the curved arms which are on either side of it in substantially the same plane, so that the trolley wheel, should it accidentally leave the wire, will not strike it or become entangled in the suspension cable.

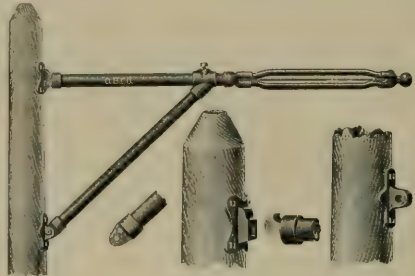


FIG. 1.

The Detroit type of flexible pole bracket, style B, for wood poles, is shown in Fig. 2, and possesses several features of merit which will commend it where a substantially constructed bracket of this form is preferred.

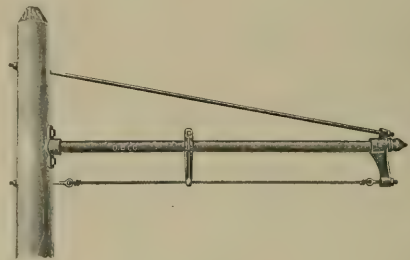


FIG. 2.

The Ohio Brass Co. has recently issued a new catalogue showing a very complete and varied assortment of pole brackets, comprising upward of 50 different styles, each of which is supplied in all the standard sizes commonly in use, and these brackets are made of either standard weight wrought iron pipe or structural steel tubing, as may be preferred.

Mr. William Lintern, master mechanic of the Cleveland, Elyria & Western Railway Co., Cleveland, Ohio, has invented a track sander that is giving very good satisfaction to several Western as well as Eastern railways. It is especially adapted to heavy service, being easily attached to the truck and delivering sand within two to four inches of the rail. It is being placed upon the market by the Nichols-Lintern Co., American Trust Building, Cleveland, Ohio, in three different styles. Among the roads fully equipped are the Union Traction Co., of Indiana, the Western Ohio Traction Co., Toledo & Western R. R., and Cleveland, Elyria & Western R. R.

Arthur W. Field, of Boston, accompanied by his new representative, Mr. George W. Barnes, is in attendance at the convention.

Mr. John Speer, president, and Mr. Andrew Kaul, Jr., of the Speer Carbon Co., of St. Marys, Pa., are attending the convention with their wives. Mr. Speer reports that the carbon brushes made by his company are steadily gaining in favor with street railway men.

Mr. G. C. Kuhlman, general manager of the G. C. Kuhlman Car Co., while at the Convention Hall on Wednesday, closed a contract with Mr. A. L. Parker, of the Detroit Construction Co., for nine large suburban car bodies for early spring delivery.



## THE EXHIBITS

At no previous convention have the exhibits—which constitute so important a feature of these gatherings—been so admirably housed. We have already called attention to this in our issue for Wednesday, and pointed out the reason for it—this year the exhibits were in charge of an expert.

Rules regarding signs and decorations were strictly enforced, and in consequence the general appearance of the hall was far better than at any previous convention. Ample facilities for installing apparatus were at hand, and under the direction of Mr. Nathan everything ran with remarkable smoothness, the exhibits nearly all being in order by Wednesday morning. The large number of papers presented before the association on Wednesday, and the lengthy discussions prevented us from including the descriptions of many exhibits in our issue of yesterday, but to-day we are able to present a considerable number of half-tone views which will give our stay-at-home readers an excellent idea of the display.

### ATLAS RAIL JOINTS.

The Atlas Railway Supply Co. has a complete line of its products on exhibit, including rail joints, braces and tie plates for all



kinds of rails. It also shows its primer and surfacer for car bodies and the IXL paint composition for all kinds of wood and metal work. The company is represented by J. G. McMichael and R. B. Kent.

### CHRISTENSEN AIR BRAKE.

The company has in operation a complete outfit of its automatic equipment, by which the motorman controls an entire train; also an independent motor and equipment adapted for single cars



and cars with trailers. It also exhibits one of its newest forms of axle compressor. Besides these, it manufactures air jackets, hoists, compressors for continuous running supplied with water jackets and compressors for high pressure. It is represented at the convention by the following gentlemen: N. A. Christensen, Milwaukee, Wis.; F. C. Randall, manager eastern district; James H. Fenton, chief engineer eastern district; Henry Pels, representative in Germany; George S. Hastings, western representative; W. A. Grauten, western representative; J. T. Cunningham, representative eastern district; George Cadwell, Milwaukee office; C. P. Tolman, Milwaukee office; A. B. Brodock and W. H. Goble, engineering department, eastern district; J. F. Dixon, Jr., New York office; J. N. Leet, J. E. Eldred and C. N. Leet, engineering department, western district.

### THE PITTSBURG REDUCTION WORKS.

This concern has an interesting exhibit of all sizes of feeders, with a complete section of a pole line of natural size. The exhibit covers all the natural sections that would arise in using aluminum



as an electrical conductor, including an exhibit of joints, etc. Visitors, especially delegates, are presented with an attractive souvenir. The company is represented by Arthur B. Davis, general manager; A. K. Lawrie, general sales agent; Percy Hodges, Boston agent; James A. Rutherford, Cleveland; Safford K. Colby, New York manager.

### AMERICAN VITRIFIED CONDUIT CO.

On the left of the main entrance, near the door, is the very comprehensive exhibit of the American Vitrified Conduit Co., of New York, in charge of Mr. B. S. Barnard, its hustling representative.



who has charge of the entire sales of the company. This concern is especially well equipped, having a manufacturing capacity of 80,000 duct ft. of conduit a day. It is at present laying conduits for the rapid transit work in New York, the Metropolitan Street Railway Co., Manhattan Elevated, Brooklyn Rapid Transit, Boston Elevated, Springfield Street Railway and the Chicago City Railway companies. The company makes every variety of conduit known to the trade, all of vitrified clay, salt glazed. It makes a specialty of multiple ducts, of which a great number are turned out.

#### ELECTRIC STORAGE BATTERY CO.

At the far end of the main floor, to the left, this Philadelphia company shows several of its specialties, including its standard chloride accumulators, of which 2,768 are now in use by the Metropolitan Street Railway Co., of New York. It is known as type G 53, and is said to be the largest storage battery used by any railroad in the world.

The company also shows a cell of type F 19 in its new all-metal tank; also a motor-driven differential booster designed by the company and used in connection with its chloride accumulators for railway work.



Prominent in this exhibit is a switchboard, designed and built by the company, for the operation of batteries and boosters in railway work; also a chloride accumulator, type F 15, in a glass jar, mounted on the company's new glass sand tray.

A feature of the exhibit is a map of New York, on which is indicated all the plants installed on Manhattan Island for railway, central station and isolated lighting purposes. This map shows the 11 installations of the Metropolitan Street Railway Co., the 13 of the New York Edison Co., and a large number of isolated plants.

The company is distributing a bulletin in which are illustrated and described a large number of its plants, supplemented by very interesting curves. Copies of the bulletin will be mailed upon application.

Among the representatives of the Electric Storage Battery Co. in attendance are the following: Charles Blizard, manager sales department; Albert Taylor, manager New York office; E. L. Reynolds, manager Philadelphia sales office; J. L. Woodbridge, engineer sales department, and J. B. Entz, chief engineer.

#### A NEW TRANSFER CHECK.

The Globe Ticket Co., of Philadelphia, shows a number of styles of tickets and transfers, including a new transfer ticket that it considers an absolute check on fares, and which is used in Norfolk and Portsmouth, Va., with excellent results. The principal feature of this ticket lies in the retention by the conductor of a duplicate of the ticket he gives the passenger. It is known as the Brown patent, and the inventor, Mr. H. N. Brown, is present at the con-

vention. The vice-president of the company, Mr. W. C. Pope, is here also, assisted by Messrs. D. C. Griffiths and P. C. Snow.

The company distributes a useful souvenir in the shape of a desk calendar for 1902.

#### THE G. P. MAGANN AIR BRAKE CO.

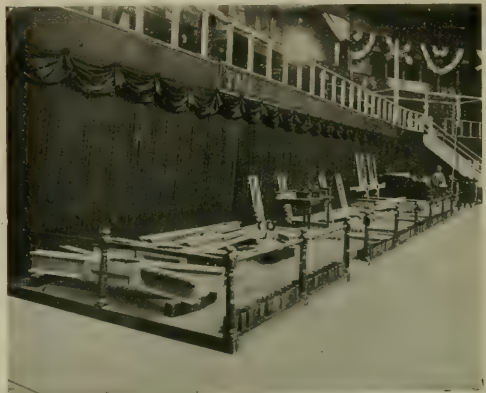
This company has a complete storage system, both straight air and automatic, with power house plant located in the basement. The brakes shown are all actual size, and in full working order,



giving exact reproductions of car equipment. The company is represented by D. C. Rutherford, manager; J. C. Grace, vice-president; W. M. Omick, superintendent, and H. Y. Harrison.

#### THE LORAIN STEEL CO.

Has an extensive line of special work and types of rails, the feature of the special work being a new device for removing hardened steel center plates with very little trouble. Also, in this connection, it exhibits an electric welded joint process. This improved process has been in use about five years. In the past three years 105 miles of track have been welded in Buffalo, where it is now shown to the best advantage. In this company's special work a 500,000 c. m. cable is welded to the continuous track on each side,



making a complete metallic return, allowing the replacing of worn pieces with new material. The most attractive feature of the exhibit seems to be the four-motor controller, type 64, and the two-motor controller, type 38-C.



In connection with this the company also has three of its typical Lorain motors, 37-h. p., 50-h. p. and 75h. p. types. It is represented by P. M. Boyd, of Lorain; H. C. Evans, New England agent; F. J. Drake, New York; D. J. Evans, Chicago; R. Clintz, Lorain; S. P. S. Ellis, Pittsburg; W. W. Kingston, Atlanta; H. D. Bayn, Cleveland; H. F. A. Kleinschmidt, Johnstown; A. B. Entwisle, Johnstown; F. A. Merrick, Johnstown, and O. H. Henry, Johnstown.

#### CROCKER-WHEELER CO.

This company is conspicuously located near the middle of the Convention Hall, and has on exhibition a field frame of 500-kw.



railway engine type generator, and a 300-kw. engine type generator complete. The company is making a specialty of street railway generators and boosters, and invites the inspection of all visiting delegates. Its representatives at the convention are: S. S. Wheeler, president; G. S. Dunn, vice-president and chief engineer; A. L. Doremus, secretary; P. A. Bates, assistant secretary; L. P. Hall, manager; J. H. Craig, Boston manager; Julian Roe, Chicago manager; W. H. Wissing, St. Louis manager; Paul Russell, Jr., Philadelphia manager, and F. B. DeGress, New York manager.

#### THE NEW PROCESS RAWHIDE CO.

This company, in addition to its usual exhibit, which is one of the most interesting in the building, shows a sign made out of a sheet of patent rawhide, the lettering being painted on the hide. This is merely an experiment, but might be easily, and probably will be, extensively used. The New Process "Rawhide" Pinions are known the world over as one of the few pinions made that are both noiseless and durable. The company's products have been indorsed and adopted by many leading lines. The exhibit is represented by Messrs. A. C. Vosburgh and T. G. Meachem, who are unremitting in their attention and explanations.

The New Process Rawhide Co. is giving away a handsome souvenir in the shape of a matchbox made of this patent rawhide. A cigar cutter at the end of the box tends to its use and attractiveness.

#### LIFEGUARD COMBINATION BRAKE.

Mr. George F. Brandou, of Utica, N. Y., and his son, Charles W., exhibit in the southeast corner of the annex a working model of an "Automatic Lifeguard Accident Railway Car Combination Brake." It is an ordinary brake, combined with an automatic lifeguard placed in front of the car in lieu of a fender, which works in connection with the emergency brake without the aid of the motorman. It is self-acting and is operated very simply. If a person is struck by the lifeguard, the guard yields, releases the brake and the car comes to a sudden stop. The Brandau brake will not allow a car to run away wild on a steep grade, either, it is claimed.

#### NEW ELECTRIC CAR HEATER.

The Bay State Electric Heat & Light Co., of Boston, submits a new electric car heater for inspection this year, which, it is claimed, embodies the latest and best principles to insure economy, safety, durability, circulation, purity and general satisfaction. Ordinarily but one heater is put into a car (although the longest vehicles may require two), and that is placed at one end under the seat. The outfit consists of a frame supporting a web of special resistance wire, an electric motor with fan, electrically connected in series with the heater, and a special switch to graduate degrees of heat and maintain constant speed of the motor. The heated air passes into a duct enclosed in a wooden box running the length of the car, the face of which takes the place of the riser or heelboard. At the lower edge of the board is a slot extending the entire length of the car and graduated from about  $\frac{1}{4}$  in. at the heater end to  $1\frac{1}{4}$  in. at the opposite end. Through this slot the heat issues. It is claimed that one outfit will easily replace six stationary heaters.

In connection with this exhibit is a new lamp called the Bernstein Lowat, manufactured by the Bernstein Electric Manufacturing Co., also of Boston. The feature of this lamp is a complete reflector entirely within the bulb and directly behind a multi-coiled carbon.

Mr. Edgar S. Gardner, superintendent of both these companies, has working models to aid him in expounding their fine points.

#### PARTRIDGE CARBON WORKS.

The Partridge self-lubricating carbon brushes still hold their own for all classes of motors and generators. Made from one quality in four grades, each has its special field. With every brush guaranteed, no fault can be found with this particular exhibit, which is presided over by Mr. James Partridge, who reports that business is good, and increasing daily.

#### THE CRANE CO.

The Crane Co., of Chicago, has a very fine exhibit. This includes a 24-in. gate, which is one of the largest that is made. Of this size the company has shipped several to Cuba with shipment of other smaller sized valves. The company also exhibits one of its No. 10-E extra heavy outside screw and yoke valves,



which stand a pressure of 250 lb. working pressure. These valves are tested to 800 lb. The company has a novelty in the form of a brass tree, which is composed of oil cups, grease cups, dip cups, air cocks, whistles, reef valves, and all the brass specialties which it makes. Another line of brass valves of which there is a very fine exhibit includes extra heavy gates and globes, with a working pressure of 250 lb. Also sample lines of radiator gates, globes and check valves.



The Crane Co. received a few weeks ago the largest order for valves and fittings that has ever been placed in the City of New York, for the new Glucose Works opposite 125th St. Also, it is furnishing the valves and fittings for the new 100,000 h. p. plant of the New York Edison Co., at Thirty-sixth St. and First Ave.

#### GOULD STORAGE BATTERY CO.

Mr. W. W. Donaldson, who represents the Gould Storage Battery Co., claims that the Gould battery is the ideal battery, and more, too. His explanations as to the construction of the particular battery he represents are interesting, and the practicability of the different



processes to evolve such a battery is illustrated by his exhibit. The Gould company claims that its electro-chemically formed plate is peculiarly fitted, where heavy work is to be done, and where deterioration must be reduced to a minimum, and will be pleased to hear from any one interested in the subject of storage batteries.

#### NEW ELECTRIC SWITCHES.

One of the centres of attraction at the convention exhibit is the booth of the Albert & J. M. Anderson Manufacturing Co., of Boston, located about midway on the left hand balcony, where, in addition to a variety of ordinary switches, switchboards, line material and insulators, a new 1,000-kw. Edison switch, designed by



the Edison Co., is prominently shown. It is claimed to be the most compact switch for its size ever designed, the weight of the single switch being 2,500 pounds.

There is also shown a 6,000-ampere, double pole, double throw knife switch made for the United States Government printing office and designed by W. H. Tapley, chief electrician at Washing-

ton, D. C. It is a very easy switch to throw, for its size, one man being able to operate it with ease.

This company shows also a trolley wheel that ran for 12,000 miles on the famous Jungfrau (Switzerland) road. The evenness with which it is worn surprises railroad men, considering the great currents the wheel had to carry. Prominent, too, in this exhibit, is an Ajax switch, one of the first of the quick-break switches used. It is as good to-day as ever, and has as many friends, says Manager Ernest Woltmann, of the New York office. Mr. Albert Anderson came on from Boston to superintend the company's exhibit.

#### THE WEBER RAIL JOINT MANUFACTURING CO.

has an exhibit of the Weber rail joints fitted to all kinds of rails; also an extensive list of views of roads where its joints are now in



active service. The company is represented by J. C. Barr, general sales agent; George L. Hall, engineer; F. A. Poor, engineer; Harold P. Chapman; E. F. Schermerhorn, and William Thruelsen.

#### MOTOR BEARINGS AND SHELLS.

The Brady Brass Co., of Jersey City, has an attractive metal display in the annex on the right of the main entrance. The leader for this year is an electric railway motor bearing, either cast-iron babbitted or of solid bronze. The company has installed special machinery to turn the motors out quickly. It also makes a specialty of motor shells. In addition are shown all kinds of bronze and brass castings, babbitt and anti-friction metals, solder, trolley wheels, battery zincs and Cyprus metal. Friends who visit the Brady Brass Co.'s booth are presented with a convenient pocket case containing six lead pencils, bronzed throughout and rubber-tipped and inscribed: "For street railway service."

The company is represented by D. M. Brady, president; C. P. King, C. M. Reubens, F. C. Cameron and E. F. Wilmerding.

#### LUMEN BRONZE BEARINGS.

The Bierbaum & Merriek Metal Co. has an exhibit of Lumen bronze bearings and Ideal trolley wheels conveniently located in space provided by the Morris Electric Co., in the balcony, not far from the main entrance, on the right hand side. It shows a number of bearings and check plates made for the J. G. Brill Co., McGuire Manufacturing Co., Peckham Manufacturing Co. and the Baltimore Car Wheel Works, all of whom are regular users of the Lumen bronze bearings. The company also exhibits castings for the G. E. 66 axle bearing. General Manager W. H. Barr is in charge, assisted by Mr. Edward P. Sharp, manager of the street railway department. They take pleasure in presenting callers neatly bound pocket programmes of the convention, as well as a sample "Lumen" bearing.

## HEATING AND COOKING.

The Simplex Electrical Co., of Boston, has a modest, but none the less highly interesting exhibit, pretty well along on the left balcony, in which it shows car heaters, car switches and cooking stoves. In connection with the last named are shown broilers, ovens, air heaters and cooking utensils.

The car heaters are known as "The American," and it is claimed for them that they are practically indestructible and are operated with absolutely no cost for repairs. Five years' use of the company's switches, it is said, has shown them to be equally good. Mr. Roger Williams, New York agent, is in charge of the exhibit.

## BISHOP GUTTA PERCHA CO.

This company has an interesting, if small, exhibit at the Madison Ave. end of the gallery. It includes specimens of gutta percha, crude, in process and manufactured; a gutta percha "biscuit" fresh from the forest being a feature. The company's headquarters are at 420 East 25th St., Manhattan. Here it manufactures high grade insulated wire and cables (rubber and gutta percha) and makes a specialty of wire for street cars, light power and central station work, as well as underground, overhead and sub-marine. Nothing but the very best grades of Para rubber are used, no shoddy or re-claimed rubber entering into the product. Mr. H. D. Reed, the superintendent, and Mr. I. W. Smith, electrician, extend courtesies to visitors.

## THE TAYLOR ELECTRIC TRUCK CO.

is exhibiting a standard 7 ft. wheel base single truck, an extra heavy 8 ft. wheel base single truck, a standard "Empire State" radial truck, irregular swing motion double truck, a pair of short wheel base double trucks, and an extra heavy swing motion double truck especially designed for severe high speed service. The ex-



hibit is very complete, and is represented by John Taylor, G. A. Tupper and Robert Kasson.

## HAM SAND BOX.

The Ham Sand Box Co. and the Trojan Trolley Fender Co. are represented by A. W. Ham and R. H. Ham. They are making a special exhibit of their trolley catcher, which they claim is the only locking device in the world which is not controlled by springs. They are exhibiting four types of sand boxes, intermittent and double intermittent, and two continuous feed boxes.

## FOWLER &amp; ROBERTS MFG. CO.

Just at the entrance of the main hall, on the right, the visitor will see this company's exhibit, showing several registers and a full line of street railway supplies. Prominent in the collection are single and double numeral registers, as well as the Lewis &

Fowler register, both old style and improved, handled exclusively by this company. The officers of the company, who are in daily attendance, are President J. W. Fowler and Secretary George E. Linch. E. Parker and F. A. Morrell, representatives, assist in doing the honors and, as they are located where they can see everybody who comes in, they are kept busy.

## HEYWOOD BROS. &amp; WAKEFIELD CO.

In a commanding position in the right balcony this company exhibits its latest car seats, revolving, walkover and other patterns, in plush, leather or rattan, while two of its specialties are shown to advantage elsewhere. Its No. 4 wheeler seat is exhibited in the J. G. Brill semi-convertible car, shown by the Standard Traction



Brake Co., in the rear of the hall; also in a section at the Brill exhibit. The Brooklyn Heights standard type of revolving chairs, shown in the car exhibited by that road, is made exclusively by this company, also. Mr. F. H. Henry, of Wakefield, Mass., and Mr. Bertram Berry, of New York, represent the company.

## GOLD STREET CAR HEATING CO.

This company is represented by Messrs. E. E. Gold and John E. Ward, who report many calls and excellent business. A full line of the Gold heater is shown. Stress is laid on the new regulating



switch, which the company claims to be perfect, both electrically and mechanically. The souvenirs which are so generously donated by the company take the form of the America's cup, which was lately defended by the Columbia.



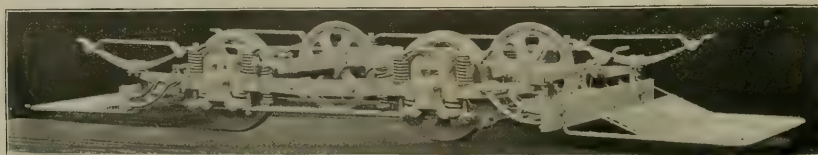
## TWO WELL KNOWN TRUCKS IN THE BRILL EXHIBIT.

There are two trucks in the Brill exhibit which deserve special attention. The first of these is the Brill No. 21—E, a four-wheeled truck of the non-pivotal type, possessing a number of unique features. The company makes the following statement concerning this truck: "That its principles are correct is shown by the fact that it is the easiest and most steady riding of any of the four wheeled non-pivotal types. The solid forged frame is also a feature which ought to attract attention. Practically there are no repairs to such a frame, since the forging once in place, keeps its shape and is a perfect support for the springs. The frame is carried on eight journal springs resting on bars on each side of the boxes. This is a feature which deserves attention, because it reduces very materially the pounding of the heavy motors and increases the life of the track as well as the truck. On top of this forged frame are placed the springs which carry the car body. These by their diverse character, their position and their varying capacities, carry the body without galloping, and in the easiest manner. They are arranged to take the longest as well as the shortest cars and the trussing applied gives long bodied cars ample support. Very many roads will find that a 4-wheeled car is ample for their requirements and they would

## OPENING OF THE CHICAGO &amp; JOLIET.

The official opening of the interurban division of the Chicago & Joliet trolley road took place Sept. 25, 1901, when a large party of guests at the invitation of the company made the initial tour of inspection over the line. Several carloads of visitors started from Clark and Washington streets, Chicago, in special cars of the Chicago City Ry. and rode to the city limits at Archer Ave., where connection was made with the new Joliet line. The party was in charge of the officers of the new road and each guest was provided with a white ribbon badge.

The new interurban cars are of the semi-convertible type and are divided into two compartments, one general compartment and the other a smoking room on some cars, and a baggage room on others. They have handsomely finished interiors with all the most modern appointments. There is a toilet room between the compartments and the seats are of the walkover type. Each car is equipped with four 25 H. P. motors, which are geared for high speed, and the trip between the city limits of Chicago and Joliet was made in 65 minutes, which compares very favorably with the steam road service between these cities. A large part of the route lies upon private rights of way, and on these portions the line is a double track one.



BRILL 21-E TRUCK.

be relieved from most of the objections which have been urged against such cars, by the use of the Brill No. 21—E truck, which seems to be the ideal truck for light service."

The second truck referred to is the Brill "Eureka" maximum traction truck. The number of these in service is enormous and are said to be in use under as great a variety of conditions as any other truck hitherto built. This is the type that is standard on the Metropolitan Street Ry. of New York City, where 2,650 of these double trucks are in operation. The Brooklyn Heights Railroad Co. is using the same type, as is also the Coney Island & Brooklyn Railroad Co., there being altogether about 4,640 in Greater New York. The leading features of the Brill maximum traction trucks are the use of single motors and placing the greater portion of the load upon the driving wheels; at the same time they bring the platform down so low that the step can be of the same height as that of a 4-wheeled car. They can also be used under open cars without increasing the height or width. These trucks are claimed to act as well on curves as on tangents, and while providing space for the very largest motors, make it unnecessary to cut large pockets for them in the steps of open cars. It is said that with the "Eureka" trucks a car weighing 22,500 lb. brings no heavier weight upon the wheel or upon any one point in the track than an 18,000 lb. 4-wheeled car, and at the same time the car rides more steadily, owing to the fact that there is no pounding, pitching and lurching, which is the characteristic of most rigid trucks.

The special field for these trucks is in fast heavy city and suburban service, especially wherever it is necessary to use both open and closed cars on the same line. They accelerate rapidly and hence it is possible to make good time on roads where stops are frequent. In this way they become economical, as at the present day a large daily mileage is one of the great sources of profit. The company makes the statement that the "Eureka" maximum traction can be run at speeds up to 40 miles per hour.

Messrs. H. M. Shaw & Co., makers of machinery and general supplies, with factories at Pittsburg, Pa., Newark, N. J., and Ballston Spa, N. Y., report through their Mr. C. J. Harrington very heavy recent sales of snow sweepers, car barn fittings, overhead insulation, span wire and rail bonds. The winter outlook is very promising.

Where the road emerges on the highways there is single track construction with turnouts. The track is very substantially built with broken stone ballast, and as the grades are but few and insignificant and the curves of long radius, there is every facility for acquiring high rates of speed.

After passing over the interurban line and the Joliet city lines, the party was taken to the race track, about two miles beyond the city, where the road terminates. Here a large local delegation was added to the visiting party and the whole assembly was led to an immense dining room preceded by a band, which discoursed many musical selections while the party discussed a bountiful and highly appreciated luncheon. There were about 600 people seated, and as the lunch hour had been delayed for an hour or more, this part of the program was executed with much vigor by all present.

The speeches which followed were of a congratulatory nature, and much satisfaction was expressed that the two terminal cities, as well as a number of intermediate places were at last brought into easy and rapid intercommunication. The day was nearly spent when the party embarked for home, and the thanks of all present are due the management of the Chicago & Joliet for a thoroughly enjoyable outing.

The officers of the Chicago & Joliet Company are: President, S. L. De Coursey; vice-president, H. J. Crowley; secretary and treasurer, C. L. S. Tingley; general manager, F. E. Fisher; chief engineer, A. S. Kibbe. Our readers may be sure that the road is all right, because the officers are all at the convention.

## "PUSH-OVER" CAR SEATS.

The American Car Seat Co., of Brooklyn, N. Y., shows several of its latest ideas to good advantage, its products being upholstered in rattan, plush or leather. The principal claim put forth by Mr. William M. Adler, the genial salesman in charge, is that all the rattan seating the company makes is the more durable because free from brass clips. The "push-over" seat is easy of action and has a patent hold-on handle, while all the "American" seating is built upon a patented interlocking steel spring plate. Miss M. A. Callahan assists Mr. Adler at the exhibit.



## A DEAD-HEAD.

As soon as I got on the car I knew him for an old horse-car conductor. The vicious way that he glanced at the motorman's back for bringing the car to a full stop for a mere man was one sign and the slow, heavy "bang! bang!" of the go-ahead signal told of long use of a flat-leather bell-strap and a heavy clapper.

He knew that I had sized him up and as he took my fare he cast his mind back over the old days and thought how very pleasant he could have made it for me then, and he examined the nickel I gave him carefully and ran over the new rules and regulations in his mind to see if there was anything unfavorably applicable to my case. I felt really sorry for him, he seemed so out of place on that bright, clean, rapid and smooth running electric, so I felt in my pocket for a cigar that Jack had pressed on me before I left. It was one of a hundred beautiful, smooth, shiny and symmetrical ones each of which had a little red-and-gold girdle on it and were in a box that was resplendent with silver and blue paper and bird's-eye views of immaculate tobacco plantations in Cuba and a whole lot of Spanish words ending in "dad." It had been a Christmas present from Mollie and if ever I doubted Jack's friendship those doubts flew away at once when he opened up the box—from which only one cigar had been taken—and, when I gingerly pulled out one from under the yellow ribbon, pressed me to "put a lot in my pocket to smoke when I got home." But Mollie was watching me with a very curious look in her usually soft blue eyes and so—I only took one!

And this one I now took out of my pocket and, sauntering to the back platform, proffered it to No. 89 with the remark,

"Pretty lonely run out here sometimes, isn't it?" for I was the only passenger.

He cast a furtive look at the motorman, slipped the cigar quickly into his coat pocket and answered,

"Thankee, I'll smoke it after a bit; ain't allowed to smoke on these noowadays! Yes, sir, it's a lonely run here o' nights, these dirty electric is killing travel right along!"

"You don't say! Why I thought they had helped traffic?"

"Not a bit of it! Why, I've carried more people with one horse and a Slawson-box in one day than this thing with fifteen horses to the axle carries in a week!"

"That so?"

"Yes, sir! Why, in these things goin' fifteen mile an hour just as if they was on a billiard table people don't feel as if they was travellin', don't seem to get their money's worth! You see, they're no sooner on and got a seat than they has to get off, no time to chat or listen to the other folks' chat! And these 'ere electric lights—why, lots of folks tells me as they've about ruined their eyes readin' their papers agoin' home at night. No one never tried to read papers in the old cars—they knowed they couldn't so they just set there or hung on to the strap and travelled their money's worth, you could tell you *were* travelling in them days!"

I gazed at him in awe—tempered with joy! Here was a find indeed; a regular black-letter volume of street-car history bound in ass's skin! So I said—cautiously feeling my way—

"I suppose you've had many queer experiences in the old days?"

"Betcher life!"

"What was the queerest one you remember?"

"Well, I dunno as I could put my hand on any special queer one just now. If you're curious that way, I'll try to think up some of them an' tell you the next time you ride."

But I remembered that in the meantime he would probably smoke that cigar and—for some reason or other—might not be on duty, so I said,

"Oh, I guess you can tell me one tonight and think up some better ones to tell me later. You've got fifteen minutes to where I get off at Elm street."

"Well, sir, I'll tell you one of the queerest things that ever happened to me. I useter tell it often when Bill Hendricks was alive—he was my driver for years—but since he died—and there's a queer tale to that, too—an' I've had to handle the tale on my own v'racity, so many folks gives me the laugh about it that I've quit telling it—but it's true all the same!"

"Well, I'll promise not to laugh and I'll believe it, too," for I knew that I was in for something good even if its "v'racity" might be questioned.

"Well, sir, I was conductin' then on the old Paradise Street line; that's twenty-five years ago, and we had lots of regular customers—half-hour schedule and stop at your door while you kissed the baby good-bye—an' some of 'em was queer and some of 'em was funny; but the funniest one of 'em all on that run was an old fellow that I useter call 'slip-the-fare.' You see, the way I come to do that was this: the first time he rode on my car it was bitter cold weather and my hands was numb an' when I went to take his fare it slipped out o' my fingers an' rolled in among the hay on the floor and he picks it up and puts it into my pocket an' says, says he, 'I'll slip the fare in myself!' an' ever after that he useter have his fare ready an' drop it in my pocket 'till it got so I never thought about reachin' for it or countin' it. He was a steady rider an' never missed a week-day for goin' on three years, got on at Wilkes St. on our 9 o'clock trip down an' went back with us on our 7:30 trip up. Well, one day I missed him an' didn't see nothin' of him for severl' days an' so I says to Bill, says I, 'Bill, what's become of old "Slip-the-fare," he ain' been on the car for two or three days?' 'Why,' says he, 'he's sick with 'neumony an' ain't expected to live.' Says I, 'Well, I'm sorry to hear that, I'd like to see the old fellow again just to say good night to him.' For he was a cheerful o' cuss an' always told me 'good night' and 'good morning.' Well, I didn't say no more to Bill about him then, but the old fellow was more or less in my mind for some days an' then he sort o' slipped out o' my thoughts. Well, about a week after that we was on our owl-trip in with an empty car. We was late, an' it was bitter cold with a fine dry snow flyin' an' Bill pushin' the horses along for all they was worth an' havin' his hands full adoin' it, when all of a sudden a passenger slung aboard an' opened the door an' come in. He was covered with snow an' never said a word an' when I went to get his fare he slipped it into my pocket an' then I looked closter an' here it was old 'slip-the-fare' hisself, but lookin' mighty gaunt an' thin—puffectly awful he looked with his face all yaller an' tied up with a white cloth under his chin!

"So, I says to him, says I, 'Well, sir, I'm glad to see you out again,' says I, 'but it's an awful night for a convalescent from 'neumony to be out in!' but he never answered a word—just turns away an' looks out o' the window. 'Well,' thinks I, 'you ain't feelin' very chipper yet!' so I says no more to him an' we pushed along until we come opposite the gate of old St. Paul's graveyard—it's been moved this fifteen years—an' what does the fellow do but raise his hand for me to stop the car, so I gave Bill one bell an' the old fellow gets off without a word an' as he passed me I noticed that the snow on his face wasn't melted yet. Well, I thought the whole thing so funny that I went front an' opened the door an' says to Bill, says I, 'Bill, did you notice who that was got off just now?' an' Bill says, 'Notice nothin! I ain't got no time to notice passengers tonight!' 'Well,' says I, 'it was old "slip-the-fare," an' he got off at St. Paul's instead of Wilkes St.! An' then Bill turns round to me an' says 'Ah, come off! You're ratty!' just that way! An' I says, says I, 'Ratty nothin! What's the matter with you?' An' Bill says, says he, 'Why, he's dead., 'Dead?' says I. 'Yes, an' buried,' says Bill. 'Buried in that same St. Paul's graveyard,' says he, 'for I see'd the funerl.' Well, sir, I didn't say no more but I run my hand into my pocket where he'd dropped his fare an' I brought it out an' what do you think it was? Two of those big copper pennies like undertakers useter put on dead people's eyes to keep 'em shut."

And the silence succeeding was only broken by the syren-like roar of the gears and the "zoo-o-o-o-o tick, zoo-o-o-o-o tick," of the trolley-wheel as it purred along the wire and struck the hard place under the hanger.

"This is your street, sir." Clang! "Good night, sir." Clang! Clang!

Members of the Association should not fail to call on the representative of the Crane Co., Mr. P. A. Kimburg, who will give them all desired information in regard to the construction of the valves.

The Adams & Westlake Co., of Chicago, New York and Philadelphia, has desk room at the right hand side of the gallery, near the main entrance to the exhibition hall. Its representatives in attendance are Messrs. Ward W. Willits, W. S. Bartholomew, E. H. Stearns, A. S. Anderson and James H. Foster.

## PROGRESS IN CAR BUILDING.

The remarkable progress of the G. C. Kuhlman Car Co., of Cleveland, O., is exemplified very forcibly in the fulfilment of a recent order for the equipment of the Detroit & Toledo Shore Line with 15 coaches of the heavy suburban type, embracing the latest improvements, the shipment of which will begin on Nov. 10 next. In exterior, as well as interior design, these cars are practically a duplicate of the Pullman type and mark the beginning of a revolution in electric street cars for ordinary use. In interior decoration and finish, certainly, they embody great beauty, richness and comfort.

The interior woodwork is of Mexican mahogany, and the windows of the best French plate. The ceilings will be tinted robin's-egg blue and lined with delicate gilt mouldings. The seats are of Hale & Kilburn make, upholstered in figured plush, with corrugated high backs and spring edge cushions. All the trimmings will be of bronze, in special patterns of heavy design and highly polished. The curtains are to be of Pantasote material with silk face and edgings.

The forward end of the car body will be fitted up as a large smoking compartment, while in the rear end, at the left hand corner, will be a lavatory and a heater room for hot water heating, the Peter Smith system having been adopted.

The floors are to be double, filled with mineral wool, and the car steps will be of the Stanwood make.

The construction and build of the cars generally will be massive, and each car body contains in the neighborhood of 75,000 tons of iron. The trucks are extra heavy, of the Brill high speed, long wheel base pattern. Each car will be equipped with four 75-horse



NEW CAR FOR DETROIT &amp; TOLEDO SHORT LINE.

power motors, capable of negotiating any grade and hauling the maximum load.

The cars measure 51 ft. over all.

This large order is not the only one the G. C. Kuhlman Car Co. has under way, by any means, for it has just received an order for 12 passenger coaches for the Medina & Wooster extension of the Cleveland, Elyria & Western. These coaches are to be 47 ft. 4 in. over all and are to be finished in cherry, with Hale & Kilburn walk-over seats with grab handles and arm rests. Altogether this will be a modern, up-to-date interurban coach and will run between Cleveland, Medina and Wooster. These cars will be built at the company's new factory.

Prior to June 1st the company was known as the G. C. Kuhlman Co., but beginning on that date it has been reorganized as the G. C. Kuhlman Car Co. It is gratifying to all Mr. Kuhlman's friends to recall the growth of this business from his humble beginning a comparatively few years ago, with a modest yearly output, to the present splendid proportions of the new plant, with a capacity of 500 large suburban cars annually, which will be in complete operation by Dec. 15 of this year. The increased facilities will enable the company to give more prompt attention to deliveries and guarantee better workmanship, if that were possible, and likewise warrant reaching out for larger business.

The company is represented at the convention by General Manager G. C. Kuhlman and Secretary C. A. Ricks.

## STERLING-MEAKER CO. ENTERTAINS.

The Sterling-Meaker Co., of New York, gave a very nice luncheon to a great many of its friends yesterday, at the company's factory, 141 East Twenty-fifth street. During the afternoon a number of the leading street railway men of the country called and were entertained. Among those present were: H. H. Vreeland, Thomas Millin, H. C. Tully, G. F. Robinson and T. A. Delaney, of the Metropolitan Street Railway Company; D. S. Roache, of Philadelphia; W. H. Brownell, of New York; J. Mil- lar, H. A. Maclean and E. C. Robinson, of the Union Traction Co. of Chicago; Robert Given and Frank S. Given, of Lancaster, Pa.; T. M. Jenkins and George J. Smith, of the St. Louis & Suburban Ry.; J. Boyle Price, of the St. Louis Transit Co.; J. R. Lardnar, of the Tri-City Railway Co., Davenport, Ia.; Richard McCullough, of the Chicago City Ry.; T. E. Mitten, of Buffalo; General Falk, of Milwaukee; G. Tracy Rogers, of Binghamton, N. Y.; J. C. Lugar, of Huntington, W. Va.; J. C. Baldwin, Jr., of the Long Island Railroad Co.; Joseph Hanna, of Chicago; Jacob Wendell and R. L. McDuffie, of New York; W. H. Janney, of Folsom, Pa.; William Silver, of New York; Gus Suckow, of New York, and H. M. Sloan, of Chicago.

## SWITCH-THROWING FROM CAR.

The American Electric Switch Co., of Pittsburgh, Pa., presents an automatic electric track switch-throwing device operated directly from a controller on the car, without any extra attachments on the car. The mechanism can be adapted to any switch in the track

and it is claimed that it is impossible to have a blockade where the device is used, it having proved successful in all kinds of weather during the past two years. The company is at present installing 50 of these devices in Pittsburgh and trial switches are in operation in several other cities—notably by the Cincinnati Traction Co., Indianapolis Street Railway Co., and the Boston Elevated Railway Co. The device is shown by Mr. W. S. Berry, general manager; Mr. J. H. Spangler, the inventor, and Dr. Charles Sohn, secretary and treasurer of the company.

## R. D. NUTTALL CO.

Large contracts have been closed for machinery since the opening of the convention on behalf of this company by the president, Mr. F. A. Estey. Mr. L. W. O'Brien, the special representative, gives great accounts of business being done, and in view. With one of the largest gear cutting works in the world, to which additions are being made from time to time, the prospects of the company are "couleur de rose."

The Falk Co., Milwaukee, is represented by Mr. Otto H. Falk, vice-president, and Mr. E. A. Wurster, secretary and treasurer. The company did not make an exhibit at this meeting.



## THE PANTASOTE CO.

The exhibit of this company is in the south gallery, and is in the care of John M. High, manager, and H. M. Grier, Western agent. The display is artistically arranged and includes head-lining for



car bodies, a great variety of curtains, and coverings for seats and chairs having several seats, and chairs covered with Pantasote.

## A PRACTICAL EMERGENCY BRAKE.

An exhibit that is attracting much attention on the part of practical railroad men is the Fairchild emergency pavement brake, shown by Mr. Charles B. Fairchild, of 26 Cortlandt street, New York, in connection with the Peckham exhibit on the main floor. This brake, which is the invention of Mr. Fairchild, is designed to work on the paving whenever the car wheels slide or the hand brakes fail to work. It consists of an eccentric cylinder carrying heavy plate springs, and is mounted in the middle of single truck cars and under one end of double truck cars, being attached to the body of the car. It is applied by means of an endless wire rope that passes over a pulley under the hood.

To apply the brake the motorman clutches the rope with his left hand and pulls down. The rope operates a screw which carries the cylinder down until it touches the paving. Then the motion of the car turns the cylinder half way over and, in turning, raises the car body two inches, bringing nearly the whole weight of the car on to the free ends of the steel springs.

When the car stops the brake is released by pulling on the other run of the rope, when, as soon as the cylinder is free from the paving, it rights itself, the weight being greatest on the short radius side.

## DIAMOND STATE STEEL.

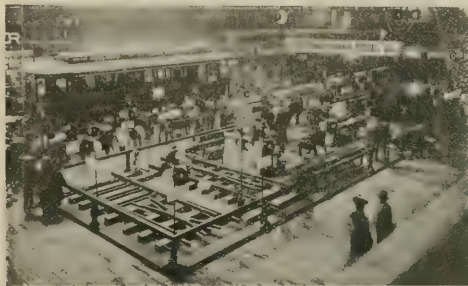
The Diamond State Steel Co., of Wilmington, Del., exhibits various track fastenings, the patented Churchill rail joint for girders and T-rails, the patented "Diamond" tie plate, and the patented "Diamond" spike. The company's booth is in the annex, to the right of the entrance, and is presided over by Mr. J. A. Parker, the company's New York representative.

## PENNSYLVANIA STEEL CO.

While there are not many features of this exhibit that are entirely new, the anvil faced work which is shown should attract the attention of all those interested in high speed electric traction. The company shows an anvil faced frog of comparative light rail section such as would be used in electric work and also one frog of a very acute street and steam crossing. These illustrate the adaptability of the anvil face and as the device has been in use for sometime on steam roads, the fact of its utility cannot be questioned. Two

styles of switches, both particularly adapted to street railways, are shown, one the Lorenz switch, which is so familiar to street railway men connected with interurban or suburban roads, and a reinforced switch, in which the rail is stiffened by an angle riveted to its web, thus doing away with the necessity for the many switch rods ordinarily used, besides materially strengthening and stiffening the rail.

In the girder rail work, the company shows first-class specimens of "Adamantine" construction, and, in addition to this, the new



system of "iron bound" adamantine, in which the hard center plates are so firmly fixed that they are practically an integral part of the work.

The Steel company is represented by the New York agent, Mr. S. W. Baldwin, and Mr. Charles S. Clark, of Boston, who have charge of the exhibit. In addition to these, the following are in attendance: Mr. F. W. Edmunds, Chicago; Mr. Richard Peters, Philadelphia; Mr. John T. Hill, Baltimore; Mr. F. A. Burr and Mr. A. E. Aeb, of New York; Mr. H. F. Martin, Mr. George W. Parsons, Mr. Mason D. Pratt and Mr. C. W. Reinhoel, of Steelton.

## ST. LOUIS CAR CO.

In this exhibit are found four types of spiral journal bearings for trucks and motors, and also the Anderson-Smith arc headlight in actual service. This headlight is specially designed to hold the light in the center of the mirror, preventing the shifting of the rays from one side of the track to the other. The company also



exhibits an elaborate display of photographs of cars of various designs. The company is represented by F. E. Huntress, general Eastern agent; George Kobusch, president; F. E. Snow, Eastern representative of the spiral journal department, and Messrs. William Plummer, T. N. Reed and W. J. Floyd.



## SPECIAL TYPE OF HEATER.

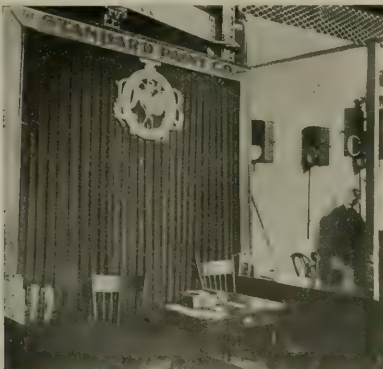
The Consolidated Car Heating Co. has a special type of electric heater in the car exhibited by the Brooklyn Rapid Transit Co. It is claimed that it is the only electric heater on the market adapted for use with individual revolving chairs, with which this car is equipped. The heater is also used in parlor cars, and in some cases, with cars having cross seats. The Consolidated's standard heaters for cross seat cars are installed in the Utica Belt Line car, exhibited by the John Stephenson Co., located just outside of the Garden. With both of the equipments, the



company's improved 3-point regulating switch is used. The Consolidated company is exhibiting a special heater adopted by the Manhattan Elevated Ry. of New York, and one just adopted by the Boston Elevated Ry. Cornell S. Hawley, the general eastern agent, with headquarters in the Havemeyer Building, Manhattan, reports that his company's sales have been larger this season than ever before; that it has received orders for electric heaters for more than 1,800 cars in the eastern territory since the 15th of June, and that the sales in the Central and Western States have also been unusually large.

## THE STANDARD PAINT CO.

makes the famous P. & B. insulating compound and insulating tape. The company has a booth in the west end of the gallery, and is presenting its friends with an artistic souvenir. It is rep-



resented by Ralph L. Shainwald, president; J. N. Richards, manager of the sales department; G. A. Myer, Hamburg representative; Charles Earnshaw, of Boston, and P. F. Vandewater, New York agent.

## STANDARD UNDERGROUND CABLE.

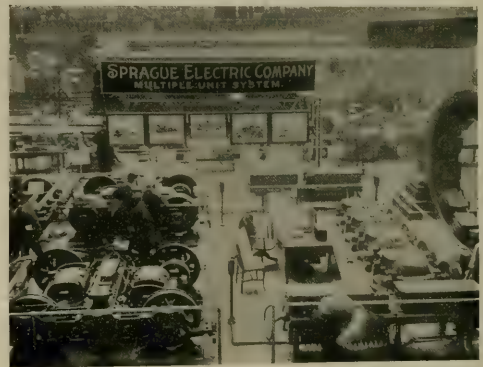
The Standard Underground Cable Company is represented by General Manager C. J. Marsh, Eastern and Northeastern Division; Manager T. E. Hughes, Southeastern Sales Department; Manager A. B. Saurman, Northeastern Sales Department; and Manager G. L. Wiley, Eastern Sales Department. These gentlemen show their usual activity in discussing wires and cables with the delegates and others. Samples of wires and cables of the Company's manufacture are exhibited at the New York office, 56 Liberty Street, and include all their many forms of underground, aerial and submarine cables and insulated wires.

## INTERNATIONAL REGISTERS.

The International Register Co. has an interesting exhibit of registers of its regular stock, which includes two types of single registers, two types of double registers, and a complete line of car fittings for operating registers. The exhibit is at the left in the entrance way, and is under the charge of A. H. Woodward, president, and W. H. Brown, secretary.

## THE SPRAGUE CO.

The Sprague Electric Co. has an interesting exhibit showing the working of the multiple unit system of control adapted to heavy railway service. Two complete motor cars and train line car equipments are shown consisting of main controllers, reversers, couplers and jumpers, master switches, etc. These are connected



to railway motors, showing the actual operation of the apparatus.

Photographs also show the trains in service on the Chicago South Side Elevated road, the Boston Elevated, and the Versailles Division of the Western Ry. of France. The company is represented by Frank J. Sprague, F. H. Shepard, Geo. H. Hill, H. G. Issertel, Alex Henderson, H. M. Davis and S. H. Libby.

## AMERICAN CIRCULAR LOOM CO.

Though not making an exhibition of its appliances, this company is represented by Mr. J. L. Kirkland, the New York manager, Mr. Thomas G. Grier, the Western manager, Mr. Robert Corey, and Mr. H. B. Kirkland, the home manager. These gentlemen are explaining the advantages of their looms, which are used on surface electric and elevated electric roads. The company is giving away a unique, but very acceptable, souvenir in the shape of a box containing a French clay pipe with "funny" bowl, a bag of tobacco and a box of matches.

## THE H. W. JOHNS MANUFACTURING CO.

This company is well advertised by the blowing of old fashioned fuses, which can be heard over the entire hall. The exhibit include the Sachs "Noark" fuses for all voltages, but prominence is given to cut-out devices for electric railway use, known as the "Standard" cut outs. An elaborate exhibition is being made of the practical use of the Sachs "Noark" fuse on normal load and overload. There is also a very complete line of trolley line insulators and fittings made of molded mica, and a large variety of "Vulcabeston" and "Monarch" insulated parts of various designs. The well-known H.



W. Johns electric heaters for car service are on exhibition and in practical operation; and the attention of visitors is attracted by the many pointedly worded signs shown in the exhibit. The following gentlemen represent the company in New York, Philadelphia, Chicago, Boston, Columbus and New Orleans: A. H. Berry, Joseph Sachs, J. W. Meek, S. G. Meek, J. W. Perry, E. B. Hatch, James Humphreys and D. T. Dickson.

## COLUMBIA MACHINE WORKS.

This company exhibits a full line of supplies made by it in Brooklyn, and shows as principal specialties brass car trimmings, commutators, trolley wheels and gear covers. It also shows the Millin patent car sign, made by it, and used on the entire system of the Metropolitan Street Railway Co. The booth is in the annex and is in charge of Manager J. G. Buehler and Mr. W. R. Kerschner, salesman.

## BAKER HEATERS.

One of the most interesting daily attendants at the convention is Mr. James G. Demarest, of New York, mechanical superintendent for the Estate of William C. Baker, makers of hot water car and steamboat heaters. Mr. Demarest has recently returned from a 3,000-mile trip across the continent, during which he received many orders for hot water heaters for electric cars. This is a new departure for the Baker people and is meeting with good success. The Brooklyn Bridge cars are heated by this method. Mr. Demarest has been with this company for more than 20 years.

## DUFF MANUFACTURING CO.

has on exhibition a complete line of the Barrett jacks, which may be classified as follows: Five drop jacks for track work; nine automatic lowering jacks for car barn and general street railway service; and one automatic jack, with a capacity of one ton, which weighs only  $4\frac{1}{2}$  lb. This latter is termed the "Miniature Giant." The exhibit is about midway of the north gallery, and is artistically arranged. The company is represented by J. R. McGinley, president; George F. Freed, superintendent, and J. S. Singer, New York agent.

## HERMAN PFEFFER.

Mr. Pfeffer, of 13-21 Park Row, New York, who is representing the American Mason Safety Tread Co., reports nothing new regarding this sure foothold. He thinks the fact that the invention has been recognized by the Manhattan Elevated, the Chicago Elevated, the Pullman Car Co., the Illinois Central R. R., the Brooklyn Rapid Transit, and is used by these companies, is guarantee enough of the merit of this efficient safety tread. In the prevention of accidents, and in saving companies actions for damages it is, and has proved to be, par excellence.

## "TROLLEY HARP PROBLEM SOLVED."

So says the Star Brass Works, of Kalamazoo, Mich., makers of the well-known Kalamazoo trolley wheel. The new harp which this company has perfected is claimed not only to avoid the wear on the spring, but to ensure its life to equal that of the harp. This new spring, made in the shape of a Y, is embedded in the outer side of the harp, which gives it perfect protection from all obstacles. The top points of the Y, which reach up on each side of the axle, are in contact with the extra heavy washer which is set inside the harp, and is held in a firm position by means of two lugs fitting in small apertures. The lugs give the contact with the tops of the Y spring. The wheel may be slipped in place without any effort, and the axle serves as a perfect lock for this simple combination. The harp has had a thorough test on the lines of the Michigan Traction Co., of Kalamazoo, Mich., and it proved a complete success.



KALAMAZOO TROLLEY HARP.

Some of the records of the Kalamazoo trolley wheel may be of interest at this time. They are as follows: 6-in. wheel, 35,000 miles, still in service; 4-in. wheel, 23,000 miles, 3 bushings; 4-in. wheel, 19,000 miles, 1 bushing; 14 in. wheel, 23,723 miles, 1 bushing.

## ROCHESTER CAR WHEEL WORKS.

The Rochester Car Wheel Works, of Rochester, N. Y., is showing in its exhibit 26 car wheels, ranging in diameter from 14 in. to 36 in., and in weight from 130 lb. to 650 lb. These wheels, although they fall short of covering anything like the complete list required in street car service, serve to illustrate, in addition to the wide range in diameter, the principal types of construction, open plate, single plate and double plate. There are also shown the development of the double bracket during the past 45 years, the single plate pattern and a curved spoke wheel.

The Wheel Truing Brake Shoe Co. reports a number of very satisfactory orders. This brake shoe is having wonderful success on the many roads where it has been in operation. Its exhibit is in charge of Mr. J. E. Griffith, president.

The Heil Railjoint Welding Co., of Milwaukee, is not making an exhibit, but Mr. J. P. Heil, general manager, is at the Garden meeting the company's many friends.



## PAYING PARK ATTRACTIONS.

The Armitage-Herschell Co., North Tonawanda, N. Y., is one of the oldest established manufacturers of riding galleries, miniature railways and other pleasure park attractions, in the country, and the company's miniature railway is coming into extensive favor with street railway managers as an attractive feature of popular resorts. The outfit comprises a miniature locomotive which is an exact fac simile of the regular type of passenger steam locomotives, and 10 passenger cars with a capacity of seating 40 children,



THE LATEST MINIATURE RAILWAY.

ren, or half as many adults. The trains run on a track laid with 8-lb. T-rails spiked to miniature ties. One of the best of these equipments has been placed in the park of the Oil City (Pa.), Railway Co., where it has afforded great sport for the public and proportionate profit to the managers during the summer. The Armitage-Herschell Co.'s factory is believed to be the largest of its kind, and will well repay inspection. Visitors to Niagara Falls are extended a cordial invitation to stop at North Tonawanda for this purpose, and all who are interested will receive catalogue and price list upon application.

The accompanying engraving shows the latest design of cars and locomotive. There are four seats in each car, which hold 12 children, or eight grown people each. The smaller car is adapted more for children than grown people.

## WORK ON THE RAPID TRANSIT TUNNEL.

The accompanying illustration shows a view of the Rapid Transit Subway at Duane and Pearl streets, and gives an excellent idea of the progress of the work and how the road will appear when completed.



pleted. The city of New York is to be congratulated on the rapidity with which the Rapid Transit construction is being carried on and there is every prospect that the road will be completed and in operation by the date planned.

Mr. A. L. Hutchinson, of Weyauwega, Wis., was a late arrival.

## IN THE GOOD OLD DAYS.

The following is a copy of the first street railway franchise granted in Birmingham, Ala., and is interesting reading, though it may make some of our readers feel just a little bit envious.

The State of Alabama, Jefferson County.

This contract made and entered into this, the 19th day of May, 1882, by and between the mayor and aldermen of Birmingham, parties of the first part, and Benjamin F. Roden, W. H. Morris and associates, parties of the second part, witnesseth:

That for and in consideration of terms, covenants and agreements herein stated, and the further sum of one dollar each to the other paid, the receipt whereof is hereby duly acknowledged, the parties hereto contract and agree as follows, to-wit:

1st. The parties of the first part hereby grant to the parties of the second part and assigns the rights and privileges of surveying, locating, contracting, equipping, etc., to operate and run a street railway in and along the streets and avenues of said city of Birmingham, Alabama, and over and along the following streets, avenues and parts of said city, to-wit: The exclusive right to construct a street railway with the necessary and proper turnouts and sidetracks for the same over and upon Fourteenth, Eighteenth, Nineteenth, Twentieth and Twenty-fourth streets; and First, Second, Third, Fourth and Fifth avenues, north, and avenues A, B, C, D, and E, south; provided, the exclusive right herein granted shall not apply to such of said streets and avenues as are now occupied by the party of the second part within ten years from the date of this contract.

2d. The party of the first part further agrees to pass such ordinances as may be necessary for the running and safety of the tracks and property of said party of the second part, and to prohibit wagons, hacks, drays and other vehicles from standing upon or in the way of the tracks or cars of said party of the second part.

3d. The parties of the second part agree to at once organize themselves into an incorporated company under the laws of Alabama, and the rights and privileges herein granted are to be transferred to said company when so incorporated.

The parties of the second part further agree and obligate themselves to construct and operate said street railway in such a manner as not to interfere with the ordinary use and travel of the streets and avenues; that they will construct said street railway in a manner to conform to and with the most improved plans of street railways as are now used in other cities. They agree to charge an amount for passengers not to exceed five cents for each passenger, a fare being considered from one end of a line to the other. The parties of the second part further agree to conform to all the just and reasonable regulations of the party of the first part, in regard to running and speed of the cars of said railway; and the parties of the second part further agree to hold the city harmless from liability to any person or persons for damages caused by the neglect or carelessness of the party of the second part, their agents or employees. The party of the second part further agrees to begin construction of said street railway within twelve months from the date of this contract, and to have at least one mile of same in first class running order on or before the first day of July, 1884.

In witness, whereof, the said parties of this contract have hereunto set their hands and seals, this 19th day of May, 1882. Signed.

Mayor and Aldermen of Birmingham, Thomas Jeffers, Mayor.

B. F. Roden, W. H. Morris and Associates.

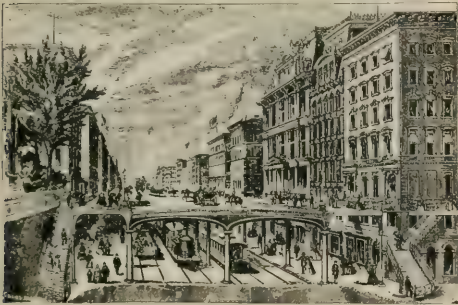
Attest, W. A. Jones.



## SOME TRANSIT SCHEMES IN NEW YORK.

Many have been the projects suggested during the past half century for improving the transportation facilities of New York City, and relieving Broadway and other down-town thoroughfares of the traffic congestion that has been chronic in the business districts. Most of these schemes were the dreams of unbalanced minds; some possessed a degree of practicability; while a few received the endorsement of reputable engineers, but were ultimately abandoned by reason of unsurmountable obstacles placed in their way by opposition from one source or another. In practically all the plans the projectors recognized the necessity of building either an overhead or underground structure to divert the traffic from the surface of the street.

As early as 1854, a Mr. Wickersham, proposed an elevated terrace over Broadway, on which was to be built an elevated side walk for foot passengers, and railway tracks for horse cars.



UNDERGROUND ROAD PROPOSED FOR BROADWAY IN 1866.

In 1870, a traveling sidewalk, very similar to the moving platform shown at the World's Fair, was projected and received the approval of many property owners on Broadway. This sidewalk was to be placed close to the buildings on either side of the street at the level of the second-story windows so that easy access to the stores and shops could be had. The sidewalk was to be laid in parallel sections, some moving faster than others.

The first elevated road to be actually constructed was built on one side of Greenwich street in 1871. It was supported on a single row of columns and came to be known as the "road on stilts," or the "one-legged road." At first the cars were drawn by an endless chain revolving on heavy drums, the noise from which is said to have resembled that from a boiler factory. The chain was soon replaced by a cable, but this proved but little better, and finally small steam dummies were utilized for drawing the cars in trains. Eventually the enterprise was a failure financially, although it may truthfully be said to have been the forerunner of the present Manhattan Elevated system, which was constructed in 1878.

One of the early overhead propositions that deserves mention for its novelty was the Gilbert overhead tunnel, through which cars were to be sent by compressed air, with the speed of the wind itself.

So far as the records go the idea of tunnelling under Broadway was first suggested in 1860, when several plans were proposed. All of these had the main features of a four track railroad; built in subways or tunnels varying from a few feet to a hundred feet below the surface of the street. Of course most of these contemplated trains drawn by steam locomotives, as no other motive power had at that time been demonstrated as feasible.

As a matter of fact an underground road was operated in New York, before an elevated line had been built. This was in 1869, when the "Beach Broadway Tunnel" was run from Warren street to Murray street under Broadway. This was only a short distance, constructed as an experiment, but its feasibility was illustrated by operating a car forward and backward for some time by compressed air. The tunnel was driven by a shield pushed forward

through the earth by hydraulic power, and the walls were lined with steel plates and bricks. The projectors of this scheme having failed to raise the necessary money to go ahead with the work, the tunnel with its single car was sealed up, and so remained for thirty years. In 1899, a fire in the neighborhood caused a cave-in and the hole was re-discovered with its car intact.

About twenty years ago the first underground transit plan to receive really serious consideration from engineers and capitalists was brought to the front by Melville C. Smith, who was the promoter of the celebrated Arcade Underground R. R. This company proposed an excavation the entire width of Broadway with underground side walks, four tracks, pipe galleries, etc. The plan received legislative sanction and the approval of the Rapid Transit Commission. Smith bought the old Beach tunnel franchise and secured from the legislature additional underground franchises and privileges, but received a set-back from which he could not recover, when Governor Hill, in 1885, vetoed the bill giving the company its longed-for powers.

The Reno subway project was the next one to receive attention, and the discussion and interest aroused by this proposition undoubtedly paved the way for the present comprehensive underground rapid transit system.

The Reno plan was proposed in 1897 by J. W. Reno, who submitted prospectus and plans for a "double-deck" subway, with express tracks below the local tracks, and pipe galleries and conduits at the side. Reno was forced to withdraw through the objection raised by lower Broadway property owners, who have always fiercely opposed an underground road along that thoroughfare, urging that a tunnel could not be laid without endangering the foundations and sub-structures of the many tall buildings and stores on both sides of Broadway.

Finally the present subway plans were perfected and are now being carried into execution as described in the September issue of the Review, but even the promoters of this enterprise have been forced to select Elm street as the route, instead of going under Broadway, which to disinterested observers unquestionably offers the most direct and logical location.

It would seem that the twentieth century has not brought a cessation of startling propositions for rapid transit in New York. The latest "discovery" is the elevated system presented in one of the illustrations. As an evidence that it is strictly modern it will be noted that the drawing of the proposed structure and car shows two automobiles in the foreground.

In a descriptive pamphlet, the American Elevated Railroad Co., whose offices are at 96 Broadway, explains that the "system is an electric elevated road with a double central rail track and an additional inverted rail under each end of the ties, which serve as conductors and also to balance and bind the cars upon the track.



THE LATEST IDEA IN ELEVATED RAILWAYS.

"The truck has central wheels placed tandem. These wheels which support and drive the cars are made in two pieces and, when bolted together, embrace a series of balls at the rim of the wheels, these taking the place of a fixed flange. The double central rail gives a double bearing to the driving wheels, the ball flange running between the rails. Pendant from each side of the truck is hung a bracket which drops below the ends of the ties and holds a set of

wheels that engage the inverted rails under the ties, thus balancing and binding the truck to the track and at the same time taking the place of the trolley."

Mr. Osborn Congelton, president of the American Elevated Railroad Co., assures us that it is only a question of time before an elevated system is built on this plan from the Battery to Harlem, through the heart of the city.

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President P. Albert Poppenhusen, of the Green Engineering Co., Chicago, is on hand.

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Thayer & Co., makers of water tube safety boilers, are represented by Charles E. Hague.

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Mr. Thomas Griffin, president of the Griffin Car Wheel Co., and Mr. Charles K. Knickerbocker, of the same company, are both on deck.

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The Farist Steel Co., of Bridgeport, Conn., is represented by Mr. George Windsor, secretary. This company did not make an exhibit this year.

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Mr. John Jones and Mr. John Jones, jr., of J. M. Jones' Sons, were meeting and entertaining many users of the Jones car.

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The New York World says that Madison Square Garden is a wonderful spectacle, and looks as if a thousand trolley cars had been dissected and the dismembered parts neatly classified and partitioned off from one another.

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Mr. Peter Smith, of Detroit, president of the heater company that bears his name, is here.

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Among the later arrivals at the Garden are Mr. George C. Lucas, general manager of the Cleveland Frog & Crossing Co., and Mr. Frank J. Lewis, president of the Victor Electrical Co., both of Cleveland, Ohio.

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Of the delegates from a distance we have noticed Mr. W. F. Kelly, general manager of the Oakland Transit Co., of Oakland, Cal., and Col. Fred. Fitch, of Denison, Texas. A large number of delegates from across the water are also in attendance at this meeting.

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The Cincinnati, Hamilton & Dayton Traction Co. is in the market for an auto car or any device that will give an independent movement of a passenger car for suburban travel. Address D. G. Edwards, C. H. & D. Traction Co., Cincinnati, Ohio.



PARK ROW NORTH FROM BROADWAY.

This short street is known the world over as Newspaper Row and here within hail of one another are published the Daily Tribune, Sun, Journal, World, Press, Times, News, Staats Zeitung and others. The first tall building at the right is the St. Paul Building; the next one north is the Park Row Building, the highest business building in New York. At the left is the New York postoffice and in the distance the approach to the Brooklyn Bridge.

#### CORNING BRAKE SHOE.

The Corning Brake Shoe Co., of Corning, N. Y., is represented by Mr. Jos. Turbell its president, who presides over an interesting exhibit in the annex. These shoes are extensively used on the street railways of New York, where they are giving excellent satisfaction. Tests of the Corning shoe made at Purdue University, La Fayette, Ind., show that the coefficient of friction of these shoes is such as to fill the requirements of street railway service.



THE PANORAMA OF NEW YORK HARBOR FROM BATTERY PARK.

Liberty Statue in the center of distance—the New Jersey coast to the left—Staten Island in the far distance—the Aquarium, formerly New York's old Castle Garden in the immediate foreground.



## THURSDAY'S REGISTRATIONS.

## DELEGATES.

Atlanta, Ga.—Thomas Elliot, E. Woodruff, Atlanta Ry. & Power Co.  
 Baltimore, Md.—J. P. Baker, W. H. Staub, A. J. Vietz, City Ry. & Elec. Co.  
 Bay City, Mich.—E. S. Dimmock, Bay City's Consolidated Ry. Co.  
 Birmingham, Ala.—C. W. Blackinton, Birmingham Ry. L. & P. Co.  
 Bridgeton, New Jersey—B. T. Hires, Bridgeton & Millville Traction Co.  
 Brockton, Mass.—E. J. Rauch, Brockton, Mass.—E. J. Rauch, Brockton St. Ry. Co.  
 Camden, N. J.—W. Y. Tompkins, C. J. Parker, Wm. Clyde, Camden, Gloucester & Woodbury Ry. Co.  
 Council Bluffs, Iowa—Frank Brown, Omaha & Council Bluffs Ry. Co.  
 Camden, N. J.—Wm. F. Weiss, J. E. Fritz, Camden & Suburban Ry.  
 Chicago, Ill.—E. C. Randolph, Chicago Union Trac. Co.  
 Danville, Ill.—S. L. Nelson, W. B. McKinley, Danville St. Ry. & L. Co.  
 Denver, Col.—John A. Becker, Denver City Tramway Co.  
 Detroit, Mich.—Allen P. Edwards, Irwin Fullerton, H. A. Stanley, Detroit United Ry.  
 Exeter, N. H.—A. E. McKell, E. B. Fuller, A. N. Jastad, Exeter, Hampton & Amesbury St. Ry.  
 Grand Rapids, Mich.—W. D. Ray, Grand Rapids, Holland & Lake Michigan Rapid Ry. Co.  
 Hartford, Conn.—E. S. Goodrich, Elmer M. White, W. H. Wilkinson, Hartford St. Ry. Co.  
 Harrisburg, Pa.—Mason D. Pratt, F. B. Musser, Harrisburg Union Ry. Co.  
 Hoboken, N. J.—F. C. Baldwin, Thomas J. Comerford, Robt. D. Boyle, Jersey City, Hoboken & Paterson St. Ry.  
 Indianapolis, Ind.—Albert B. Herrick, Indianapolis St. Ry.  
 Joliet, Ill.—P. E. Fisher, J. R. Blockhall, Sam'l G. De Coursey, Joliet Ry. Co.  
 Kansas City, Kan.—Chas. O. Everts, W. G. McDale, Kansas City, Leavenworth & R. Co.  
 Lancaster, Pa.—Wm. D. Gaven, Frank S. Given, H. B. Rhodes, J. J. Stewart, John H. Cramer, J. W. Hoffman, Conestoga Traction Co.  
 Lynn, Mass.—David Bruce, Lynn & Boston R. R.  
 Florence, Col.—Thomas Robinson, Harry Robinson, Florence Electric L. & Ry. Co.  
 Lancaster, Pa.—W. A. Lindsay, Conestoga Traction Co.  
 Louisville, Ky.—St. John Boyle, Louisville Railway Co.  
 Jersey City, N. J.—J. W. Leach, C. W. Shipman, North Jersey St. Ry.  
 Meridian, Miss.—W. M. Bisel, H. W. Kelley, Meridian St. Ry. & P. Co.  
 Merrimack, Mass.—N. E. Childs, Haverhill & Amherst St. Ry. Co.  
 Milford, Mass.—Chas. H. Fay, E. W. Goss, Milford Hallowell & Framingham St. Ry.  
 Mobile, Ala.—W. H. Paterson, Mobile L. & R. R. Co.  
 Montreal, Canada.—H. H. Lockhart, Montreal St. Ry.  
 New York, N. Y.—J. L. Hines, Louis Fitzgerald, Coney Island & Brooklyn R. R.  
 New York, C. E. Rudi, Brooklyn Heights R. R.  
 New York, N. Y.—J. L. Adams, Newark St. Ry.  
 Ottawa, Canada—T. W. Adams, Ottawa Electric Ry.  
 Philadelphia, Pa.—G. F. Nichols, Chas. H. Hewitt, R. C. Oliver, Frank Wampler, W. L. Maize, Union Traction Co.  
 Providence, R. I.—George B. Francis, H. F. Purinton, Frank D. Wright, Union R. R.  
 Pittsburgh—J. W. Brown, P. McKessey & C. Ry.  
 Reading, Pa.—M. C. Aulenbach, United Traction Co.  
 Rockford, Ill.—G. W. Knos, Rockford Ry. L. & P. Co.  
 Saratoga Springs, N. Y.—W. M. C. Colburn, Charles T. Ames, J. A. Powers, Saratoga Traction Co.  
 Schenectady, N. Y.—R. H. Fraser, Schenectady Ry. Co.  
 Springfield, Ill.—Kilford Boyle, Springfield Consl. Ry.  
 St. Joseph, Mo.—John H. Van Brundt, E. L. Sibley, St. J. Ry. L. & P. Co.  
 St. Louis, Mo.—Frank R. Lee, St. Louis & North St. Ry. Co.  
 Toronto, Canada—J. M. Smith, E. H. Keating, W. T. Watson, Toronto Ry. Co.  
 Vicksburg, Miss.—Z. G. George, Vicksburg R. R. Power & Mfg. Co.  
 Washington, D. C.—Geo. H. Horner, B. W. Butler, R. N. Burrell, Columbia Ry. Co.  
 Waterbury, Conn.—W. B. Carter, Eugene Marler, J. P. Hines, C. A. Tomlinson, L. S. Byles, Wm. Darke, E. I. Kyle, A. O. Wamsright, Conn. Lg. & Power Co.  
 W. & H. Conn. & G. R. Hyde, Winchester, N. H. R. Co.  
 Wilmington, Del.—Chas. T. Herrick, Francis H. Davis, Wilmington, Del. Ry.  
 Worcester, Mass.—Louis Pung, Wm. Donnell, Worcester General St. Ry.  
 Youngstown, Ohio—Harry Ineson, Mahoning Valley Ry. Co.  
 Detroit, Mich.—Irwin Fullerton, Albert H. Stanley, Detroit, Rochester & Lake O. Ry.

## MISCELLANEOUS.

Atwood, Edward S., Ohmer Car Register Co., Dayton, Ohio.  
 Ackerman, A., Sawyer-Man Elec. Co., New York.  
 Andrews, C. E., Ry. Equipment Co., Cincinnati.  
 Anderson, Edw. H., Gen. Elec. Co., Schenectady, N. Y.  
 Ahy, A. E., Penna. Steel Co., New York.  
 Andrews, Arthur P., Jackson & Sharp Co., Newark, N. J.  
 Anderson, Gus., Con. Ry. Elec. Ltg. Co., Albion, Henry A., Concord St. Ry., Concord, N. H.  
 Aulenbach, M. C., United Traction Co., Reading, Pa.  
 Aldis, Charles, Torrington & Winchester Street Ry.  
 Rougeon, Alfred, Sprague Elec. Co., New York.  
 Billings, Wm. R., Taunton Loco. Mfg. Co., Taunton, Mass.  
 Barnes, Geo. M., Freshman Mfg. Co., Boston.  
 Blackington, C. W., Birmingham R. L. & P. Co., Birmingham, Ala.  
 Benlow, Wm. C., Benlow Co., Columbus, Ohio.  
 Brown, William H., International Register Co., Chicago.  
 Breed, George, Draper & Co., Philadelphia.  
 Russell, A. Mail & Express, New York.  
 Burleigh, Chas. B., General Elec. Co., Boston.  
 Bennett, Geo. D., Page Woven Wire Fence Co., Adrian, Mich.  
 Breckenridge, R. M., Evening Post, New York.  
 Brown, Geo. M., Profitable Advertising, Boston, Mass.  
 Borham, W., International Iron Co.  
 Boyce, H. R., J. H. Lane & Co., Ilford, Tilford.  
 Bean, E. N., New Car Register Co.  
 Hlean & Hale, N. Y.  
 Burns, E. A., Pennsylvania Steel Co.  
 Bottom, J. R., New Haven Car Register Co., New Haven, Conn.  
 Bliven, E. M., Western Co., Philadelphia.  
 Beny, Roy Nelson, N. Y. & N. J. Telephone Co., Orange, N. J.  
 Bradley, Clinton S., Sterion Copper, Brass & Iron Co., Chicago.  
 Boyd, F. C., New Haven Car Company, New Haven, Conn.  
 Barclay, J. Curtis, Carriage Dealers' Journal, Troy, N. Y.  
 Bradley, John E., O. Bradley & Sons, Worcester, Mass.  
 Benson, S. A., Gen. Elec. Co., Salt Lake City.  
 Brownell, W. L., Crocker-Wheeler Co., Amper, N. J.  
 Bryers, W., Sterling-Meaker Co., New York.  
 Blackburn, A. H., Green Fuel Economy Co., Mattewan, N. J.  
 Brooks, F., Mun. Insulation Co.  
 Bradley, John E., Bradley Car Works.  
 Brown, J. Walbert, P. McK. & C. Ry. Co.  
 Bell, Wm. S., Wilkesbarre & Wyoming Val. Tract Co.  
 Byrne, John W., The Mohawk River Traction Co.  
 Belknap, W. E., Dept. Docks & Ferries, New York.  
 Barcus, J. Curtis, Carriage Dealers' Journal.  
 Bowers, Geo. H., Peckham Mfg. Co., New York.  
 Borman, Wm. W., The Peckham Mfg. Co.  
 Benlow, Wm. C., Edly Elec. Mfg. Co.  
 Bradley, R. L., Con. Rail Joint Co. of Am.  
 Chaffee, C. H., Springfield Mfg. Co., Bridgeport, Conn.  
 Clarke, Wm. E., Continuous Rail Joint Co., Chicago.  
 Cox, Chas. H., Middleboro, Wareham & Buzzards Bay St. Ry. Co., Middleboro, Mass.  
 Conway, J. C., F. W. Devco Co., New York.  
 Cullen, Wm. A., Wm. A. Cullen & Co., Newark, N. J.  
 Carey, Thomas F., Bemis Car Box Co., Boston.  
 Craig, J. Hally, Crocker-Wheeler Co., Boston.  
 Frey, Fred B., General Elec. Co., Schenectady, N. Y.  
 Craghead, T. J., Craghead Engineering Co., Cincinnati.  
 Crider, F. S., National Carbon Co., Cleveland.  
 Christy, William, The Cleveland Const. Co., Akron, Ohio.  
 Crossman, P. W. H., Coc Mfg. Co., Providence.  
 Casey, T. B., Boston.  
 Cooper, H. S., The Elec. Eng. & Dev. Co., New York.  
 Cole, Wm. C., Graphite Metal Co., New York.  
 Craig, J. J., John Stephenson Co., Elizabeth, N. J.  
 Clegg, Harry F., Oakwood St. Ry. Co., Dayton, O.  
 Chambers, Thomas D., Newton Elec. St. Ry. Co.  
 Lamp, D. I., Ford, Bacon & Davis.  
 Carpenter, Davis, Brooklyn Rapid Transit.  
 Christy, James J., Wash. & Annap. Elec. Ry. Co., Washington.  
 Conant, R. W., Cambridge, Mass.  
 Conant, Geo. H., Am. Elev. R. Co.  
 J. M. Callahan, Met. St. R. R.  
 Cox, Chas. H., Rochester Rapid Transit.  
 Carlin, Hy. W., Chesterton, Md.  
 Darlington, F. W., Darlington Electric Fountain & Supply Co., Philadelphia.  
 Deannan, E. W., The N. Y. & N. J. Telephone Co., Orange, N. J.  
 Davidson, W. H. A., Sprague Electric Co., Baltimore.  
 Dickson, John F., Dickson Car Wheel Co., Houston, Texas.  
 Durand, D. C., Sprague Electric Co., New York.  
 Duncklee, John B., Am. Society Civ. Engrs., So. Orange, N. J.  
 Dinsmore, Frank S., The Railway Age, New York.  
 Dick, H. C., Flood & Conklin Co., Akron, Ohio.  
 Davis, W. E., Cleveland Construction Co., Akron, Ohio.  
 Darville, Edward H., The Iron Age, New York.  
 Doll, C. C., Heywood Bros. & Wakefield Co., Pittsburg.  
 Dimmock, E. J., Bay City Con. Ry. Co., Bay City, Mich.  
 Darbes, Wm., Con. Railway & Ltg. Co.  
 Davids, A. G., United Power & Transp. Co.  
 Devon, Wm. J., International Trust Co., Baltimore.  
 Durrant, A. S., Peckham Mfg. Co.  
 De Coursey, S. G., Chicago & Joliet R. R. Co.  
 Dunn, G. S., Crocker-Wheeler Co.  
 Davidson, W. H. A., Sprague Elec. Co., Baltimore.  
 Dale, John W., The Dale Co.  
 Ewing, George C., Morris Electric Co., New York.  
 Evans, E. O., J. N. H. Cornell, New York.  
 Elliott, G. W., Elec. World & Eng., New York.  
 Eppley, F. W., Essex C. Ry.  
 Evans, Geo. W., Streeter Brake Shoe Co.  
 Furby, Chas. L., Ohio River Elec. Ry., Pomeroy, O.  
 Foth, E. L., Lynn & Boston R. R. Co.  
 Follwell, W. H., Peckham Mfg. Co.  
 Follwell, S. S., Peckham Mfg. Co.  
 Forbes, H. R., Berham & Merrick Metal Co.  
 French, Lester G., New York.  
 Fairchild, C. B., Fairchild Emergency Brake, New York.  
 Finerty, W. J., Standard Traction B. Co.  
 Hewell, H. E., Bethlehem Steel Co., New York.  
 French, Lester G., Editor "Machinery," New York.  
 Fitch, A. W., Peckham Mfg. Company, Boston.  
 Flanders, Chas. V., United & Globe Rubber Co., Trenton, N. J.  
 Fairchild, John F., Assoc. Mem. Am. Soc. C. E., Mt. Vernon, N. Y.  
 Fairbair, Charles L., Pomeroy, O.  
 Frost, A. H., Frost Ventilating Co.  
 Gummender, Arthur Ramapo Iron Works, Mohawk, N. J.  
 Gellany, Hart, The Ohio Brass Co., Pittsburg.  
 Gray, Vance L., The Russell Co., Toledo, Ohio.  
 Graves, A., Russell & Ewin, New Britain, Conn.  
 Granow, Wm. Jr., McElroy Brunow El. Ry. System, Bridgeport, Conn.  
 Gennert, E. F., E. P. Gleason Mfg. Co., New York.  
 Gurney, W. S., 3d, The Elec. Eng. & Dev. Co., New York.  
 Goldsmith, J. S., Fowler Mfg. Co.  
 Given, E. B., Conestoga Traction Co.  
 Gammellein, A., Peckham Mfg. Co.  
 Good, Robert O. & C. Co., of Chicago.  
 Harten, P. F., Electric Ry. Equipment Co., Cincinnati.  
 Hale, Joshua, Blood & Hale, Boston.  
 Hartley, Richard, "Electrical World & Engineer," New York.  
 Haylar, Jr., Philadelphia.  
 Hays, Charles E., Thayer & Co., New York.  
 Honan, J. B., The Nat'l Conduit & Cable Co., New York.  
 Hamill, Samuel M., General Elec. Co., Schenectady, N. Y.  
 Humphreys, James, H. W. Johns Mfg. Co., Boston.  
 Hopkins, Thornton, F. W. Devco Co., New York.  
 Hoopes, William, The Pittsburg Reduction Co., Pittsburg.  
 Headley, Horace G., The Waterbury Tool Co., Waterbury, Conn.  
 Hutchinson, A. L., Wisconsin Midland R. R., Weyanage, Wis.  
 Halsey, Herbert O., Longman & Martinez, New York.  
 Holden, C. H., The Emerson Elec. Mfg. Co., New York.  
 Heil, J. P., The Heil Railroad Welding Co., Milwaukee.  
 Hay, W. O., Easton & Nazareth St. Ry. Co.  
 Hunley, John J., P. C. & W. P. E. Ry. Co.  
 Hawken, Thomas, Rockland Traction Co., New York.  
 Hart, F. R., Jr., Portsmouth & Kittery & York St. Ry.  
 Helmig, Geo. E., 3d Ave. R. R., New York.  
 Hall, Louis P., Crocker-Wheeler Co.  
 Hathaway, D. P., D. C. St. Ry. Co.  
 Hamlin, H. W., Philadelphia.  
 Hoffman, Albert von, Milwaukee.  
 Haylar, Benj. T., Jr., The Mayer & England Co., Philadelphia.  
 W. F. Hendee, Burlington, Vt.  
 Honen, C. E., C. L. A. Elec. St. R. R. Co.  
 Hewitt, Chas., Union Traction Co.  
 Hogan, Wm. F., N. Y. & N. S. Ry. Co.  
 Howard, L. M., Mrs. E. R. World & Engineer.  
 Ives, Archer W., General Electric Co., Boston.  
 Isertell, H. G., Sprague Electric Co., New York.  
 Ingram, F., Schuykill & Orwigton R. R. Co.  
 Isbell, Arthur C., N. Y. & Stamford R. R. Co.  
 Jones, John M., J. M. Jones Sons, West Troy, N. Y.  
 Janney, W. H., Media, Middletown, Aston & Chester Elec. Ry. Co.  
 Johnson, W. T., The Crosby Steam Gage & Valve Co., New York.  
 Jackson, C. L., New York Car Wheel Works, New York.  
 Jarger Fred C., Western Electric Co., Philadelphia.  
 Jackson, Harry, Sawyer Man Electric Co., New York.



- Jackson, W. S., No. Hudson Co. Ry. Co., Hoboken, N. J.  
 James, F. G., Columbia Refining Co., New York.  
 Jefferson, C. W., Mica Insulator Co., Schenectady, N. Y.  
 Jeffers, B. N., Midland R. R. Co., Staten Island.  
 Jester, J. R., Streeter Brake Shoe Co.  
 Jackson, J. M., Peckham Mfg. Co.  
 Jones, B. F., Economic Mfg. Co.  
 Janny, J. W., Media Middleton & Chester Elec. Ry.  
 Jay, John M., Penna. Steel Co.  
 King, Clarence P., Pottsville Union Traction Co., Philadelphia.  
 Keeler, H. E., Railway Supplies, New York.  
 Keane, E. F., Walworth Mfg. Co., Boston.  
 Kite, Louis S., Pomerooy, O.  
 Kling, Fred, John Stephenson Car Co.  
 Kling, Wilbert, John Stephenson Co.  
 Kimball, James L., Ridgeway Dynamo & Engine Co., Boston.  
 Kirkland, H. R., American Circular Loom Co., Chelsea, Mass.  
 Kremenetz, George, Black River Traction Co., Watertown, N. Y.  
 Kuhlman, G. E., The G. C. Kuhlman Car Co., Cleveland, Ohio.  
 Kissam, Joseph H., The Bridgeport Brass Co., New York.  
 Kent, James, Wash. Elec. St. Ry. Co.  
 Krohn, William, Street Railway Review.  
 King, Clarence P., Pottsville Union Traction Co.  
 Keating, E. H., Toronto Ry., Toronto, Can.  
 Leddell, H. J., McCord & Co., New York.  
 Lett, Julian S., Christensen Engineering Co., Milwaukee.  
 Laghton, F. E., United Steel Co., Boston.  
 Lewis, E. S., Standard Steel Works, Philadelphia.  
 Lucas, George C., The Cleveland Frog & Crossing Co., Cleveland.  
 Lewis, Frank J., Victor Electrical Co., Cleveland.  
 Ludlow, W. E., American Standard Rail Joint Co., Cleveland.  
 Lane, Nat. P., Parrott Varnish Co., New York.  
 Leake, E., Tanaton Loco. Mfg. Co., Taunton, Mass.  
 Levy, W. R., Erie Exploration Co., New York.  
 Long, E. G., The Peckham Mfg. Co., New York.  
 Low, New, W., Wis. Midland R. R. Co., Fond du Lac, Wis.  
 Linden, C. T., New York.  
 Lane, P. E., American Bridge Co., New York.  
 Lebkuecher, J. A., Black River Traction Co., Watertown, N. Y.  
 Ludlow, Edgar S., Automobile and Cycle Parts Co., Ketchikan, B. H., Denver, Colo.  
 Lang, E., Peckham Mfg. Co.  
 Leahy, J. W., N. J. St. Ry. Co.  
 Lebkuecher, J. A., Black River Traction Co., Watertown, N. Y.  
 McQuade, Jr., John A., American Steel & Wire Co., Philadelphia.  
 McCallum, Wm. A., Elec. Ry. Equipment Co., Cincinnati.  
 Mellon, Wm. P., Murphy Varnish Co., Chicago.  
 Moore, Harry P., Chase-Shawmut Co., Boston.  
 Meixell, A. E., Fairmount Park Transportation Co., Philadelphia.  
 Mone, H. P., Chase-Shawmut Co., Boston.  
 McBiney, H. J., National Lead Co., Chicago.  
 McDonald, M. J., J. R. McCordell & Co., Trenton, N. J.  
 McQuale, Jr., John A., American Steel & Wire Co., Philadelphia.  
 Marsland, C. A., Baltimore Enamel Co., New York.  
 Mason, Edward C., Adams Construction Co., Buffalo.  
 McKenna, E. W., A. M. P. Co., New York.  
 Bartz, S. C., Crane Co., New York.  
 Meikenna, T. M. R., New York.  
 McKenna, Jas. J., New York.  
 McAdoo, M. R., Pittsburgh, McKeesport & Conellsville Ry., Pittsburgh.  
 Murphy, Wm. J., Conn. Ry. & Ltg. Co., Bridgeport, Conn.  
 Macardie, P., Bemis Car Box Co.  
 Meade, E. W., Bemis Car Box Co.  
 Mayer, L.  
 Marsh, J. P., Standard Underground Cable Co., Philadelphia.  
 Mackay, J. W., Crane Co., Chicago.  
 Mellon, Wm. P., Murphy Varnish Co.  
 McGrath, Wm. A., Peckham Mfg. Co.  
 Mitchell, N. J., Herboth Eng. Co., Philadelphia.  
 Nutty, G. R., National Lead Co., Cincinnati.  
 Narcross, William M., Hale & Kilburn, Philadelphia.  
 Nichols, W. J., Ford, Bacon & Davis.  
 Newman, F. R., Citizens' Elec. St. Ry. Co., Newburyport, Mass.  
 Nellis, E. M., Westinghouse Air Brake Co.  
 Niven, John B., New York.  
 Nichols, J. B., Union Traction Co., Philadelphia.  
 Naylor, J. W., Hartford, Manchester & Rockville Tractionway Co.  
 Nostrand, W. H., The Peckham Mfg. Co.  
 Nettleton, F. W., Vern Buell & Rubber Co.  
 O'Malley, F., Midland R. R., New York.  
 Pfatscher, M., Electric Dynamic Co., Philadelphia.  
 Pace, J., Seaver, F. W. Devco & C. I. Reynolds Co., New York.  
 Pratt, Mason D., The Penna. Steel Co., Steelton, Pa.  
 Polk, W. A., The Patterson-Sargent Co., New York.  
 Partridge, W. E., J. G. Brill Co., Philadelphia.  
 Pearson, V. A., Conn. & Railway Lighting Co., Philadelphia.  
 PULLIS, Pierre P., Street Railway Review, New York.  
 Prosser, C. S., Peerless Rubber Co., New York.  
 Potter, Henry Noel, Westinghouse Elec. Co., New York.  
 Pope, W. Constantine, Globe Ticket Co., Philadelphia.  
 Pasco, W. T., St. Lawrence Elec. Ry. & Land Co.  
 Palmer, R. W., Roanoke Ry. & Elec. Co., Roanoke, Va.  
 Pope, W. C., Globe Ticket Co., Philadelphia.  
 Price, W. B., St. Ry. Assoc. of N. J.  
 Pierre, Harry N., Olean, Rock City & Bradford.  
 Purdy, C. J., Catskill R. R. Co.  
 Parker, Horace B., Lexington & Boston St. Ry. Co.  
 Polk, W. A., The Patterson-Sargent Co.  
 Quintin, D. Scott, Darlington Elec. Fountain & Supply Co., Philadelphia.  
 Riedel, Edward, Met. St. Ry. Co.  
 Reed, Herbert E., Easton & Nazareth St. Ry. Co., Easton, Pa.  
 Randolph, E. C., Chicago Union Traction Co.  
 Rickers, Fred E.  
 Rogers, Fred E.  
 Read, W. P., Con. Ry. & Power Co., Salt Lake City.  
 Read, W. P., Con. Ry. & Power Co., Salt Lake City.  
 Reubens, Chas. M., Brady Brass Co.  
 Riley, J. T., McLaughlin Car Coupler Co., Philadelphia.  
 Ricker, C. A., The G. C. Kuhlman Car Co., Cleveland.  
 Rogers, Fred E., Steam Engineering, New York.  
 Richardson, John Wardell, Marshall-Sanderson Co., New York.  
 Rockwell, Geo., Elec. Ry. Equipment Co., Brooklyn.  
 Rice, Richard H., Providence Engineering Works, Providence.  
 Rugs, J. S., Westinghouse Electric Mfg. Co., New York.  
 Rogers, W. Cogswell, Peckham Mfg. Co.  
 Ricks, Charles Atwater, The G. C. Kuhlman Car Co., Cleveland.  
 Reed, Harry D., Bishop Gutta Percha Co., New York.  
 Robson, Wm., Pa. Standard Rubber Paint Co., Inc., Philadelphia.  
 Roberts, S., Peerless Rubber Mfg. Co., New York.  
 Roberts, Stephen, Peerless Rubber Mfg. Co., New York.  
 Robinson, Harry Florence Elec. St. Ry. Co., Florence, Colo.  
 Robinson, The Florence Elec. St. Ry. Co., Florence, Colo.  
 Swapp, Chas. W., Boston Northern.  
 Storer, N. W., Westinghouse Elec. & Mfg. Co.  
 Schifartz, A. L., Union Switch & Signal Co.  
 Sherman, H. R., N. Y. Switch & Crossing Co., Hoboken, N. J.  
 Schroeder, A. F., Globe Elec. Mfg. Co., Cleveland.  
 Siegel, J. E., U. S. Railway Supplies Co., New York.  
 Sheldon, Harry W., The Standard Steel Works, Philadelphia.  
 Smith, H. W., Stuart-Howland Co., Boston.  
 Smith, Peter, The Peter Smith Heater Co., Detroit.  
 Sporborg, H. N., General Electric Co., Schenectady, N. Y.  
 Schermerhorn, G. L., Gen. Elec. Co., Schenectady, N. Y.  
 Sugdale, E. W., Standard Underground Cable Co., New York.  
 Smith, Stephen C., The Fairbanks Co., New York.  
 Seward, Frederick E., The Coal Trade Journal, New York.  
 Stivers, Schuyler C., The J. C. Hoboken & Paterson St. Ry. Co., Hoboken, N. J.  
 Smith, M. Gray, Gen. Elec. Co., New York.  
 Spellmire, W. R., Bullock Elec. Mfg. Co., New York.  
 Smith, Wm. B., Graphite Metal Co., New York.  
 Smith, J. R., Crane Co., Chicago.  
 Smith, R. C., Despatch Conn. Co.  
 Stark, M. E., Albany & Hudson Ry. & P. Co.  
 Shedd, Edward W., Danbury & Harlem Traction Co.  
 Siebert, F. N., Danbury & Harlem Traction Co.  
 Schlayer, Louis, N. Y. N. H. & H. R. R.  
 Shannahan, J. N., Fones, Johnston & Gloversville R. R.  
 Smith, Wm. J., Sel. M. R. R. Co.  
 Stahlbrodt, A. C., Standard Traction Brake Co.  
 Smith, Jay L., National Lead Co.  
 Shaffer, Stanley, Cin. Law. & Aurora El. St. R. R. Co.  
 Stewart, S. B., General Electric Co.  
 Simmons, E. A., Railroad Gazette.  
 Sage, Henry W., Ogdenburg Street Railroad.  
 Thacher, John Boyd, Louis S. Tread Hill, Albany.  
 Tschentscher, R., Sawyer-Mann Elec. Co., New York.  
 Tolman, Charles P., Christesen Eng. Co., New York.  
 Tarr, A. S., Elec. Supplies & Apparatus, Baltimore.  
 Tilden, Philip S., Franklin H. Kalbfleisch Co., New York.  
 Trimble, James A., British Elec. Car Co., New York.  
 Treadwell, George Curtis, Improved Running Board, Albany.  
 Taylor, W. S., Phila. & Westchester Tract. Co.  
 Townsend, W. S., Meriden, Southington Com. Tractionway Co.  
 Tucker, W. A., Tucker & Carter Rope Co.  
 Thompson, Geo. H., Am. Elev. R. R. Co.  
 Taylor, W. B., Peckham Mfg. Co.  
 Underhill, G. A., Vacuum Oil Co., E. Orange, N. J.  
 Van Deervoort, F. M., United Elec. of N. J., Morristown, N. J.  
 Vreeland, Frank C., Met. St. Ry.  
 Wright, John, Met. St. Ry.  
 Vane, A. S., Elec. Ry. Equipment Co., Philadelphia.  
 Visby, J. Jr., The Dayton Mfg. Co., Dayton, O.  
 Wiley, G. L., Standard Underg. Cable Co., New York.  
 Wilkes, George, National Surety Co., New York.  
 Watern, Phil. F., Elec. Ry. Equipment Co., Cincinnati.  
 Warfield, F. P., Peckham Mfg. Co., New York.  
 Whitmore, E., Man. Elec. Supply Co., New York.  
 Wood, W. A., Sawyer-Mann Elec. Co., New York.  
 Waterbury, R. A., Swan & Finch Co., New York.  
 Westaway, R., Nichols Lentine Co., New York.  
 Wood, M. M., Gen. Elec. Co., Chicago.  
 Western, Benjamin R., Manfr. Advertising Bureau, New York.  
 Wilmet, S. K., Elmira Hts. Fdy. & M. Co.  
 Warner, J. N., Waterbury Tool Co., Waterbury, Conn.  
 Whiteside, W. H., Westinghouse Elec. & Mfg. Co., Washington, D. C.  
 Whitcomb, William W., Alston Fdy. Co., Boston.  
 Weitzel, N. T., Whitney Instrument Co., New York.  
 Wunder, F. A., Keystone State Tel. & Tel. Co., Philadelphia.  
 Wood, W. L., Brooklyn.  
 Windsor, Geo., The Farist Steel Co., Bridgeport, Conn.  
 West, Geo. W., Ontario El. Western R. R.  
 Wood, Theo. E., Guy M. Geest, Subway Contractor.  
 Walters, H. S. S. I. Midland R. R. Co.  
 Wagoner, P. D., General Electric Co.  
 Wickett, S. G., J. H. Laen Co.  
 Worthy, Richard, Electrical Worker & Engineer.  
 Whitman, E., Man. El. Supply Co., New York.  
 Wilkes, Geo., National Surety Co.

Mr. P. A. Kimburg, who has charge of the Crane Co.'s exhibit in the annex, is very proud of his "convention tree," which is composed of the brass specialties made by his company, and invites all the members of the A. S. R. A. to take a look at it. Incidentally, he will be happy to explain the construction of the Crane Co. extra heavy valves and allow the visitors to examine a 24-inch valve in the exhibit.

Mr. David Bruce, who has just been appointed division superintendent of the Haverhill division of the Boston & Northern Railway Co., is a young man, who is looked on as a bright and coming railroad man. He graduated at the General Electric Works at Lynn, Mass., and went from there to Seattle, where he held the post of superintendent for some years. Before going to Seattle he

was a resident of Lawrence, Mass., where he was educated at the public schools. Mr. Bruce's future seems assured.

Mr. S. H. Harrington, of the signal department of the Railroad Supply Co., Chicago, is in evidence every day.

Mr. Franklin Brooks, vice-president, and Mr. Charles E. Coleman, manager, of Eugene Munsell & Co., and the Mica Insulator Co., of Chicago, are attending the convention.

The National Lock Washer Co., of Newark, N. J., has a neat exhibit in the annex, where are displayed lock washers, sash locks, sash balances and curtain fixtures.

## DAILY STREET RAILWAY REVIEW

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VOL. XI.

SATURDAY, OCTOBER 12, 1901.

No. 4

This is the last "Daily Review" for 1901, and our next number will be the regular monthly issue, dated October 15. Do not fail to preserve all the "Dailies" and keep your file complete.

When 1902 comes we shall be found at Detroit, and again have the first complete report of the convention proceedings.

This year the four issues contained over 250 pages.

Remember the Bethlehem Steel trip to-day.

Secretary Penington and Secretary Brockway have been re-elected to the offices in their respective associations which they have filled with such marked ability.

The "Street Railway Review" was to-day elected an honorary member of the Street Railway Accountants' Association of America, a courtesy for which we tender our best thanks.

It is now ex-President Ham, but the Accountants' Association will still have the benefit of his wise counsel and energetic action, as he is a member of the executive committee.

We greatly regret that owing to the large number of persons visiting Madison Square Garden to-day, our photographers were unable to secure all the views that we had intended to include in this issue.

The J. G. Brill Co. has arranged for special cars over the Pennsylvania Railroad, leaving 23d street, New York, at 11:55 Saturday, and is anxious to have its many friends make an excursion to Philadelphia to view the company's car and truck works. This party will return early in the evening.

It would be difficult to conceive of a more tactful and dignified presiding officer than President Walton H. Holmes, of the A. S. R. A. His qualifications as a leader were exemplified to a marked degree in the direction of the convention deliberations this week. By judicious choice the best men were called upon to participate in the discussions, with the result that the assembled street railway men were never so instructively entertained, nor the salient points so ably brought out.

## HONOR TO WHOM HONOR IS DUE.

In issuing the last "Daily Review" for the 1901 Convention it is appropriate to publicly express our appreciation of the endeavors of the more important agencies which have assisted to make the paper the great success that it has been—the stenographers, the printer, the photographer and the engraver.

To have a neatly printed and attractive bound magazine, such as the "Daily Review" is, ready at hand, the first thing each morning, containing reports of all the important events of the preceding day and evening reported with the despatch of a metropolitan newspaper is no small undertaking and redounds immeasurably to the credit of the printer.

The official stenographers of the two associations, Messrs. T. E. Crossman and W. B. Weaver, furnished the discussion reports promptly, and then we really began to get busy. A prime requisite in such an enterprise is a thoroughly well equipped modern printing plant, and such an establishment we found in The Technical Press, of which Mr. S. Rosenthal is the efficient president and general manager.

Equally strenuous have been the requirements upon the photographer, Mr. Pierre P. Pullis, the official photographer of the Rapid Transit Commission, the Rapid Transit Subway Commissioners and of Mr. John B. McDonald, the contractor for this work.

If much was expected of the printer and photographer, the man who made the numerous half-tone engravings used in the Daily's makeup was kept on the jump likewise. Mr. Clarence Betterton, secretary of the Manhattan Photo Engraving Co., looked after our interests in that respect, and did it well.

The employees who cheerfully responded to the request to work overtime, in some cases at great personal inconvenience, ought not to be forgotten, either.

It appears that the efforts of our printers must have been recognized by the American Street Railway Association, for last evening the toast, "The Technical Press," received one of the happiest responses offered at the banquet.

We gladly render "honor to whom honor is due."

## THE AUTOMOBILE PARADE.

Yesterday's automobile parade was considered by the two hundred or more ladies participating one of the most delightful functions of Convention week. It was made possible through the courtesy of the New York Electric Vehicle Co., which tenetred the use of 100 carriages to transport the ladies through some of the most attractive thoroughfares of upper Manhattan, a compliment that was greatly appreciated. The start was at 11 o'clock from Madison Square Garden, and the route followed was through Fifth avenue (Millionaires' Row), Central Park, Riverside Drive, past the Grant Tomb to Hotel Claremont, situated on the bluff opposite and commanding a view of the famed Palisades and Fort Lee. Lunch was enjoyed at the Claremont, which is noted for its cuisine excellence.

## THE BANQUET.

The 20th annual dinner of the American Street Railway Association was given at Sherry's last evening. This meeting is technically a continuation of the afternoon session, the business being the installation of officers-elect.

After dinner was served and the cigars were lighted President Holmes made his official farewell in the following address:

## PRESIDENT HOLMES' ADDRESS.

It is not always wrong to be proud. At times every man ought to be proud. It is my turn to be proud to-night. I shall not miss my turn. I am proud to be the president of this organization at the time of its most successful meeting. Of all our twenty conventions this has certainly been the most nearly perfect of all. We have literally had the "freedom of the city"—this most wonderful city of the world. We have had the unwearied attention of the bravest of men and the fairest of women. We have been "personally conducted" by every conductor in the metropolis, from the chief executive of the city and President Vreeland, down to the smiling manipulators of the punch. Our money has been refused and our paths have been upholstered with roses. From the highest to the lowest we have received a courtesy which will not end with this matchless banquet—a courtesy which will surely yield friendships and sweet memories which will end only with the close of life. Is it any wonder that I am proud? Can any man blame me for being proud? Can any one here refrain from showing this pride with me? I think not.

Gentlemen, I wish here and now to thank you for the honor you have conferred on me in the past year—an honor which I shall soon lay down, but which I shall never forget. I congratulate you, as I do myself, on having been permitted to enjoy the fascinating and instructive sessions of the convention. No meetings were ever held in this country more deserving of the profound respect of the most critical.

Gentlemen, we have come to that part of our program in which I know I ought to disappear. I am a good man with knife and fork, but a poor hand at talking. I have asked our chief entertainer, our host of hosts, Mr. Vreeland, to take up the pleasant and, for him, congenial task of managing the silver tongued orators

who are to further entertain us this evening. Mr. Vreeland will please take the chair.

Gentlemen, I thank you, and introduce one who needs no introduction, President Vreeland, of New York.

President Vreeland then delivered his inaugural address and in conclusion expressed his pleasure in having had the opportunity to represent one of the hosts of the Association, and his appreciation of the honor conferred in his election to the presidency.

The president then read the following telegram from Hon. David B. Hill, who was to speak to the toast "The Street Railway in Law and Politics:—"

TELEGRAM FROM THE HON. DAVID B. HILL.

"An imperative engagement prevents my being present. The street railways of the United States are the pride of the country; their management is unsurpassed anywhere in the world; their utility and convenience to the public render them indispensable. Their officials are not only able business men, but I am sure they are jolly good fellows, and I regret my inability to feast with them to-night."

Mr. Guggenheimer, who had the subject "Greater New York," was also unable to be present and was represented by Mr. Jocelyn Johnstone.

The other assigned speakers were:

"Our Friends, the Steam Railroads."—Job E. Hedges.

"The Kickers."—Simeon Ford.

"The Technical Press."—T. C. Martin.

"West Point and Annapolis."—General Eugene Griffin.

"The Mule in the Field of Traction."—Hon. John S. Wise.

"The Only Railroad Man I Ever Knew."—Martin W. Littleton.

"The Press."—Albert Miller.

COMMENDABLE COURTESY.

The United Power & Transportation Co., of Philadelphia, controlling a number of street railways in New Jersey, Pennsylvania and Delaware, showed its appreciation of the services rendered it by its various superintendents in a manner very pleasant to the latter. At the expense of the company the superintendents, to the number of fourteen, have enjoyed a visit to the convention, arriving here on Wednesday via the Pennsylvania, and are to return to their homes to-morrow. The entertainment provided was of the best, including tickets to the banquet, and the fourteen gentlemen are loud in their praise of the courtesy of Mr. John A. Rigg, president, and Mr. F. L. Fuller, general manager, of the company. The Schuylkill Valley Traction road of Norristown, Pa., is represented by Mr. John Hoeger, general superintendent; the Chester Traction line, by Mr. A. K. Jacks, superintendent; the Wilmington (Del.) City Railway, by C. R. Van Trump, superintendent; the Wilkesbarre & Wyoming Valley Traction line, by T. A. Wright, general superintendent, and John Clifford, superintendent of transportation; the Southwestern Street Railway, of Philadelphia, by A. G. Davids, superintendent; the Lebanon & Annville Street Railway, by C. H. Smith, superintendent; the United Traction line of Reading, by S. A. Rigg, superintendent; the Trenton (N. J.) Traction line, by Peter Hurley, superintendent; the Holmesburg, Tacony & Frankford line, by George Hoeger, superintendent; the Navesink Mountain road, of Reading, by D. H. Christman, superintendent; and the Delaware County & Philadelphia Electric Railway, by Samuel Haigh, general manager.

An interested spectator at the exhibit yesterday was Mr. John H. Robertson, president and treasurer of the New York Estimating, Engineering & Contracting Co., Inc.

The Mayer & Englund Co. is represented by Charles J. Mayer, president; A. H. Englund, secretary and treasurer; Frederick R. Shattuck, director; W. A. Crockley, of the New York office; William Armstrong, Jr., H. G. Lewis, Benjamin Haylar, Jr., Edwin B. Ross, D. L. Crawford, Harry J. Mayer, George W. Provost and J. L. Merrill, of Pittsburgh.

The Columbia Lock Nut Co., of New York, is represented by Mr. C. C. Doll, who says that he would not have missed this convention for worlds.

Mr. C. H. Lang, Jr., treasurer of the Heywood Bros. & Wakefield Co., is here and is highly pleased with the convention and its results.

Recalling the simile in a New York daily that Madison Square Garden on Wednesday looked "as if a thousand trolley cars had been dissected and the dismembered parts neatly classified and partitioned off one from the other," it is seemly to consider the part that the director of exhibits, Mr. Marcus Nathan, assumed. No better compliment can be paid that gentleman than to say that upon the very first day everything was in apple-pie order. It was a gigantic task, consummated with skill, tact and a large amount of good nature. Everybody concerned is to be congratulated that Mr. Nathan was at the helm.

The Keystone Electrical Instrument Co., of Philadelphia, has an exhibit with the Morris Electric Co., and is represented by J. F. Stevens, the president of the company. The exhibit includes a full line of switchboard and portable instruments for both direct and alternating and direct currents.

The Standard Paint Co., received a telegram from their exhibit at Buffalo to the effect that, with still one exhibit to be heard from, they had been awarded four medals for the P. & B. at the Pan-American.

The Streeter Brake Shoe Co. has an exhibit with the Morris Electric Co. The exhibit includes brake shoes for various kinds of trucks, and is represented by Mr. Evans, from the factory in Bloomfield, N. J.

Mr. A. A. Hilton, general sales agent of the St. Louis Car Wheel Co., visited the Garden yesterday, and found much to interest him.

One of the prominent visitors to the convention is Mr. John Howard Yardley, secretary of the Keystone Wheel Co., of Pittsburgh, Pa., who expresses himself as delighted with everything.

Among the new members to join both associations at this meeting was the Richmond Passenger & Power Co., of Richmond, Va., represented by Mr. W. S. Dimmock. This company is in consolidation with several smaller properties in Richmond, and has 76 miles of track. The New York and Richmond capitalists, who have the controlling interest in Richmond, also own the Petersburg road, 20 miles from Richmond. Mr. Dimmock has made a record for himself in Omaha and Council Bluffs, where he has been manager for several years, until a few months ago, when he took the management of the Richmond properties. His northern energy and push will enable such a manager as Mr. Dimmock to be sure to make this a valuable property. Mr. Dimmock was one of the charter members and attended the first organizing meeting of the Accountants' Association, has been a member of the American Association for a number of years. He is well known in the steam as well as the electric railway field.

THE PHELAN TROLLEY POLES.

In connection with the exhibits of the Creaghead Engineering Co. and the Pittsburg Reduction Co., mention should be made of the trolley poles exhibited by D. W. Phelan, of 277 Broadway, New York, who furnished the poles upon which these companies' exhibits were placed. Mr. Phelan deals in poles and ties and reports an excellent business during the past year.



## TWENTIETH ANNUAL MEETING

## AMERICAN STREET RAILWAY ASSOCIATION

New York City—Oct. 9–11, 1901.

## Friday Morning's Session.

President Holmes called the meeting to order at 10.30 A. M. Secretary Penington read the following:

The Rapid Transit Commissioner of New York City announces that the stations at Elm and Bleeker Sts. and at 59th St. and Broadway will be lighted to-day and attendants will be at these points to show the delegates to the American Street Railway Association construction of the Subway at these mentioned points.

The secretary also read the following telegram from W. C. Ely: "I regret my inability to attend the sessions of the Association at its present meeting, but am detained by pressure of important business. Please accept my best wishes for the fullest success of the convention."

President Holmes: The first business this morning will be the reading of the paper on "The Best Manner of Conducting the Return Circuit to the Power House," by Mr. E. G. Connette, of Syracuse, N. Y.

Mr. Connette read the paper, which will be found on pages 722, et seq.

Mr. Roberts: The matter of bonding is a serious one to all of us. I have been connected largely with interurban roads of considerable length, and I very much question whether the plan to have return wire conductors throughout is one that is commercially desirable. I believe you can obtain a good return circuit without a continuous wire.

The matter of cross bonding is an important one, which is not always taken into consideration, the bonding of all special work, cross bridges and cross bonding frequently at the top of grades and at the bottom of grades and at the end of curves, and cross-bonding all special work. It does not cost very much and nothing at all to what it would cost to make a conductor for the entire circuit; if you have a certain line loss figured upon in the direct feeders and especially in the interurban roads, and you endeavor to make your return circuit the same loss as the feeder loss, of course you would have to have the same total conductivity, but in your loss, the maximum loss and return is less than in the feeder, and of course the average loss is very much less. It is more a commercial problem than one of engineering, and good engineering includes the financial consideration; and I question whether it is commercially practicable or from an engineering standpoint necessary, to run a complete metallic return, as in most engineering there are exceptions.

The returns to power house and sub-station especially, should be made with the greatest of care and conductivity of the return circuit should be frequently tested, which, if a telephone system, can be done without much trouble.

Mr. L. E. Myers: I think our experiences have all been along the same lines. The question of ground return is a very important one in the construction of an electric railway, as we all know, but I do not think any of us are getting perfectly satisfactory results. I quite agree with what Mr. Roberts said as to the desirability of increasing the bonding at the curves and top and foot of grades. I think Mr. Connette, who read the paper, outlined the best thing for us to do in an independent metallic return connected to all rails, but in spite of all we seem to be able to do we have more or less leakage and in one instance, where the bonds were welded, we found, after a couple of years' service, that as time went on the losses became greater, which would prove the statement correct that eventually, even with that method, in spite of its expense and trouble, there are many defects inherent in it.

Mr. W. E. Harrington: I think this question of bonding is one

of the most interesting sub-questions we have to deal with. It is necessary, of course, to provide a return circuit for large roads as you get near the station; but when you take an ordinary sized road, operating 50 or 100 cars distributed over miles of territory, as we find in the ordinary small cities, the placing of return feeders on these systems does not seem to be warranted if proper steps are taken and proper methods are adopted in bonding. We in Camden tried years ago and had been from time to time using the different forms of bonds on the market, and we experienced all the troubles Mr. Connette refers to. Three years ago we began using a heavy copper plate 4x6 in., with two grooves in it, and bolted to the web of the rail with two 1-in. bolts, with an iron plate with grooves in it over the two No. 0000 wires. That bond has been quite expensive, costing about \$1.50 for each bond. We feel that, judging by our experience, we have been warranted in this expense, because our track return loss has been very low, so low that we consider we have as nearly a practically successful return as can be obtained. We bond at the railroad crossings, which invariably are places where the bond wires break with No. 0000 wires from one side to the other through terra cotta pipes under the tracks. In one crossing we have thirty-two No. 0000 wires running across and bonded into the double tracks on each side, with one tap every three feet of the rails wires on to the middle of the crossing. The bonds have been examined at different times and found to be in perfect condition. I might say that we grind off the rail with an emery grinder and use the Edison-Brown alloy as a surface for the rail and as a surface on the cast copper plate. This makes an intimate contact and the resistance of the joint is less than the corresponding rail section length.

The matter of electrolysis is one that we all have in mind, and we have gone through the question pretty thoroughly and have found that almost all of the trouble is attributable to the current leaking into small gas or water pipes, crossing underneath the tracks in close proximity to the tracks. The pipes near the power station are found to give us the most trouble. We have overcome this difficulty to a large extent by having the gas or water company place their small pipes in terra cotta conduits.

I think the running or auxiliary copper returns is uncalled for in most cases. I do not approve of it under any circumstances for the ordinary sized road. It is very expensive and you do not always accomplish what you are aiming to accomplish. We had an experience last year which I will recite. We have a park four miles from the power station, and our line drop there, on heavy loads, would show a pressure of 400 to 425 volts. Thinking that could be raised, we ran this last spring two No. 0000 feeders from the power station to that point and connected them into the track, running the line overhead and connecting it with the track at 16 different places, with the same class of bonding just described. We did not notice any material difference in our drop across the line at the park from what it had been the summer before. Consequently this year we took that ground return and connected it into the line feeding that section, and our voltage jumped up 50 to 60 volts and we had better service. I ascribe our success to this fact. It was as if we had a water pipe 16 in. in diameter and were trying to feed that pipe by an intake 1/4 in. in diameter. By putting the wires as supplementary to the overhead feeders it changed the conditions, which showed that the loss was in the overhead lines. We have had our system thoroughly checked and gone over. Mr. A. B. Herrick checked and tested our system and found our feeder return losses were very low, practically negligible, but it is necessary to connect the track leading into the power station carefully and in an ample way. On our road, where we average from 800 to 1,200 volts, we have four 1,000,000 c. m. cables running out to the station and connecting to the track in about 80 different places; and

it is certainly remarkable how it brings down the trouble and reduces the voltage loss in the vicinity of the power station.

I wish to emphasize the point that I do not approve of this matter of supplementary copper return, because the troubles can be overcome by putting in solid, heavy, massive joint connections.

Mr. Myers: What is the thickness of the plate which you use and how do you take care of expansion and contraction?

Mr. Harrington: The plate is  $\frac{3}{4}$  to  $\frac{5}{8}$  in. in thickness, 4 in. wide, 6 in. long; that is the copper plate. The iron plate is 1 in. thick, 4 in. wide and 6 in. long. We have a lock washer under the head of the nut on the 1 in. bolt, and the holes are drilled back a sufficient distance around the fish plates to allow us to easily bend a No. 0000 wire underneath. As to the question of expansion, I would say that we have opened dozens of joints in the last two years and have not found that any joint has been depreciated in any manner.

Mr. Myers: I understand that the plate is rigid and made so with bolts. I understood that it was the usual bolt hole and the plate attached in that way. Do you provide for any contraction or expansion in the copper plate?

Mr. Harrington: I do not consider that there is enough expansion and contraction in the plate to make that a matter of much moment, because you have the heavy lock washer on the nut and it is taken up in that way. I have not noticed any trouble of any account in the contacts.

Mr. Pestell, of Worcester, Mass.: It seems to me that the matter of supplementary wires should be looked at purely from the condition of operation of the roads. We have a case where our power station is some miles from the center of distribution, and we have practically a double track of 60-lb. T-rail to this center of distribution. We find that if the bonds are in good shape there is very little need of having supplementary copper wires, our output being at a maximum something like 5,000 amperes. If we were to use, as on some roads, 20,000 or 30,000 amperes, it would be necessary to run the copper out to the center of distribution.

In regard to bonding, we have been cross-bonding every sixth or eighth joint, and have been bonding, where the maximum amount of current is being taken, up to the capacity of the rail, as near as possible. I believe the writer of the paper mentioned that the resistance of the return circuit should be as low as that of the overhead system. I believe that almost any one who has made any tests on railroad work of this kind will admit that the track circuit in almost all cases is a great deal less than the overhead circuit. We cannot use as much current in our track as on the overhead system, on account of the difficulties to be overcome from the drop of voltage and electrolysis resulting. It is sometimes stated that a great deal more copper is run out for the overhead than for the track. That is usually so, in fact is so in almost all cases, for the reason that the overhead circuit is split up into several sections and the copper of each section only takes care of the current of that section, whereas the copper for the track is a unit and is now sectioned up; consequently all the current that is flowing at any time is flowing through all the copper in the track section.

Mr. Roberts spoke of a bonding around special work and at tops of hills and places of that kind. I believe that is a proper thing to do. In almost every case where we have a broken bond we find it to be either at a street intersection, where heavy teams cross the track and where special work is placed, or at the foot or top of a grade.

There is another point which it seems to me should be followed up with care, and that is the testing of the bonds. In putting in a bond in the first place, we often find that it has a very low resistance, but frequently, in testing that bond, in perhaps 12 or 18 months, we find the resistance has increased, for some reason which we cannot always explain. It might be well for me to quote an experience which I had this past summer. We had two miles of rail bonded with two 300,000 a. m. bonds, and the resistance appeared to be high. We investigated the matter and the bonds showed an enormous high resistance. We took out some of the bonds and found the terminals were not more than about 30 per cent. of the original section. The holes in the rail were eaten out, some of them in the center about 1-32 or 1-16 in.

Mr. Uhlenhaut, of Pittsburg: I think the question of a proper auxiliary bond return depends on the geographical location. In a station in Pittsburg, where the Monongahela River is on one side

and the Allegheny River on the other, with two branches of the road running on the outskirts and connecting in the rear, it has been found that cross-currents would run from one side of the town to the other through water pipes and gas pipes, down inclined planes, practically causing a drop of 15 to 20 volts. In this case the installation of auxiliary bonds was a necessity. It was found with four No. 0000 copper wires we could save a drop of from 10 to 15 volts. The power station was located on one side of the system, with a maximum power consumption output of from 13,000 to 15,000 amperes, all of which must be returned through the rails of two streets. The current density of the maximum output is such that the resistance of the return exceeds the resistance of the outgoing feeders, and hence the question of auxiliary return is an absolute necessity. We found this cross-connection of auxiliary feeders, running across the country, has given beneficial results, so that I think the question of whether auxiliary feeders should be run depends largely on where the power station is located in relation to the sections of the line.

President Holmes: We will now take up the paper on "The Values of Storage Batteries as Auxiliaries to Power Plants," by Mr. W. E. Harrington, of Camden, N. J.

Mr. Harrington presented the paper, which will be found on pages 726 et seq.

President Holmes: We would be glad to hear from Colonel Heft, of New Haven, on this question of storage batteries.

Colonel Heft: I am sorry to say that my experience with storage batteries has not been very satisfactory, judging from the commercial side of it. We have eight installations, and they have been very expensive to maintain, and until the makers of storage batteries can develop a storage battery of more satisfactory type than those which they are producing at the present date I would not recommend installing any more storage batteries.

Mr. Wason: I would ask Colonel Heft if the size of the battery chosen was commensurate with the work which the battery was called upon to do.

Colonel Heft: I can only say that when we installed these batteries we were guided wholly by the advice of the manufacturers, and when we complained of the expense, they said that our superintendence had not been sufficient, and believing that we were short in this respect we suggested that they send us a superintendent to look after these matters. The results in dollars and cents has been practically about the same. I say this without hesitation, as I do not believe any member of the association would state what he does not believe and know from the records of the books of his corporation to be true. I simply speak from the standpoint of the comptroller's report of the cost of these batteries on our road.

Mr. Davidson, of Pittsburg: I ask Colonel Heft if the large expense which he mentions is due very largely to the cost of simply superintending these stations or is it largely made up of trouble and necessary repairs?

Colonel Heft: The principal cost is the replacing of the plates.

Mr. Uhlenhaut, of Pittsburg: I think the question of storage batteries is one of the amount of work required from each battery. In Pittsburg we had three batteries, all of which were floating on the line and left practically to themselves. Two of the batteries have been in service for about four years and the other battery for about two years. The two batteries in service for four years have given excellent results with practically no depreciation whatever. The second battery, in service for two years, we found afterwards to be overcharged at night, with a larger feeding capacity at that point, and has been rather expensive in maintenance of positive plates. I think the question of the amount of work the battery is required to do is the determining element in the whole matter.

Mr. Wason: In the arrangement of sub-stations, in considering the question of location, there is one thing which should be taken into consideration, and that is the possibility of using the sub-station as a depot for freight and the selling of tickets, etc., rather than to consider only the question of having the sub-station placed in the best locality from an engineering standpoint. We have had several sub-stations on our lines, located by scientific gentlemen, who did not appreciate operating expense involved, and installing the batteries at points where nothing else could be done other than taking care of the batteries. If something could be sacrificed in the location of the battery from the engineering point of view, and they



could be placed in charge of those who have work to do other than taking care of the battery, there would be a gain in the cost of maintaining the battery in this respect.

Mr. Davidson: I am glad to hear Mr. Wason make the statement he has just made regarding the location of sub-stations for the batteries, for the reason that the company I am connected with has just chosen three points for sub-stations on a long line, and we have taken the view of the matter which he has advocated. We have placed these stations at points where the batteries will receive the necessary attention with scarcely any expense on account of attendance, as other operations are carried on in the same premises.

Mr. Roberts, of Cleveland: Mr. Wason's statement recalls the original design for power houses for this storage battery system, which has been placed in operation. The question was whether to build two sub-stations at what might be considered a normal distance apart, or whether to build one station in a place where an attendant had to be in order to take care of the package freight business that was anticipated and which has now developed. The first cost of the two sub-stations included the feeder wire, and the cost of the plant complete was somewhat greater than the cost of the one sub-station through that space. But, capitalizing the salaries necessarily paid to the employees in the two sub-stations, plus the attendant in the place where they wanted an attendant for package express, almost neutralized the difference in the cost; and moreover, one important element of that cost was this—that in two sub-stations a large part of the money went into machinery, which has a considerable depreciation and repair account, and a possibly increased repair account due to lightning. On the other hand, with the one sub-station, the money went to a greater degree into feed wire on which the interest only was to be paid and practically no depreciation or repair account, because the pole line was not increased in size. That is an important matter which is sometimes not taken into consideration—that it is not only the difference in the interest account, but whether your investment has a greater depreciation and repair account, as compared with some other investment. When the specification for that road was submitted to two representatives, one from each of the larger companies manufacturing such machinery, each immediately claimed that there were not sufficient sub-stations for the best results. They had a diagram giving the length of the line and distance, taking into account the actual local conditions. Mr. Wason very properly refers to these local conditions as being an important factor in the matter. I consider that good engineering includes consideration of matters of a financial as well as technical character.

I have been informed, as to the Union Traction Co., of Indiana, that their storage batteries have proved efficient as lightning arresters and that at times of heavy storms they throw out the differential boosters. By throwing them out the battery discharges less for each time, but they have been very effective in preventing trouble from lightning.

The first road to which I referred proposes to start very shortly a milk train from the end of the road, to run into the principal city, a distance of 38 miles; the train to start at 3 o'clock in the morning. The power house ordinarily starts up at 5 o'clock. The milk train will be run in with current supplied from the storage battery, and the power house will not have to start up any earlier than is the case now. With storage batteries, like everything else, every case depends on local conditions. We have one line, on which we have just decided we will not put storage batteries at the present time, though they would effect a considerable economy, because we purpose in another year to extend the line some 15 miles. By putting in certain size units now, we can put in storage batteries in another year, and with the capacity we now have we will be able to operate the entire line. We run at an increased cost of fuel now, but we shall operate with increased economy later; and not having to add generating machinery, when the storage batteries are added, it will be more economical.

Mr. Wason: I think there is one point in connection with the storage battery, as regards its location with reference to the power house, which has not been touched on, and that is the ability of a battery to take care of the load in case something happens to a large unit, in case your power house is equipped with large units. This occurred in the power house of a road I am connected with. The battery was floating on 1,600 kw. and one of the valves stuck and threw the engine out, and the battery carried the load without any one knowing anything about it.

Mr. Crosby: Following the statement made by Mr. Wason, I would say that in Washington a storage battery installed near the center of the city was able to carry the load of 75 cars for a period of something like six hours when through some unfortunate accident the whole station was out of commission. That, of course, was a considerable and heavy drain on the battery, but it did its work satisfactorily.

Referring to the experiences of Colonel Heft, I think the different methods of installing the batteries, that is, the physical conditions surrounding them, may explain why, in one case, excessive repairs are necessary, and in another case the repairs are not so excessive. On a road in which I am interested the two batteries are installed in the same region of the city, the conditions approximating the same for both, with no question as to the capacity of the battery to do its proper work, but in one of these cases a very disastrous to do its proper work, but in one of these cases a very disastrous was quite favorable when the advantages of the battery are taken into question. So far as could be ascertained, the unfortunate case arose from the fact that the installation was made in the basement on an opera house. It was the only available place in which to install the battery in the particular region in question, but it was not well adapted for the purpose. The temperature in the basement rose to a very high point, whereas in the battery station, made specially for the purpose, proper provision had been made and the temperatures were normal. In the high temperature room, the repair account was excessive, and in the other room it was not. I put this experience in evidence as a possible explanation of some of the difficulties arising here and there, where similar difficulties do not arise in other cases.

I want also to suggest that the use of a storage battery on outside lines may enlarge considerably the area over which your direct current can be satisfactorily operated and obviate the necessity of installing high tension service for such lines. In the neighborhood of Washington recently the operation of a rotary sub-station has been discontinued by reason of the installing of the battery far over on the direct current lines, the service from the direct current station being carried four miles further than was first intended, this being possible by reason of the installation of the battery. The alternating current system was relieved from that service and the spare capacity of the direct current used where it was not supposed it could be; and the service of attendants which thus far seems to be necessary on rotary stations, has been saved. That is to say, in this battery station there are no attendants whatever, whereas in the rotary station it was necessary to maintain one man all the time. In such a case, the wages of the man necessary in connection with the rotary station would in itself take care of a considerable amount of battery depreciation. In such cases it seems to be clear that the battery is useful. I have no doubt that Mr. Harrington's paper covered all the general considerations in mind, and I bring up these points as illustrating cases where conclusions might be reached different from those which are usually held.

Colonel Heft: I may have been misunderstood, and for fear that I may have given a wrong impression I will say that under one condition I am willing to admit that the storage battery can be used successfully, and that condition is that the price of the battery shall be reduced. I am also willing to admit that the basement of an opera house is a bad place to put a battery, because it might affect the voices of the singers. I am also willing to admit that my knowledge as to the proper location of these batteries is limited; but I look upon the battery principally from the commercial side and not from the engineering side, and until such times as a storage battery can be produced at a price that is inviting I certainly do not feel like recommending any further investments in storage batteries.

Mr. Harrington: In connection with the statement of Colonel Heft of considering it from a commercial point instead of an engineering standpoint, that is just the way our road has considered it—from the commercial standpoint. We have certain conditions to meet, and we have coffee roasters in our board of directors; we had dye stuff manufacturers and all that sort of thing; they look at the dollars, and so there was a great deal of money saved by turning these things in at the prices we paid.

Furthermore, we put in an installation, and that was so satisfactory that within six months we made another purchase, and our results were based on the commercial end of it; and what engineering knowledge we have gained from the use of them I have tried to put into this paper.



President Holmes: I want to say to you on behalf of the Association that we appreciate your work in preparing this paper. You have certainly gone at it in a scientific way. On behalf of the Association and myself I desire to thank you very sincerely for your kind effort. Now we will hear the report of the Committee on Standardizing. Mr. Graham, will you read that report, please?

Mr. Graham then read the report, which will be found on page 739 et seq.

#### DISCUSSION ON STANDARDS.

Mr. Graham: I would say, Mr. President, that we have a great lot of data and material that we have collected, and we are ready to turn it over to any new committee that is appointed here.

Mr. Sloan: I move that the report be received and spread on the minutes, and that the thanks of the Association be extended to the gentlemen composing the committee, and that the same be continued for another year. Motion seconded.

President Holmes having moved that discussion of the report was in order under the motion, Mr. Beggs said: I desire to say a word upon the question of T-rails for cities. I think that to a great extent the street railway companies of the country have been required to use a class of city construction which was in many cases the fad of some city engineer, without any practical knowledge of the requirements of the service that was to be passed over the rails, and the time has now come when this Association should, through the various managers, make an earnest effort to show to the municipal authorities that there are certain conditions necessary in the construction of tracks and roads by which good transportation facilities may be rendered to those who may require to use this means of transportation. We have permitted city engineers to dictate. One has a fad for one kind of a groove, and in an adjoining city the other city engineer has a fad of something else. I do not mean any disrespect to them at all, but I think there are a great many of them that we would not employ as the engineers of our roads. It is too frequently the case that their appointment is dictated by political reasons rather than for their fitness for the position they held. In the city in which I have been located for the past four or five years we have been able up to the present time to maintain the installation of T-rails; not without considerable argument; but we have been compelled to lie down and say we would not extend certain lines, and we would not replace certain rails where the streets had permanent pavements placed in them. I think what it requires now is an intelligent, determined effort to show the municipal authorities that a T-rail is the best rail, even for vehicle traffic, if it is properly put down. I would like to go into these different classes of construction that can be used in connection with T-rails to remove all objections that are urged against them and make it virtually a grooved rail.

We use granite headers and stretchers and a chamfered groove worked into the granite itself. That forms the groove for the rim of the wheel, but it will not collect ice and snow as readily, and will wear as the head of the rail goes down. As I have shown to the city engineer we must expect to wear off the head of the rail. I found in Toronto a few years ago that length after length of the lip of groove rail was worn off by the tread of the wheel. I offered to pay the expenses of the city engineer of Milwaukee if he would go there and examine it, and look into the conditions imposed by the city of Toronto. We use and we supply at the expense of the company, granite headers and stretchers placed on the inside of the track chamfered to about the same extent as we would a grooved rail. We also supply blocks, but not chamfered, for the outer edge of the rail. We are compelled to pay the cost of repairs and asphalt cannot be put against the rail so that it will stay there; it will fill in with water and freeze within a very short time.

We lay all of our T-rails on a concrete base 6 in. deep under the entire spread of ties. We put down a 6-in. T-rail leaving a sand cushion of one inch and from that our special work to all the intersection we pave entirely with these granite blocks. The company does that itself, using paving cement and hot gravel to fill the interstices. Therefore we are compelled to do our own special work. I take up the granite block pavement and replace it at much less cost than the original.

Colonel Hef: I would say the committee proposes to place in the hands of the association drawings showing the different

styles of pavement from macadam to petrified brick or asphalt. In all uses of the T-rail we use from 5-8 up to 11-8 in. flange.

Mr. Beggs: Our action has been prompted to a certain extent by the fact that we own everything in the way of surface railways in our section of Wisconsin, and we propose to try to continue to own them and for that reason we have made our city construction to accommodate our interurban equipment.

I believe that the master mechanics of our several properties should meet together just as our accountants have done this morning; that the superintendents of construction and maintenance meet together and discuss these matters just as the steam roads have done. I think it would be much more important, Mr. President, than even if we meet here. We are simply (I am assuming that many of those that are here are the recognized representatives of the various roads) are possibly the hub on which hang the spokes, our superintendents of maintenance and equipment, and our electricians, and the superintendents of our lighting departments. We are here from a distance of a thousand miles; there are five representatives of the Milwaukee company here, and I think as did Captain McCulloch that it was more important that they should be here than for the general manager of the property. I am here at very great personal sacrifice and I expect to take the 6 o'clock train in order to get back to Milwaukee as quickly as possible. These conventions are to me times of hard work.

I throw out this suggestion in the line of continuing this standardizing committee, that the committee having in charge these standards should continue the good work which it has begun. I know the good work that has been done by the Accountants' Association. Our auditor has been an active official in that organization and has done a great deal of work in trying to perfect the accounts. For instance, our money is going out to a very great extent through our superintendents of transportation. My superintendent of transportation is here. I think he is out listening to a school of the Metropolitan road, and our men go from here to several cities before going back to Milwaukee; they have already been away ten days. I feel most earnestly that they are the people that ought to get together, and they should help our standardizing committee.

Mr. Graham: After accepting the chairmanship of this committee and getting to work, it opened up a new field for my thoughts. I began to see where the importance of the standardizing of the street railway equipment came in. We started in at Niagara Falls. When we first met we worked for two or three hours and didn't get a mite ahead, and I guess we could have worked a month. I found that the committee was hurriedly organized and we went to work and got some outside help. We had money to spend. We didn't spend a great deal of it, but we had the money to spend if we wanted to; and I have come to the conclusion, after nearly a year experience, that the committee ought to be changed, there should be new blood gradually worked into it. I am more in a business way, but I can see the advantage if we go to work and have the members attend to this committee and get gradually new blood into it, within two or three years we will get something that will be a credit to the Association. I do not want to take up your time at present, but I feel that this committee ought to be appointed by the Executive Committee after a very careful consideration.

Mr. Sloan: I beg to withdraw my original motion and substitute another: "Resolved, That the report of the committee be received and spread upon the minutes, and that the thanks of the committee be extended to this committee, and that the executive committee choose another committee for the ensuing year, and that all the data which has been collected shall be published."

Mr. Crosby: I would like to ask whether in accepting the report of the committee the particular declarations are adopted as the sense of the Association.

President Holmes: That is not the case. They are simply submitted like any other paper before this convention and are really suggestions. I want to say gentlemen, before I put the motion that when the committee was appointed it was very hard to get anybody to serve on it, and it was always the case with our association committees. I have been a member of this association a great many years and I do not believe that during that time there has ever been a report as good as the one just pre-

sented. I feel personally very grateful to the members of the committee, and I do not blame them for wanting to be relieved of their great responsibility. I only hope that the incoming executive committee will continue this good work, for what has been done is only the beginning of what must be done in the future.

Colonel Heft: It comes to me now that when the report is sent out it should be at the instance of the new committee, and that this report should be sent to the different roads along these lines asking for their views and replies. This would assist the new committee and we should be able to cover more ground and cover it more thoroughly in one year than we should otherwise cover it in ten. I merely offer it as a suggestion to you; I think it would assist the committee.

Mr. Sloan's motion was carried and the convention then adjourned until 2:45 p. m.

#### FRIDAY AFTERNOON SESSION.

President Holmes called the meeting to order at 2:45 o'clock.

The first paper to be considered was, "The Modern Power House, Including the Use of Cooling Towers for Condensing Purposes," by Mr. J. H. Vail, of Philadelphia. This paper will be found on pages 723 et seq.

Mr. Crosby: I will ask one or two questions, which may develop some interesting points in connection with the subject. Mr. Vail spoke of a very low percentage of evaporation, 1 to 3 per cent., and I would ask whether the conditions had any special advantages which would keep the evaporation down so low, as ordinarily I think they are much higher.

Mr. Vail: A great deal depends on the humidity, the atmospheric temperature and general conditions. It must be kept in mind that the losses by evaporation will vary according to the type of condenser used. If the condensed steam is combined with cool water through a jet condenser, then the water, which actually passes as boiler feed, is apt to be cool and the loss is not perceptible. But if it goes through a surface condenser the loss is perceptible and will run as high as 3 per cent.

Mr. Crosby: Has Mr. Vail in mind any cost per 1,000 gallons of water at which it becomes uneconomical to use the ordinary condenser and economical to use the special condenser which he describes? The case is that which really presents itself in all engineering problems, whether one line of practice or the other is less expensive. We can either get the water by paying the city for it, or we can build a pipe line belonging to the company. The point is, at what price per 1,000 gallons of water does it become less economical to use the ordinary condenser as compared with the cooling towers? I think that would be the crucial question, as it presents itself to me.

Mr. Vail: I do not know that I can state the exact price. There is no question but that a cooling tower is a saver of boiler water, for the reason that it enables a station to use more economical engines. These towers which I have spoken of have been placed in locations where the water is purchased from the city and the water used over and over again for condensing purposes. The amount of boiler feed is reduced.

Col. Heft: It seems to me that this question is governed largely by the local conditions and the price at which water can be procured for condensing purposes; and it is a question which has been presented to me in just this way. Before I would commit myself to the theory advanced by the writer of the paper I should want to go into the question of water very thoroughly. It strikes me as a very fine engineering proposition, and might be called splitting hairs. I think the question asked by Mr. Crosby is the meat of the whole proposition.

Mr. H. M. Sloan, of Chicago: I unfortunately did not hear the paper read; but from a remark Mr. Crosby made, he leads me to believe that he considers that condensation by cooling towers was cheaper than the ordinary method. Am I correct?

Mr. Crosby: That was not the position I took, at all. I intended to convey the idea that under one set of conditions, as to cost of water, the ordinary methods are cheaper, and under another set of conditions, the cooling tower is cheaper. I do not want to set myself for or against the cooling tower, as that would be illogical,

since conditions arise, which would first make one, and then the other, better for a given case. I have both to consider. We have installed both systems in properties in which I am interested. The question has presented itself to me along the lines that I have proposed, but I do not carry in my own mind the final definite conclusions, which ought to be lodged somewhere in the literature on this subject in order to make it helpful. Mr. Vail's paper is thoughtful and suggestive. It would be more helpful to one reading it, if I may be pardoned for suggesting it to Mr. Vail, if finally that deduction in the form I suggested had been made. The point I wanted to get at was this, taking the cost of water at 10 cents per 1,000 gallons (I am using that figure for comparison), whether that is the cost at which we should consider the cooling tower. That is the point which I would like to have had settled. It will not be difficult, in taking a given cost of coal, in a given locality, that a fairly well defined rule should be laid down for preliminary guidance in the study of the problem.

Mr. Vail: As I said in the paper, it is a matter of a great deal of regret that you cannot obtain from the general run of our stations in this country accurate data as to the cost of operation and what they save by the use of certain appliances. In regard to the use of water, with the cooling tower, when the tower is filled the amount of water supply is a sufficient body of water for condensation purposes for continuous circulation, and there is then only a very slight waste by evaporation, but to the best of my knowledge there are no figures in existence which show where the line should be drawn as to the cost of water. Sometimes there exists a natural supply of water. I can refer to a station where there is a pond in the town and a power station of 3,000 h. p. capacity was located three-quarters of a mile from an otherwise desirable situation for the sake of using that water. In six months the water of the pond, after continual circulation, without any means of cooling, was so warm that it was of no value for condensing purposes. I recall another case where we built the cooling tower and the condenser in the station in the heart of the city, and bought water from a water company and we actually saved the operation of two boilers. The water bills in the station were not increased one dollar, but we increased the output of the station a thousand horsepower. These figures I know to be facts, but when it comes to the drawing a line as to the cost of water, I have not that data.

Mr. Uhlenhaut: Referring to the special inquiry of Mr. Crosby, I would say that there is a case recently come to my mind of a station located near a river where the maximum depth was 71 ft. and the average about 60 ft. The question of locating the station above the high-water mark was important, and the figures submitted by one of the manufacturers as to whether it would be advisable to erect a cooling tower and use city water, at 6 cents per thousand gallons, or put in a pumping station to pump water for condensing purposes to the elevation, showed that it would be advantageous to put in cooling towers and buy water from the city.

President Holmes: We will now have the paper on: "The Adoption of Electric Signals on Suburban and Interurban Railroads, Single or Double Track, and Their Economy of Operation," by Mr. William Pestell, of Worcester, Mass.

Mr. Pestell presented his paper, which will be found on pages 721 et seq.

Mr. McCormack: The question of signals on suburban roads, particularly as most of them are single-track roads, is something which is very important. I have given the question some study, but not having any such roads in charge I possibly do not fully realize the importance of the subject of signals as other gentlemen who operate single track suburban roads. My opinion is that the suburban roads have got to go to steam railroad practice in formulating rules and to operate signals on the same principle on which the steam roads operate them. Some of the suburban roads running out of Cleveland depend entirely on the train despatcher. That is, they have the telephone system and at each box they report their car numbers and direction in which the cars are bound and ask for orders. The orders are given to meet a car at one point and go to another point. The other point may be beyond a



sub-station; a telephone station. The conductor then repeats the order to the motorman, who repeats it back, so as to have a thorough understanding. When the telephone system is disrupted by storms or otherwise, there are delays on account of the fear of making any general rule to govern the cars when they cannot get the telephone orders. I, therefore, think that rules which would give suburban trains the right of way on the same conditions as steam railroads are run, would be necessary for the government and operation of suburban lines. The steam railroads have what is called a time convention, in which a committee is appointed and for some eight or ten years they worked to arrive at conclusions concerning the best rules to govern the operation of trains by telegraph orders and by rules when they could not get telegraph orders. The principle involved is that a train in one direction has the right of the road. Meeting points are shown at different places along the road and the opposing train has up to that time to arrive there on certain class trains. On different classes of trains they have to clear the superior class train five minutes, and if the other train does not arrive the opposing train proceeds. I think that some rules such as the steam roads have would be necessary for the operation of suburban lines.

Mr. Vreeland: There is no question but that this matter of signalling is a most important adjunct in the operation of roads where such systems of signalling are necessary. I found roads last year on the Pacific slope very far ahead of any of our Eastern or Central suburban street railways, as to the methods of operation and signal protection. I assume it was because they were among the later constructed of electric roads, and had the advantage of all that had been done in that direction. I found in Vancouver a suburban line, which is operated on the same system as the steam railroads, with the exception that they use the telephone system instead of the regular telegraph; but the moment the telephone system was out of order, they had a regular system of time tables at meeting points and immediately operated under the same methods as prevail in steam railroad practice as described by Mr. McCormack.

I think the question is a very important one, and it is pertinent to the subject to say that I do not think that the average suburban road is operated as it should be in the interests of safety. Four years ago I examined a railroad property as to its general physical condition and methods of operation. I mentioned to the general manager that his suburban line was operated without any signal lights on the cars and that it seemed to me to be unsafe to do so. He at once answered: "Those are some of your steam railroad ideas; this is a street railroad." His cars were running at a higher rate of speed than prevailed on the steam railroads of the United States 20 years ago, when I was running a train as conductor. All of the conditions which pertain to steam railroad operations pertain to his operation. Within ten days after I was on that property, on a foggy, stormy night, a car lost the trolley, and before the pole was replaced and the car relighted, the car behind it went into it and killed three persons and injured five others. On another road, shortly afterwards, I called the attention of the manager to the same thing, and he laughed at the idea and made about the same answer, "You are a steam railroad man, and not a street railroad man." That road had a bad accident the same summer. I had a similar experience with a third road, and my conclusion is that I would prefer to be a steam railroad man with steam railroad ideas, operating a street railroad, under steam railroad conditions, than to be a street railroad man with ideas that prevailed in horse-car operation.

Mr. W. W. Wheatley: Mr. President, and Gentlemen—The reader of the paper stated the principles of signals and turnouts. The object of a signal is to give an indication to the motorman or the engineer as to whether the track ahead of him is clear or obstructed. I can conceive of conditions on double track electric roads where there are danger points that ought to be protected by signals. Those danger points may be junction points; they may be curves, where the view is obstructed by trees or by hills; there may be tunnels in which there are curves and where it is desirable to have an indication given whether the track ahead is clear or is obstructed.

Referring to any given proposition in the operation of a double track electric railroad the question as to whether signals are or are not necessary must be settled entirely on the basis of the traffic and speed. Where the traffic is dense and the speed

is high, signals are very necessary in double track operation. Where the traffic is light, the headways are seemingly light, and where the speed is slow the road may be very safely operated without signals.

We have several lines, even to the seashore, on which our traffic is exceptionally heavy, and which on certain portions of the lines we operate at high speed. We have our danger points protected by safety signals. We have not yet gotten into the question of block signals for the purpose of spacing our cars, because we have covered that rather freely by flagging, which we are required to do at highway crossings and at other points that must be protected.

I think, however, that in the operation of suburban and interurban lines where the conditions more nearly approach steam railroad operation, that the gentlemen operating those roads will sooner or later have come to the question of adopting some signal to protect their operation, and when that time comes it will be necessary for them to determine whether they ought to operate a system known as the absolute block system or whether they will operate a permissive block; whether they will operate an automatic system or whether they will operate a manual control system. There are perhaps at present very few of the suburban and interurban roads that will care to go to the expense of an extensive automatic signal system. They will probably find it convenient for many years to come to depend upon the manual control system confined to such points as are known as danger points.

Mr. Fuller: I fully agree with Mr. Wheatly that the time is coming when you will have to have a signal block. I am now building a high speed road where we are guaranteed to have our cars to run 35 miles an hour. I would give a good deal of money at the present time to be able to get a good safety signal for that road; I cannot find it, and I have had my electrical engineer study the two or three systems in the exhibit hall; whether they will do he will not say. They are automatic signals, I think, all of them; but whether they would be safe or not to put on to a high speed road is more than I am able to determine. I wish I were.

Mr. Wason: On the suburban road out of Cleveland from time to time we tried different signalling devices, all of them from time to time failed to operate, and so far we are yet to find a signal that will always do the work required. In consequence of that we are depending entirely upon telephone messages from the train dispatcher to the turnouts. On one of the roads to Toledo and Norwalk they are running on the steam railroad system if the telephone is out of circuit; otherwise they get their orders through the telephoné, the conductor writing them on a slip and he in turn giving it to the motorman; that is repeated by the motorman and he runs over the road according to the orders received and written on this slip. That slip is turned into the office and compared with that given out by the train dispatcher.

There is no question but that the suburban roads are running at disadvantages due to the lack of any apparent specific signals, as Mr. Wheatly suggested. The expense necessary to install the automatic device has not been permissible with the amount of work that the suburban road has yet been called upon to do. There is no question but that if any device could be found that would be sure to work, it would be welcomed by the suburban people, but the trouble is that it is not dead sure of always performing the work desired; and then if you have not some other ultimatum, you are at a disadvantage. You must have orders that will be carried out in case the motormen are unable to get the train dispatcher, and that is bound to occur from storms, the falling of trees interfering with the telephonic lines, probably more on suburban roads than the steam roads, because the roads are passing through streets and villages where obstructions are more likely to break down the circuit. The steam railroad practice it seems to me must be carried out as nearly as possible by the suburban road.

Mr. Fuller: I do not think the first cost of any signal system should be taken into consideration at all no matter what it cost; it won't cost you as much as some accident might cost you.

Mr. Wason: Then it seems to be that the adoption of the steam railroad system of the Pennsylvania road would help the

(Continued on Page 739.)



## PAPERS BEFORE THE AMERICAN STREET RAILWAY ASSOCIATION.

Read Friday, Oct. 11, 1901.

## THE ADOPTION OF ELECTRIC SIGNALS ON SUBURBAN AND INTERURBAN RAILWAYS, OF SINGLE OR DOUBLE TRACK AND THEIR ECONOMY OF OPERATION.

By William Pestell, Superintendent of Motive Power, Worcester (Mass.) Consolidated Street Railway Co.

The subject of signals for electric railways is of the greatest importance and is receiving, very deservedly, a great deal of attention among practical railroad men in all sections of the country at the present time.

The necessity of some system of signalling becomes more pronounced as the weight and size of cars, the volume of traffic and the speed at which our cars are run is increased.

The delays and inconveniences arising from the operation of suburban roads without a properly designed signal system adapted for the service are only too apparent and become more pronounced as we examine into and get into closer touch with the various signal systems that are today being tried in the various sections of the country. Whatever signals have been introduced for street railway work, even though their operation has not been perfectly satisfactory, they have illustrated the fact that delays can be reduced and a schedule maintained in a more satisfactory manner.

Signalling as applied to steam railroads for some years has been in satisfactory and general use and has been brought to a high state of perfection and efficiency. Apparatus such as applies to steam roads would be practically of no use in street car service, as the conditions governing the operation are so entirely different.

The use of signals on steam railroads is mostly for double track lines and is principally for keeping a proper difference between trains going in the same direction.

At the present time it seems doubtful if this class of signals would be required on street railways, but if the necessity should arise some form of signal now in general use on steam railroads could be adapted to the purpose.

On steam railroads where temporary increase in traffic demands a greater carrying capacity, more cars are added to the train, the train still being maintained as a unit so far as its effect on the signal system is concerned. In street railway service the conditions are not usually such that this can be conveniently accomplished, and it is necessary to send out several cars, each detached from the other, and all working to maintain the same schedule. As these cars cannot ordinarily keep in sufficiently close touch with each other to indicate their location, it complicates the work to be done by a signal system to properly take care of their operation. It is not always safe to depend upon the crew of one car notifying the crew of another car at a passing point of cars that are due to follow and pass at the same point. Different roads use various means to obtain this end even when no signal system is in use. Some by attaching signs to the dasher of the car, indicating that another car is to follow; these the crew on the car waiting at the turnout are supposed to observe, and are not to leave until the last car, which should have no sign on the dasher, has passed.

On steam railroads stopping places where passengers are to be taken on or let off are practically a constant factor, and are comparatively long distances apart. This has the effect of allowing trains to keep to their schedule more easily and obviates the necessity of frequent orders from train dispatchers.

In cases of necessity of change of orders to a train crew on a steam railroad the telegraph is almost universally used. The presence of employees at every stopping place along the line renders this easy of accomplishment without the loss of valuable time, or chance of costly mistakes.

The telephone is rapidly being introduced along the lines of street railways for this purpose, but the street railway com-

panies are at a disadvantage in the use of the telephone, in not having men permanently located at frequent points along the line of the road, and having to depend on the car crews for one end of their dispatcher system much valuable time is lost in receiving and imparting the necessary information.

Another defect of the telephone system for dispatcher work on street railways, is the inability to reach car crews at the time required and the likelihood of several crews trying to use the telephone on different points of the line at the same time.

It is not intended to convey the idea that the telephone is not desirable as an aid in operating street railway systems, but that the telephone of itself for general use is not to be wholly relied upon.

In connection with a reliable signal system it should be of inestimable value, as the use for dispatcher work would be reduced to a minimum, and with proper rules, intelligently followed, practically all conditions could be provided for, giving the single track road its maximum efficiency and putting it more nearly on the basis of a double track road.

Where the necessity of a signal system on electric roads seems to be generally indicated is on single track roads, both for suburban and interurban service, city service usually requiring special applications to cover local conditions.

The object of a signal system for such purpose would be to indicate a safe passing point for cars going in opposite directions giving single track roads with fairly frequent passing points more nearly the same operating conditions as those of double track roads, thus avoiding delays and maintaining the schedule.

The experience of steam railroads in the use of signals, their reliability, and the confidence now placed in them, makes it reasonable to suppose that equally good apparatus would be developed on the vast mileage of electric railways, represented by this Association.

Different signals for day and night use (as disks or semaphores by day and different colored lights at night) seem to be thoroughly established for any class of signal work, as regardless of the purpose for which a signal is set it should always be easily discernable.

All signals will add certain elements of danger due to chances of failure inherent in every piece of mechanism. It is therefore important to select a signal with the chances of failure so slight that only the added safety resulting from its use need be considered. The use of block signals on steam roads has reduced the liability of rear end collisions, and yet were the signals of such construction as to be unreliable the danger would be greater with, than without the signals.

In this connection it would be well to note the care bestowed by steam roads on their signals. They employ trained mechanics whose duty it is to see that all signals are properly inspected and maintained. An electric road usually puts its signal under the care of a lineman, or some other man who may know but little of either their principle or mechanical construction. It is natural to suppose that as the use of signals increases more care will be bestowed upon their inspection and maintenance.

The first, and most essential element to be considered in connection with any signal system is that of safety, and no signal should be considered unless its reliability can be demonstrated to such an extent, that it adds to the safety of operation of the road.

Among the various types of signals in use we find those depending wholly on incandescent lamps, those depending wholly on semaphores or disks illuminated at night, and those depending on disks or semaphores by day and upon colored lights at night, for their visual indication.

Another type of signal is that which leaves the trolley wire dead on the entering side of turnout ahead and leaving side of turnout behind, thus preventing a car, from either end of the block, entering until the block is clear.

Again we find various devices in use for operating these types of signals. First the manually operated switch, which has been in use for perhaps the longest time and is generally conceded a failure owing to the fact that the men cannot be relied upon for its proper operation. Second, we have the rail contact devices, which have been very little used, and so far as I can learn are not generally exploited. Third, we have switches operated automatically by the passing of the trolley, which are coming into more general use as the state of the signal art progresses.

These may be divided again into several classes. One in which a contact is simply made by the wheel sliding upon a contact surface normally insulated from the trolley wire. Another, operating a switch mechanism by the passing of the trolley, making various connections, selected according to the direction the trolley passes under the switch. Still another in which the mechanical work of the signal is partly done by the trolley in passing under the switch. Each of these types of signals and switches in service may have a particular value for the location to be protected, and it would be unwise at this time to make any recommendation covering general conditions. The following is a copy of resolutions drawn up by a committee appointed by the Massachusetts Street Railway Association, on which the writer had the privilege to serve:

"The committee appointed by the Massachusetts Street Railway Association on the 'Recommendation of Electric Signals for Street Railway Service' would make the following recommendations:

"That a telephone system in conjunction with a proper block system is necessary for a safely and satisfactorily operated suburban single track road.

"That it is impossible to make any recommendations to cover the needs of general city traffic, the necessities of the same being largely determined by conditions entirely local.

"That the telephone system should be owned and operated by the railway company.

"That a system of selective signals should be used in connection with the telephone system, to call outside telephone stations.

"The block signal system should be entirely automatic, should contain a minimum number of parts; should contain some other means of visual signal besides incandescent lamps, should not depend upon incandescent lamps for continuity of circuits; should set as far as danger end first and be locked at danger before it is possible to operate cautionary signal at rear end; should not burn out under ordinary conditions of contact with live parts of trolley system; should be normally at danger and cannot be set at safety unless all parts are in normal working condition; that signal, after being set at danger cannot return to safety until all cars that have gone onto block have gone off again; should be capable of working satisfactory from 200 to 600 volts; and should be of the best possible construction, mechanically and electrically."

The following is a copy of blank sent out to various street railways throughout the country to enable the writer to get a fair idea of the extent of the use of signals for street railway work, a general idea of the defects existing, the economies produced, and the apparent demand for a signal of any kind.

Have you signals in use?

How long?

What kind and make?

On single or double track?

Suburban or interurban?

Are they satisfactory?

Are they reliable?

What particular trouble have you had with them?

Do they effect the economy of operation? How?

Are they affected by lightning?

In what respect is the signal in use on your road lacking?

Do you desire signals on your road?

For what purpose?

Would they affect the economy of operation? How?

What particular requirements are necessary in a signal for your service?

The general idea prevalent seemed to be that signals were

not required for double track work, but were required for single track work, producing economy where in use, by dispensing with flagmen in some places and as some have stated "by indicating the position of cars and thereby enabling the schedule to be better maintained under extraordinary conditions." The principal defects noted were the fact that signals were not absolutely reliable and were generally affected by lightning. Also, their lack of ability to indicate more than one car on a block at a time, that is the first car passing off the block sets the signal to normal condition, giving no indication of any other cars that might be on the block.

It has not been the purpose of the writer to go into the details of the different devices, gotten out for use as signals for street railway work, or to criticize or recommend any particular type or make. A number of signals of various types are now on the market and while from the standpoint of the writer they are all in a more or less experimental state, they are deserving of every encouragement, for until the various conditions of our service have been thoroughly brought out and enlarged upon, by both the operators and signal engineers, no satisfactory device can be produced.

The street railways generally manifest a great deal of interest in the question of signals, and I would therefore recommend that, owing to the present apparent experimental condition, this matter be further followed up and a report be submitted to the next meeting of the Association. I regret that the press of business since my acceptance of the honor of writing this paper has been such that I have been unable to devote the time necessary to obtain and properly work up the data for a paper dealing with such an important subject.

I trust, however, the discussion will be free, and that my feeble efforts may bring to the bringing out of some points of value to us for further work.

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## THE BEST METHOD OF CONDUCTING THE RETURN CURRENT TO THE POWER HOUSE.

By E. G. Connette, general manager, Syracuse (N. Y.) Rapid Transit Company.

The writer is somewhat at a loss for new material to offer on this subject, as it has been discussed for years, and improvements introduced until the present practice of using the rails with bonded joints for conducting the return current has been practically perfected, so far as the use of the rails of the track can be utilized for that purpose; especially when the highest state of the art of bonding the joints is particularly observed and the work carefully done. A large portion of the troubles which exist under the present practice is on account of inefficient careless work, and the use of faulty material, but even when the greatest care is observed and the best material is used, in bonding the joints, the deflection of the joints in the course of time from various causes will impair the efficiency of the ground return.

A few years ago, when electricity as a motive force had been perfected to such a degree as induced the street surface railroads to transform their motive power from horses to electricity, there were two electric companies in the field offering apparatus for street car propulsion, viz.: the Sprague Electric Co. and the Thomson-Houston Electric Co. In 1890 the writer assumed the management of a street railway company, a part of which was being equipped by the Sprague Electric Co., and the rest by the Thomson-Houston Electric Co. The Sprague Electric Co. used the rails of the track exclusively for conveying the return circuit and used a No. 6 galvanized iron bond, riveted to the rails, around each joint. The Thomson-Houston Company used an auxiliary copper wire, the same size as the trolley wire, laid in the center of the tracks on the tops of the cross-ties, and connected with a wire of a smaller size with a rivet to the center of each rail, and I believe it was the idea to use the same amount of copper wire for the ground return along the tracks, connected in the manner described, as was used overhead. In a few months it was discovered that the voltage on the lines equipped by the Sprague company was very low, especially towards the end of each line, and upon investigation, it

was found that the galvanized iron bands had almost entirely disappeared, while on the lines equipped by the Thomson-Houston company the loss in potential was about the same as when the work was first installed, the rail joints of the Sprague lines were re-bonded with copper bonds riveted to each rail, but in the course of time, it was further discovered that these bonds were too small in size, and that the loss of potential was gradually increasing on account of the bonds deteriorating and being broken off, and it was necessary to go over the lines again and re-bond them. On account of the large initial expense of an auxiliary ground wire and of the improvements and progress in the method of bonding the joints and the use of heavier rails, together with the improved method of supporting the joints, the use of the auxiliary wire in the ground for the return circuit was abandoned.

With the great variety of devices and improvement in the art of bonding the rail joints at the present time, there is yet more or less trouble experienced, and the tendency is towards a jointless metallic return by using electrically welded or cast-iron joints, which practically makes an unbroken metallic return, so far as



E. G. CONNETTE.

the tracks are concerned; but, unfortunately, a large number of street railroads are not financially able to relay their tracks with heavy rails and use the improved method of joint support and connections, and the problem with them is yet unsolved as to how to bond the joints of the rails so as to get a perfect connection and one that will stand and overcome all resistance or loss. It must be remembered that in a mile of track, there will be from 176 to 352 joints, and while the rails of the track have more than ample capacity for conveying the current, the joints must be so connected as to give the current a path across of but little or no resistance; when the joints are properly bonded, the track for a period of time answers well for a return circuit, but after a while the connections at the joints become corroded, the bolts are worn, the joints defect, and the bonds here and there are either broken or worn in two, or corroded and loose at the connection, and the result is, a very imperfect and inefficient ground return. In some instances there is an insufficient amount of wire used for the return circuit from the tracks to the power house, and in some cases when there is enough wire for this purpose, the connections to the rails are inadequate and creates a resistance, that neutralizes the conveying capacity of the copper intended to convey the return circuit to the power house. The wires of the return circuit should be connected to the rails with a connection of equal capacity to the conductor, and should be connected in three or four places, so that if one should become broken or disconnected, there would still be ample carrying capacity in the other connections.

In the early days of telephone exchanges, the ground was used as a return circuit, and we are all familiar with the inefficient and poor telephone service while this state of things continued. The service was disturbed by the trolley currents and other influences until finally the telephone exchanges were forced to put up a metallic return in order to save trouble, annoyance and disturbances to their service, and I believe after a trial it was discovered that the expense of putting up the metallic return was more than compensated for, by the improvement in the efficiency of the service, and was money well invested.

It is, therefore, the opinion of the writer that "the best manner and mode of conducting the return circuit to the power house"

is by using practically a jointless and independent metallic return, connected to each rail, and the connection made with ample surface contact and absolutely water tight; on account of the chemical action, which is likely to take place between the copper rivet and the steel rail, the rivet should be covered with a thick coating of lead, solder or tin. The best connection which can be used, if the facilities are available, is to electrically weld the connection from the auxiliary ground wire to the center of each rail, and, I dare say, that even with the extra initial cost of an independent ground wire, it will result economically in the long run. If an independent metallic return circuit were usual now, there would be no necessity for a paper to be written on this subject; there would be no more need of discussing the subject of rail bonding, or of electrolysis, or of the best method for discovering bad connections in the return circuit, and the expenditure of a large amount of money for expert investigation and advice to cure the bad results of the present imperfect system of conducting the return circuit to the power house; and the amount saved in decreased loss of power, cost of rail bonds and labor of renewals, tests and investigations, as well as the trouble and expense incident to electrolytic action will be more than ample to pay a large interest upon the cost of installing an independent ground return.

Cast iron joints and electrically welded plates on the joints makes the rails of the track practically a jointless metallic circuit as a conveyance for the electric current, but the very large number of joints in the rails of the track makes the certainty of an unbroken and continuous metallic circuit a doubtful proposition, as the wear and tear of heavy traffic, and the expansion and contraction of the metal will, in the course of time, produce results, which may very materially impair the efficiency of the joints as a perfect conductor, and it appears to the writer that it is just as essential to have a conductor of as perfect design and as efficient in carrying capacity, to convey the current back to the power house, as is used to convey the current from the power house to the car, and if this were the case, there would be no more troubles with the return circuit. I do not advocate a double trolley, because of the difficulties which are well known to street railway people, but an independent metallic return used in connection with the single trolley system is not as expensive to install as the double trolley system, and, practically, obviates all the troubles incident to the ground return, where the rails with bonded joints are used for the return circuit.

#### THE MODERN POWER HOUSE INCLUDING THE USE OF COOLING TOWERS FOR CONDENSING PURPOSES.

By J. H. Vail, mechanical and electrical engineer, Philadelphia.

It is not the purpose of this paper to enter into the minute details of what should comprise the equipment of an individual modern power generating station, these general features being too well known to warrant repetition, but I preferably invite your attention to improvements in certain directions which make for economy, and that may with advantage be introduced into existing or prospective stations.

I submit the proposition that it is not good business policy to maintain in operation a wasteful plant, for the reason that as compared with an economical plant of equal capacity the wastefulness in fuel, water or other costs of operation must be capitalized according to the ratio of the increased cost of operation and maintenance. Therefore the engineering question of judicious selection of auxiliary equipment to reduce wastefulness becomes of prime importance to the business man who anticipates reaping the largest attainable profit from his investment in the electrical field.

There should be a sensitive perception of the particular advantages to be derived from the combination of certain types of appliances in any particular station according to its locality. The application of economical auxiliaries in a station is to a certain extent a commercial as well as an engineering problem for the reason that the engineer is expected to design and build the station equipment to the end that the highest commercial results may be obtained.

The application of any special economic device will be justified when by careful analysis it is determined that the savings derived will repay



1. All cost of maintenance, depreciation, attendance and operation.
2. A fair interest on the initial investment.
3. A reasonable profit in addition.

The environment of the station will largely determine many of the leading features of its equipment. For instance there are towns in the coal regions where the cost of fuel is so low that the saving elsewhere usually secured by condensation, will not be sufficient to pay the interest on the cost and maintenance of the additional equipment needed to operate a condensing engine; but these exceptionally favorable conditions are so rare that while worthy of notice we can best devote our attention to the locations where money can be saved by the introduction of new methods at reasonable cost.

Prof. R. H. Thurston at the New York meeting, 1899, of the American Society of Mechanical Engineers has fully set forth the progress in steam engine efficiency summarizing the economy obtained in the best practice to date, and finally concluding that the steam engine has now been so far perfected that but little more can be expected from the designer. If we would secure additional economies we must look for them outside of the engine, and I venture to advance some suggestions that I believe are justified from results attained, and which if adopted in combination where fuel and water are important items of operating expense will materially reduce the cost per horse-power hour.

The use of pulverized fuel I venture to advance as one of the lines for greater economy of fuel in the future for several reasons:

1. More perfect combustion can be obtained resulting in the possible utilization of a larger proportion of the heat units contained in the coal.
2. As the coal is pulverized by machine and by automatic regulation supplied to the furnaces, the labor of firing is reduced to minimum expenditure. One man can attend the furnaces for at least 1,000 h. p. of boilers.
3. As every available particle of combustible is burned, there is a saving in the handling of ashes. I have seen stations where 5 to 10 per cent of good coal was thrown away with the ashes.

At many large cement works most effective and satisfactory methods of firing with pulverized fuel have to my personal knowledge for a long time been in successful and continuous service in rotary kilns for burning cement clinker, which require to maintain a temperature of 3,000° F. The method of burning pulverized fuel with an air blast is the most advantageous, as it admits of a more accurate adjustment of the supply of air and fuel, almost ideal combustion is secured, similar to the burning of natural gas, and all requisite flexibility may be obtained for controlling the supply of combustible and the steaming production of the boilers.

In adopting the use of pulverized fuel there will be required a larger combustion chamber, and the boilers should have a larger proportionate heating surface to enable them to absorb the increased available heat units obtained from the better combustion of fuel, or with boilers of a given heating surface and steaming capacity less fuel will be used; the opportunity of using a cheaper grade of fuel should not be overlooked.

At the May meeting in Milwaukee of the American Society of Mechanical Engineers this subject was presented and discussed, showing that its employment has emphatically passed far beyond the theoretical stage. The superheating of steam means the raising of its temperature after its generation in the boiler, without greatly increasing its pressure. The idea is not new, as the subject has been followed up with more or less success for the past fifty years. The theoretical economy hoped for and practicable methods of its attainment have been persistently sought; the difficult problems have one by one been worked out, and the obstacles one by one overcome until now application of superheating will be contracted for by reputable concerns, and very high economies obtained.

It is stated that with horizontal tandem compound engines of comparatively small power, an economy of 9.50 to 9.76 lb. of steam per i. h. p. is obtained, while in larger engines 8.97 has been reached. The writer does not claim to have personal experience with superheated steam, but is informed by one of our most conservative engineering firms that they will contract for installations and guarantee under stipulated conditions a steam consumption not exceeding 10 lb. steam per i. h. p., with large compound or triple expansion condensing engines.

The advantages obtained with a condensing equipment are so fully and generally recognized by engineers of good repute that we need not dwell on these details, but we all recognize the fact that many stations for various reasons are so unfavorably located as to be deprived of the advantages of an ample supply of cooling water, and to the managers of such stations the benefits to be derived from the cooling tower must appeal with unusual force if care is bestowed in analyzing the cost of equipment, the benefits derived from the cooling tower must appeal with unusual force if care is bestowed in analyzing the cost of equipment, the benefits derived, and the economy affected.

The idea of artificially cooling the temperature of circulating water to make its continuous use available for condensing purposes is not new. Many methods have been described in the technical papers. There have been used series and tiers of iron pans, plank troughs, spray pipes, tubular tiles set vertically with broken joints, suspended woven wire mats or partitions set as open towers, or with enforced air circulation by fans, shallow tanks, etc., all of which have been more or less effective. Thus it will be seen that the methods of artificially cooling water for condensing purposes have been subjects of experiment along various lines for many years, and the final result of experiments and investigation is concentrated in the present successful design of a cooling tower that so distributes the water that the greater area of surface is exposed to the air circulation, and the vapors resulting from evaporation are successfully dissipated, either by natural circulation, or forced draft.

The cooling water therefore actually fills the gap of affording the needed opportunity for economy where the environment of an inland station would otherwise require that particular company to continue to expend its money for an extravagant waste of fuel and water.

A practical illustration is the 26th St. Station of the New York Edison Co. designed by the writer in 1887 and started in 1888. The maximum equipment was limited to 2,600 h. p. with the best selection of apparatus then obtainable. But with the originally designed boiler capacity we now find with improvement in engine and dynamos, and the application of a cooling tower and condenser system, the maximum capacity is increased to 6,000 h. p.

I could state several instances where I know large expenditures were purposely made to locate the power house at a convenient point for water supply, frequently incurring an extra expense for coal delivery and a large investment in long pole lines or systems of underground conduits and conductors; the combined cost of which was greater than a cooling tower, and the net results would not compare favorably.

There are now upwards of 500 cooling tower installations that range in capacity from 250 to 12,000 h. p., which is substantial evidence that the cooling tower is not experimental, but when applied by an experienced engineer is beneficial; the advisability of its application in any specified station becomes a question that must be determined from the commercial and engineering analysis previously suggested. To those who may contemplate the installation of cooling tower and condenser equipments I would earnestly suggest that for the entire equipment a liberal margin of capacity be allowed over and above the maximum estimated service, for the reason that a combination of conditions may arise where a heavy load is demanded under adverse atmospheric conditions, and in such event a very liberal supply of cooling water will be required for effective condenser service. The cooling water should be estimated at not less than thirty times the steam consumption of the engine, and two thousand times more air than water will be required.

The heat extracted from the water by passing through the tower will depend upon atmospheric temperature, humidity, etc.; but actual results show a range of from 30 degrees to 50 degrees reduction of temperature, and a vacuum from 23 to 27 in. is readily obtained.

Under certain conditions there will be a small loss of water due to evaporation in passing through the tower, say from 1 to 3 per cent; where the circulating water is kept separate from the boiler feed this loss can be made up at slight cost. In a carefully designed equipment of cooling towers with surface condensers and grease extractors, the cost of boiler feed water can be reduced to the purchase of a very small amount to make up for losses by evaporation and leakage.

Where conditions for installation are favorable the open cooling tower requiring no expenditure of power for driving fans shows excellent results as attested by the following extracts from daily log records of the power station at Plainfield, N. J., during July, 1901:

## OPEN TOWER—TEMPERATURE

Date.	Atmosphere	Condenser Discharge	Condenser Suction	Degrees Reduction	Vacuum, Inches
July 1, 3 p. m.	104°	124°	100°	24°	25
July 1, 12 m.	100	130	100	30	25
July 1, 6 p. m.	102	130	100	30	25
July 1, 9 a. m.	98	130	100	30	25
July 2, 3 p. m.	106	146	104	42	23
July 2, 12 m.	104	140	102	38	23
July 2, 9 a. m.	102	138	102	36	23
July 3, 12 m.	100	134	102	32	24
July 4, 6 a. m.	76	112	84	28	26
July 6, 12 m.	84	126	100	26	26
July 9, 6 a. m.	68	120	96	24	26
July 10, 3 p. m.	86	123	92	31	26
July 12, 6 a. m.	70	106	84	22	27
July 13, 6 p. m.	77	124	96	28	26
July 15, 12 m.	90	120	94	26	26
July 15, 3 p. m.	90	128	98	30	26
July 16, 9 a. m.	86	128	94	34	26

The forced draft or fan type of tower possesses a wide range of flexibility in manipulation, and where the amount of heat to be removed is great and under severe duty in the hot summer months more work can be done than with the fanless type.

In an equipment of forced draft towers it is very important to have facilities for driving the fans at variable speed. This requisite flexibility is better obtained by having a small engine direct connected to the shaft of each pair of fans than by a motor drive. The exhaust from the engines can be used to heat the boiler feed or can be condensed. Under varying conditions of temperature and load the speed of the fans can be increased or decreased. In winter there are many hours when the low temperature of the air circulating through the tower will cool the water without running the fans, while during the high temperature in summer the fans must be run at maximum speed.

The combined air pump and jet condenser may be used where the cooling tower is located at the ground level, but where it is set on a roof or much elevated above the pumps it is preferable to use the surface condenser as there will be a balanced water column and the work on the pump is simply against the head of water due to the height of the tower. Motor driven pumps are suggested as being preferable to steam pumps on the score of economy.

Having stated the conditions under which the cooling towers may be installed to secure the advantages of condensing systems let us briefly investigate the results attained.

I submit the following table prepared from daily records in the log book of a power station equipped with the fan type of cooling towers, and operated under the writer's supervision, which gives a fair range of working conditions in different months:

Time.	Jan. 31. 9 p. m.
Temperature atmosphere, deg. ....	30
Temperature condenser discharge to cooling tower, deg. ....	110
Temperature condenser suction returned from tower to tank, deg. ....	65
Degrees of heat extracted through tower, deg. ....	45
Speed of fans at tower, r. p. m. ....	36
Vacuum at condenser, in. ....	25½
Strokes of condenser pump ...	30
Lb. boiler pressure ...	110
Temperature boiler feed, deg. ....	212

It will be noted from the table that with an atmospheric temperature of 96 degrees, and the temperature of condenser discharge 130 degrees we extracted 37 degrees of heat by passing the water through the towers and obtained a vacuum of 24½ inches.

In the same station a 750 h. p. engine did the following:

	Maximum.	Minimum.
Temperature, atmosphere, deg. ....	103	83
Temperature, condenser, discharge to tower, deg. ....	128	106
Temperature, condenser suction, deg. ....	98	91
Degrees of heat extracted through tower....	32	21
Speed of fans, r. p. m. ....	160	140
Vacuum at condenser, in. ....	26	20
Strokes at condenser pump ....	50	38
Pounds boiler pressure ....	121	100
Temperature, boiler feed, deg. ....	212	200
Engine, horse power developed ....	900	400

I note these instances which I know to be facts simply to show results obtained under extreme conditions.

In this same plant indicator diagrams were taken of the engine, air pump and fan engines. The results were as follows:

Engine r. p. m. ....	120
Steam pressure, lbs. ....	112
Vacuum at condenser, in. ....	25
Work done in high pressure cylinder ....	311.8 h.p.
Work done in low pressure cylinder ....	331.5 h.p.

Total output ....	643.8 h.p.
Work done in L. P. cylinder below atmospheric line 1 h p. ...	185.1
Deduct work done by air pump ....	13.75 h. p.
Deduct work done by fan engines ....	13.5 h. p.
	27.25

This shows a net gain of 157.85 horse power by the use of the condenser and cooling tower.

The cooling tower was located on the roof and water was elevated 58 ft. using an air pump and jet condenser. Had a surface condenser been used the results would have been still better, as the work on the pump would have been less with a balance water column.

A fan tower is also used at Plainfield, N. J., and extracts from daily log records show the following results.

## TEMPERATURE.

Time.	Atmosphere	Condenser Discharge	Condenser Suction	Degrees Reduction	Vacuum, Inches.
July 4, 3 p. m.	94	128	96	32	25
July 4, 6 p. m.	86	132	96	36	24
July 10, 3 p. m.	86	123	92	31	26
July 11, 12 m.	90	138	102	36	24
July 11, 3 p. m.	92	138	102	36	24
July 11, 6 p. m.	88	136	96	40	25
July 14, 6 p. m.	88	130	98	32	24
July 15, 12 m.	90	120	94	26	26
July 15, 3 p. m.	90	128	98	30	26
July 15, 6 p. m.	84	130	98	32	25
July 16, 8 p. m.	86	142	102	40	23
July 16, 10 p. m.	84	140	104	36	23
July 16, 12 m.	80	138	102	30	24
July 17, 6 a. m.	78	130	102	28	25
July 17, 12 m.	74	122	100	22	25

It is a matter of regret that careful records of operations are not maintained in all power stations.

	Feb. 8 p. m.	June 20. 6 p. m.	July. 8 p. m.	Aug. 26. 8 p. m.	Nov. 4 5:35 p. m.
Temperature atmosphere, deg. ....	36	78	96	85	59
Temperature condenser discharge to cooling tower, deg. ....	100	120	130	118	120
Temperature condenser suction returned from tower to tank, deg. ....	84	84	93	88	92
Degrees of heat extracted through tower, deg. ....	26	30	37	30	37
Speed of fans at tower, r. p. m. ....	0	145	162	150	148
Vacuum at condenser, in. ....	26	25	24½	25½	25
Strokes of condenser pump ...	30	37	44	43	28.
Lb. boiler pressure ...	110	120	120	120	112
Temperature boiler feed, deg. ....	212	210	211	213	213

Special emphasis should be placed on the value of careful inspection, regular cleansing, and skillful adjustment of the entire station equipment. Carelessness in these matters is not appreciated; it wastes many dollars that could readily be saved without extra cost of labor.

In conclusion I thank you for your courteous attention and in summing up will say that I believe the time is near at hand when the engineer who is afforded sufficient scope in designing a plant can select a combination for a station equipment of upwards of 1,000 h. p. capacity that will in daily operation successfully produce one indicated horse power from one pound of good coal.

#### STORAGE BATTERIES LOCATED IN POWER STATION.

By W. E. Harrington, vice president and general manager Camden (N. J.), & Suburban Railway Co.

The installation of a storage battery in a street railway power station will lead to economical results, under the following conditions:

A. When the load is of a very fluctuating character.

station generating apparatus depreciation, should be carefully weighed. There is no question but that the battery materially reduced the rate of depreciation on the machinery in the power station and may more than pay by the reduction in the expenditures in repairs and by prolonging the life of the generating apparatus the expense charged as storage battery depreciation.

An incidental advantage of a storage battery installation is in its lightning arrester capacity, the plates offering through the electrolyte such an excellent path to ground as well as acting as a large condenser serves as the best protection against the serious effects of lightning discharges that can be obtained. This effect of lightning protection has been frequently noted; in fact on the lines where sub-storage battery station are located lightning discharges have never been experienced in the Camden & Suburban power stations.

In order to illustrate the application of the storage battery in the power station, a 22-hour test was made, running our old plant,

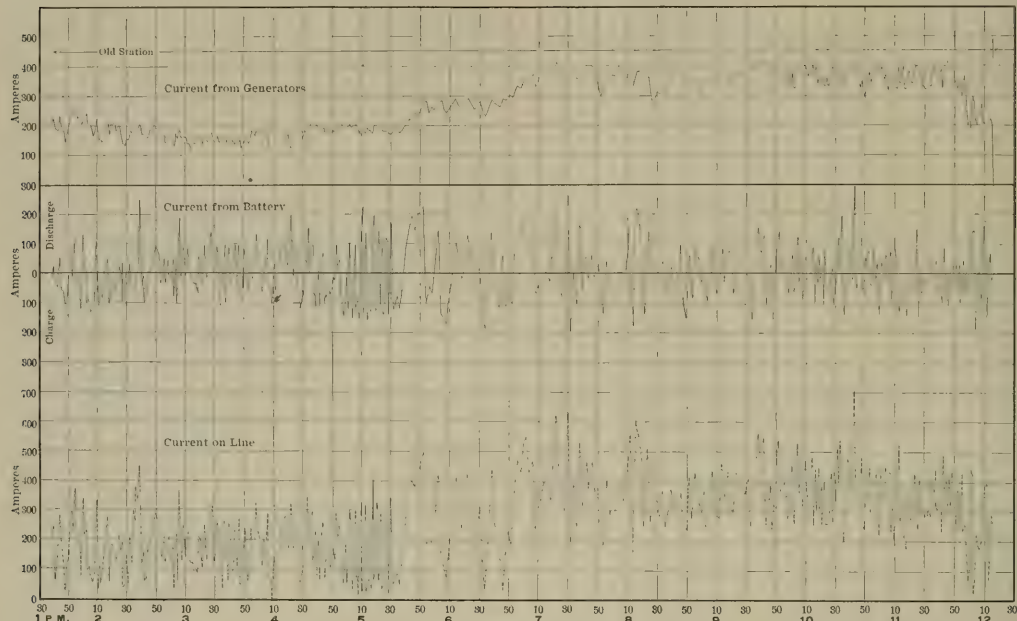


FIG. 1.

B. When the peak of load is of short duration and is either considerably in excess of the average load, or perchance in excess of the capacity of the station.

C. When light night loads are to be carried, which permits shutting down the steam plant.

D. When a station is equipped with a diversity of engines and generators having different characteristics.

The results obtainable from the installation of a storage battery in the power station only affect the economy of the station and in no wise can be considered as an aid to the feeder distribution, except perhaps in maintaining a more uniform voltage at the station. The use of a storage battery in the power station calls for special apparatus, in the shape of boosters, special reversing rheostats and switchboard auxiliaries, not required in storage battery sub-stations located on the feeder lines.

With all this, however, conditions may be such as have been outlined and fully warrant battery installations.

A storage battery does not in itself generate energy, as the generator does, but under the conditions A, B, C and D may by the economies obtained have the same effect as the installation of additional generating apparatus, with the attendant advantage of more economical operation and lesser capital investment.

In considering depreciation a point usually lost sight of, power

which consists of two 100-kw. Edison generators, one 225-kw. General Electric generator, one 180-kw. Westinghouse generator and one 250-kw. Westinghouse generator, all belted units. The storage battery in the station consists of 265 cells, type 17F of the Electric Storage Battery Co.'s make, installed in lead lined tanks, sufficiently large to permit of doubling the capacity. The present capacity is 300 amperes for one hour discharge.

This battery was installed Oct. 13, 1899. The tests began 1.40 p. m., August 17th, and concluded 11.30 a. m., August 18th, making practically a 22-hour test.

The cross section curves marked Figs. 1 and 2, give a clear representation of the power station loads during the tests. The upper curve is a current from generators. The second curve from top is current from the battery and shows the discharge above the heavy black line marked zero, and below the line the charge into the battery. The bottom curve shows the output from the power station to the line. It will be noticed that the fluctuations are on the battery. (In order to more clearly illustrate the fluctuation, other cross section curves giving in detail the power station generator output with the storage battery charge and discharge taken on minute readings, were submitted by the author.) The average current flowing from the battery was 57 amperes, and the average charge was 59 amperes.



Figs. 1 and 2 show that the current from the battery on discharge frequently discharges above 200 amperes and at times reaching 300 amperes and over. Also on the charge side the current frequently reached 180 amperes. The maximum fluctuations, therefore, ranging about 450 amperes.

Fig. 3 is a plan showing the switchboard, storage battery, booster and general connections. (The author also submitted the power station reports, each including the two days upon which these tests were made, and a blank, which is known as the Camden & Suburban Railway Co. form No. 70, used for recording specific gravity and individual cell voltmeter readings taken each week on each cell of the various installations. Want of space prevents our reproducing these).

In the study as to the advisability of installing a sub-storage battery station several questions immediately presented themselves:

age battery and (ground and a building to accommodate it) to have a discharge rate of 160 amperes, one hour discharge, but having the racks and building to permit of doubling the capacity. The cost of this layout proved to be \$9,000, showing a net saving in first outlay of \$7,416. Upon this showing the installation was made. This battery consists of 240 cells type 9-F Electric Storage Battery Co. make.

The cost of maintenance to date has not been over \$100 per year. The depreciation is covered in a fund carried at 6 per cent. on the cost of the battery amounting to \$480 per annum. The attention required is only nominal. The battery is tested by a man sent from the power station once a week to test voltage and specify gravity of each cell making report on our form No. 70, a copy of which, as has been our custom, we send to the manufacturer.

The advantages and saving effected we are confident exceed the

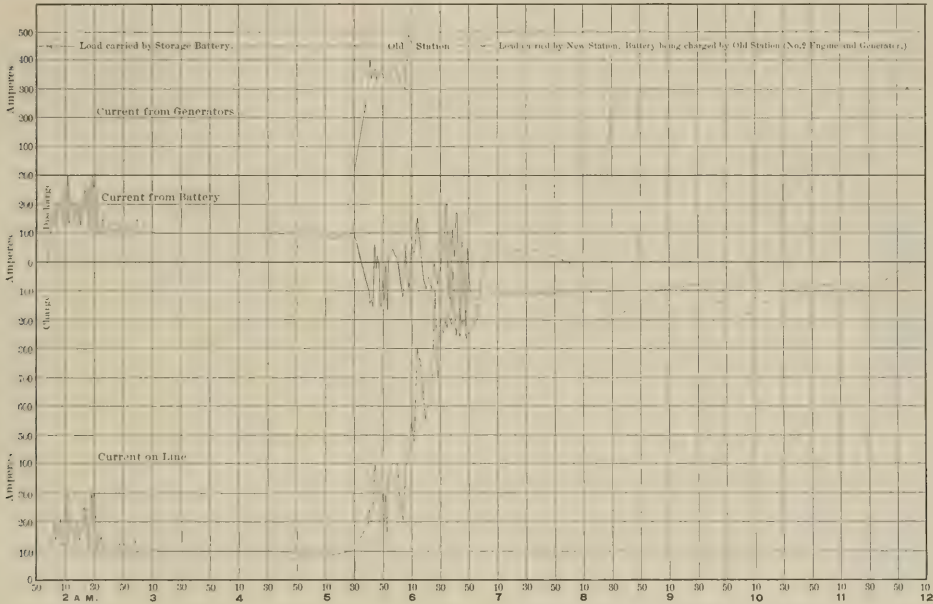


FIG. 2.

1. What will be gained.
2. How much will it cost to install.
3. How much will it cost to maintain.
4. Where shall it be located.
5. What is the depreciation.
6. What kind of attention is required.

These questions require a careful study of conditions, the writer will take a case occurring in his own experience and readers can then draw deductions to suit the particular cases in which they may be interested.

The Camden & Suburban Railway Co., of Camden, N. J., has a line running to a town called Haddonfield,  $7\frac{1}{2}$  miles from the power station; 40-ft. double truck cars weighing 14 tons each, equipped with two No. 38 B. Westinghouse motors, running on 10 minute headway gave a fluctuating voltage at Haddonfield varying between 350 to 550 volts, the power station voltage being maintained at 550 volts. Two No. 0000 feeders run from the station to a point six miles from the station called Westmont, and one No. 000 runs through from there to a point about 1,000 ft. from the extreme end of the line. About  $2\frac{1}{2}$  years ago, careful readings were taken on the feeder and the fluctuations on this line showed a mean variation of 150 amperes. A calculation showed that the installation of sufficient copper to bring the average pressure not less than 450 volts, would require \$16,416. We obtained prices upon a stor-

age battery and (ground and a building to accommodate it) to have a discharge rate of 160 amperes, one hour discharge, but having the racks and building to permit of doubling the capacity. The cost of this layout proved to be \$9,000, showing a net saving in first outlay of \$7,416. Upon this showing the installation was made. This battery consists of 240 cells type 9-F Electric Storage Battery Co. make.

The question as to location of a sub-battery station is one of peculiar interest. I will, therefore, dwell upon this point quite fully. The determination of the most economical point to locate a sub-station battery is one requiring careful calculation. There are several constants entering into the calculation, which are purely a question of engineering judgment, such as loss or drop in volts, amperes flow and particularly the distribution of the loss or drop in volts.

Experience has indicated the necessity of having an independent feeder line running from the main power station to the sub-battery station, the line then being fed from feeders running from the sub-station. The chief reason for the feeder running independently from

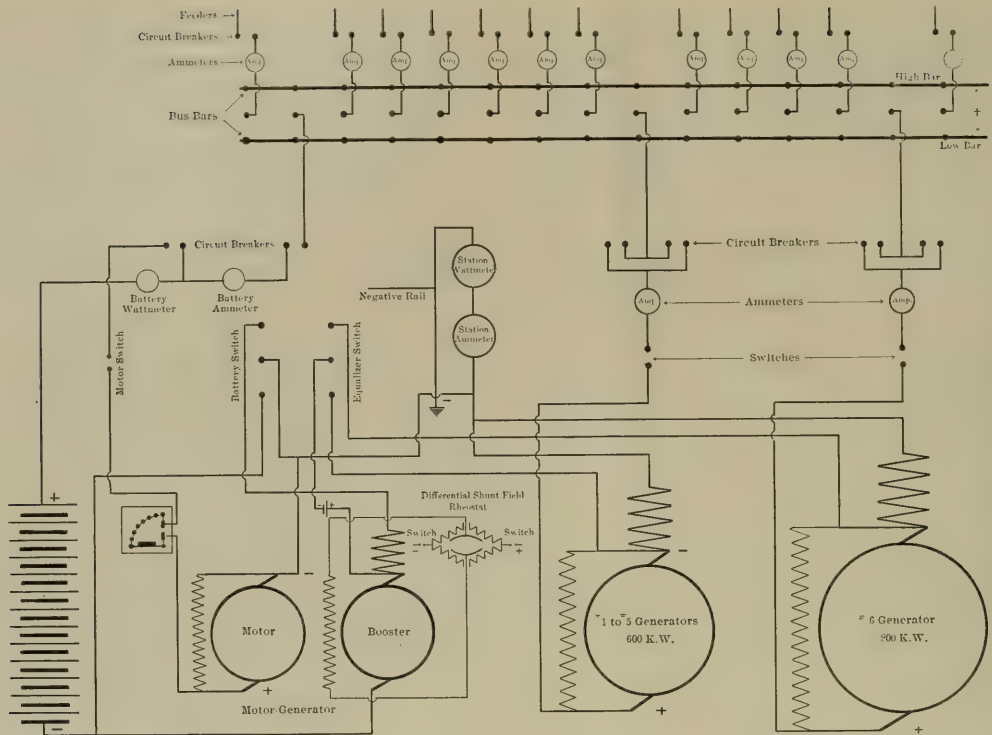


FIG. 3.

the power station to the sub-battery station is to be able to charge the battery without interfering with the line.

The following sketch, Fig. 4, illustrates quite clearly the method as practiced by the writer. The letters on the diagram have the following meaning:

- A—main power station.
- B—sub-battery house.
- C—automatic magnetic circuit breaker.
- D—extreme end of the sub-feeder away from the station.
- E—point on line at sub-station battery house where connection is made.

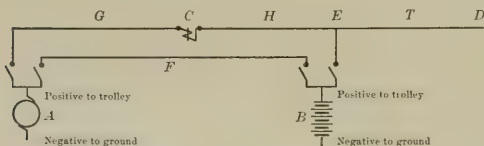


FIG. 4.

F—independent feeder running from power station to sub-battery station having no taps or connections of any kind between the two stations. This feeder may be boosted either by booster, or run on a generator at a higher voltage, or off a bus bar of a switchboard operating on different voltages.

G—ordinary feeder running out of the station from which taps are made to trolley as in the usual construction. This feeder should run to join feeder.

H—sub-battery station feeder running back from the sub-station towards main power station.

G and H are joined together through an automatic magnetic circuit breaker, the function of which is so clear that no explanation is necessary.

T—feeder running from the sub-battery station to the distant end of the line.

The writer has been using a formula which gives in terms of dollars the cost of the copper and has found it quite useful in determining the most economical point to locate the sub-battery house.

In all the calculations it is assumed that the track returns will be at least equivalent to the overhead feeders.

#### GENERAL FORMULAE.

$$\text{WEIGHT OF COPPER} = \frac{3.03 \text{ C M } \times d}{1,000,000}$$

in which C M = circular mils, d = distance in feet.

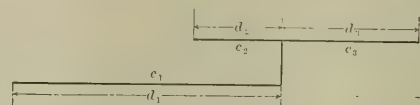
$$\text{WEIGHT OF COPPER} = \frac{16 \text{ C M } \times d_1}{1000}$$

in which C M = circular mils, d = distance in miles.

Substituting cost of copper at 18 cents per pound.

$$\text{COST OF COPPER} = \frac{\$304 \text{ c } d_1^2}{V}$$

in which c = amperes, d<sub>1</sub> = miles, V = volts lost.



By substituting for values in the elements of the above diagram gives

$$\text{COST OF COPPER} = \$304 \left[ \frac{c_1 d_1^2}{V_1} + \frac{c_2 d_2^2}{V_1} + \frac{c_3 d_3^2}{V_2} \right]$$

Assuming that  $V_2$  and  $V_3$  are each 50 per cent. of  $V_{1a}$  the General Formula becomes,

$$\text{COST OF COPPER} = K = 304 \left[ \frac{c_1 d_1^2}{V_{1a}} + \frac{c_2 d_2^2}{\frac{V_{1a}}{2}} + \frac{c_3 d_3^2}{\frac{V_{1a}}{2}} \right]$$

$$\text{or } K = \frac{304}{V_{1a}} [c_1 d_1^2 + 2 c_2 d_2^2 + 2 c_3 d_3^2]$$

Assume  $d_1 + d_2 = 10$  miles

$$\begin{array}{ll} d_1 = 8 \text{ miles} & c_1 = 100 \text{ amperes} \\ d_2 = 2 \text{ " } & c_2 = 75 \text{ " } \\ d_3 = 2 \text{ " } & c_3 = 50 \text{ " } \end{array}$$

$$\text{then } K = \frac{304}{V_{1a}} [(100 \times 64) + (2 \times 75 \times 9) + (2 \times 50 \times 4)]$$

$$K = \frac{304}{V_{1a}} [6400 + 1350 + 400]$$

$$\text{Cost} = \frac{\$2,480,000}{V_{1a}}$$

Assume  $d_1 + d_2 = 10$  miles

$$\begin{array}{ll} d_1 = 7 \text{ miles} & c_1 = 100 \text{ amperes} \\ d_2 = 2 \text{ " } & c_2 = 50 \text{ " } \\ d_3 = 3 \text{ " } & c_3 = 75 \text{ " } \end{array}$$

$$\text{Cost} = \frac{304}{V_{1a}} [(100 \times 49) + (2 \times 50 \times 4) + (2 \times 75 \times 9)]$$

$$(A) \quad \text{Cost} = \frac{\$2,020,000}{V_{1a}} \quad (\text{minimum})$$

Assume  $d_1 + d_2 = 10$  miles

$$\begin{array}{ll} d_1 = 6 \text{ miles} & c_1 = 100 \text{ amperes} \\ d_2 = 1 \text{ " } & c_2 = 25 \text{ " } \\ d_3 = 4 \text{ " } & c_3 = 100 \text{ " } \end{array}$$

$$\text{Cost} = \frac{304}{V_{1a}} [(100 \times 36) + (2 \times 25 \times 1) + (2 \times 100 \times 16)]$$

$$\text{Cost} = \frac{\$2,080,000}{V_{1a}}$$

Assuming that  $V_2$  and  $V_3$  are each equal to  $V_{1b}$ , the General Formula becomes

$$\text{COST OF COPPER} = \frac{304}{V_{1b}} [c_1 d_1^2 + c_2 d_2^2 + c_3 d_3^2]$$

Substituting the values of each of the three conditions as follows:

$$\begin{array}{ll} \text{Case 1} & d_1 + d_2 = 10 \text{ miles} \\ d_1 = 8 \text{ miles} & c_1 = 100 \text{ amperes} \\ d_2 = 2 \text{ " } & c_2 = 75 \text{ " } \\ d_3 = 2 \text{ " } & c_3 = 50 \text{ " } \end{array}$$

$$\text{Cost} = \frac{2,210,000}{V_{1b}}$$

$$\begin{array}{ll} \text{Case 2} & d_1 + d_2 = 10 \text{ miles} \\ d_1 = 7 \text{ miles} & c_1 = 100 \text{ amperes} \\ d_2 = 2 \text{ " } & c_2 = 50 \text{ " } \\ d_3 = 3 \text{ " } & c_3 = 75 \text{ " } \end{array}$$

$$\text{Cost} = \frac{1,760,000}{V_{1b}}$$

$$\begin{array}{ll} \text{Case 3} & d_1 + d_2 = 10 \text{ miles} \\ d_1 = 6 \text{ miles} & c_1 = 100 \text{ amperes} \\ d_2 = 1 \text{ " } & c_2 = 25 \text{ " } \\ d_3 = 4 \text{ " } & c_3 = 100 \text{ " } \end{array}$$

$$(B) \quad \text{Cost} = \frac{1,590,000}{V_{1b}} \quad (\text{minimum})$$

$$\begin{array}{ll} \text{Case 4} & d_1 + d_2 = 10 \text{ miles} \\ d_1 = 5 \text{ miles} & c_1 = 100 \text{ amperes} \\ d_2 = 1 \text{ " } & c_2 = 25 \text{ " } \\ d_3 = 5 \text{ " } & c_3 = 125 \text{ " } \end{array}$$

$$\text{Cost} = \frac{1,710,000}{V_{1b}}$$

Assuming that  $V_1$  and  $V_2$  are each twice  $V_{1c}$ , the General Formula becomes

$$\text{COST OF COPPER} = \frac{304}{V_{1c}} [c_1 d_1^2 + \frac{1}{2} c_2 d_2^2 + \frac{1}{2} c_3 d_3^2]$$

Substituting similar values to cases 1, 2, 3, 4, there results respectively

$$\text{Case 1—Cost} = \frac{\$2,080,000}{V_{1c}}$$

$$\text{Case 2—Cost} = \frac{\$1,620,000}{V_{1c}}$$

$$\text{Case 3—Cost} = \frac{\$1,340,000}{V_{1c}}$$

$$\text{Case 4—Cost} = \frac{\$1,240,000}{V_{1c}} \quad (\text{minimum})$$

In all the above cases a total loss of 150 volts will be assumed—which will appear as follows in the various cases:—

Where  $V_2$  and  $V_3$  are each 50 per cent. of  $V_{1a}$  then  $V_{1a} = 100$  volts

"  $V_2$  and  $V_3$  are each equal to  $V_{1b}$  then  $V_{1b} = 75$  volts

"  $V_2$  and  $V_3$  are each twice  $V_{1c}$  then  $V_{1c} = 50$  volts

By substituting these values of  $V_1$  in each case appearing as the minimum cost of copper, there results:—

A	$\frac{2,020,000}{100}$	$\frac{2,020,000}{100}$	\$20,200
B	$\frac{1,590,000}{75}$	$\frac{1,590,000}{75}$	\$21,200
C	$\frac{1,240,000}{50}$	$\frac{1,240,000}{50}$	\$24,800

The above calculations demonstrate clearly that case A is the most economical in copper distribution with the data as given. The fact is clearly apparent that great care must be exercised in determining upon the location of the battery house. Each case must be carefully studied upon its own merits, every available location examined and calculated.

The use of formula

$$\text{COST OF COPPER} = 303 \left\{ \frac{c_1 d_1^2}{V_1} + \frac{c_2 d_2^2}{V_2} + \frac{c_3 d_3^2}{V_3} \right\}$$

gives a ready means for quickly determining the most economical point of locating the battery house.

The remarkable features attending the use of storage-battery substations are most happily illustrated in the curves shown herewith.

As stated before the Westmont station is fed with a special No. 0000 feeder, which we call our Westmont booster feeder as it can be used for charging the Westmont battery as well as permitting feeding this end of the line at a higher voltage from the power station.

Readings were taken at the power station with a Bristol recording ammeter having a dial requiring only one hour to complete one revolution, thus giving a chart faithfully reproducing the frequent and detail fluctuations, show a very uniform pressure when the battery is connected.

## REPORT OF THE COMMITTEE ON STANDARDS.

Your committee on standardizing of street railway materials and equipments, appointed by the executive committee at its meeting, held in New York City, February 28, 1901, respectfully presents the following report:

Three meetings of the committee have been held—Niagara Falls, June 3d; New York, September 14th, and Boston, September 18th. At the first meeting the work was divided and assigned to the members of the committee, as follows:

Rails and wheels, axles, journals, journal brasses, oil boxes, etc., to N. H. Heft and F. G. Jones.

Car bodies to John R. Graham.

Electrical equipment to W. J. Hield.

Overhead equipment to C. F. Holmes.

### Track Rails.

We recommend a T-rail as the most desirable under any conditions. The rail-head should be of the form and dimensions shown in Fig. 1. With a rail-head of this form and dimensions, a car wheel having a 3-in. tread and a flange of from 5-8 to 1 1-8 in. depth, as shown in Fig. 2, can be operated without interfering with the pavement in cities, and with safety on suburban roads, at a minimum cost for track maintenance.

We recommend for a grooved girder rail, one with a head 3 in. wide, angle and groove as shown in Fig. 3. With a head of this form and dimensions, the same car wheel can be operated without interfering with pavements with safety on suburban roads, and with less cost for maintenance than the present form, due to increased surface of contact between wheel and rail and decreased wear on flange. This form of groove will decrease wear on side of rail-head and allow wheels to be pressed on axle further than in common practice at the present time, thereby decreasing wear on rails at curvatures and the liability to mount rail.

### Car Wheels.

We recommend a car wheel with a plate center and cast-chilled tire for all speeds up to 50 miles per hour. When a greater speed







These include lighting contracts of four different forms to meet various cases.

Contracting agents record of contracts.

Memorandum to read meter, giving instructions.

Order to test meter, the blank having room for an entry of the result of the test.

Letters of advice from the contracting department to the operating department, giving lists of contracts made or canceled.

The routine work of the accounting department in so far as consumers accounts are concerned, is as follows:

1. To post into the meter record the credit for cash paid in during the previous day.
2. To make up bills covering all readings of previous day and to post to the debit of each consumer's account in the meter record the net amount of the bill to be mailed out.
3. To tabulate all bills made up so that report may be made daily to executive officers showing revenue earned and giving such other information as is called for.
4. To make pink "dun cards" covering accounts which are delinquent after the date on which discount is allowed. These must be mailed in sealed envelopes or delivered by hand.
5. To transfer to summary at the end of the meter record the totals of each page as it becomes completed, in order that at end of month no delay may be had in getting grand totals from which to make journal entries covering revenue as it should appear in the general ledger.
6. To make journal entries covering credit allowed on claims for error adjusted through contracting department.
7. To make new leaves for meter-readers books for each new customer's account, to adjust and file all cancelled and lapsed contracts, to keep indices of all books up to date.
8. To audit treasurer's books, post general books and make up all statements required by executive or other officers.

(A page of the meter record book which covers all accounts receivable for Domestic Lighting Contracts was appended to Mr. Moore's paper. This book is wide enough to give, with an interleaved sheet, room for 13 sets of vertical rulings, one for name of customer and general information and one for each of the 12 months of the year. The column headings of the general information section are: Record No.; Name of Customer; Street and No.; Contract No.; No. and Amount of Advances made by Consumer and Date Redeemed; Guarantee; Amt. Unpaid at End of Fiscal Year. The readings for the first month of the fiscal year are: Reading of Meter Index, three columns,—Date, Previous and Present; Consumption; Price; Rate of Discount; Net Amount; Discount; Date and Amount of Payment; Arrearage. Each of the other months has similar column headings, save that only one is provided for meter index reading, and Price and Rate of Discount are omitted.)

At the close of each day's business the treasurer assort coupons into lots covering Domestic Consumers, Arc Lighting, City Lighting, Current for Power and Meter Rentals, respectively. These comprise the various revenue accounts which are shown on the general ledger. The treasurer passes tabulated lists of coupons, together with the coupons themselves to the accounting department and receives a receipt for the actual number so delivered by him. The clerks in the accounting department post the payments into the meter record direct from the coupons, which are afterwards filed for future reference.

All bills other than those made on postal cards should be copied by letter press and postings made direct from the copy to the journal.

Outside banks or mercantile houses at whose places of business payments of bills can be made should be furnished with a receipting machine (which costs about \$2.50), which will, in addition to the dating and receipting stamp, show certain letters which will distinguish their collections from those made at company's office. These collecting agencies should also be furnished with addressed and stamped envelopes in which not only the original coupons but a report of the collections made by them should be sent daily to the treasurer. Each collection agency should be dealt with separately as to its remuneration for the services rendered. This, however, is not generally much of an expense, as stores are quite satisfied to attend to collections for the advertising it brings them, while banks, except old established ones, usually require that a certain amount of the funds collected shall remain permanently on deposit with them.

In conclusion I believe that to secure a complete history of the sale of electric current for lighting or power and to follow the transactions from time of sale until its value has been paid into the company's treasury or otherwise accounted for, will necessitate quite a little of what in times past was termed "red tape" but which is now recognized as systematic accounting which saves in time and money much more than it costs.

Proper reference maps should be possessed by every company whose business it is to distribute electric current to consumers, and these maps should show all of the streets, lanes and alleys within

PRESENT THIS CARD WHEN MAKING SETTLEMENT	<b>C. A.</b>	<b>LOCATION.</b> <b>ADDRESS.</b> <b>To THE ALLEGHENY COUNTY LIGHT CO., Dr.</b> Office Hours 8 a. m. to 5 p. m. Evening 7 p. m. to 9 p. m. RETAILERS, 415 Sixth Avenue, PITTSBURGH, PA.	<b>E</b>	
	A. D. T. D.	<b>For Electric Current supplied by Meter at above Location, as follows:</b> ( ) hours, as shown by Meter Dial on _____ LESS ( ) hours, as shown by Meter Dial on _____ ( ) hrs. @ 1c per Amp. hr. less _____ %		
		We desire to call your attention to the fact that the above account is overdue. Please settle the same without further delay. PROMPT SETTLEMENT OF BILLS THE CONDITION OF SUPPLY.		
		MAIL ALL REMITTANCES TO C. J. BRAUN, JR., TREASURER		

PINK DUN CARD.

the company's territory, as well as the location of every house along each street upon which poles and overhead lines or underground conduits for the distribution of current have been or are intended to be placed. The poles as well as all arc lamps for public lighting should be numbered and the respective numbers of each placed upon the map whose index should give clear and explicit reference to streets, poles and lamp locations. The lines and circuits should be identified by differently colored inks, and the character of wiring and size of meter necessary for each location should be noted upon the maps. The fire insurance companies have in use maps of this character and copies of them can be procured from the publishers. Upon these copies all data necessary to the proper handling of the electric lighting business can be added and from tracings of the original as many blueprints can be made as will equip each department whose duties are in line with the sale and distribution of current with this necessary and valuable information. The maps must be kept up to date else their usefulness will be greatly impaired.

In the contracting department, where all applications for supply of current shall be made, where all contracts shall be concluded and registered, and where all complaints from consumers shall be received and given prompt attention, there should be kept a complete record of all locations along the company's lines of service which are wired for the use of current, whether they are in service or not. This record, the use of which is more specifically referred to above, can be the shape of loose ledgers or of the card system, and no matter which method is adopted it can be divided up as is most convenient, either alphabetically as to customers names or street names, into districts or according to meter-readers' routes

#### STANDARD SYSTEM OF ACCOUNTING FOR ELECTRIC LIGHT COMPANIES.

By G. E. Tripp, General Auditor, Stone & Webster's Cos., Boston, Mass., Chairman.

When President Ham assigned to me a paper on a standard system of accounts for electric lighting companies he suggested that I present the report read before the National Electric Light Association at Niagara Falls in May. I then wrote to Mr. Geo. F. Porter, secretary of that association, asking permission to do this. Mr. Porter kindly consented, asking me to give due credit to the Electric Light Association. Under these conditions I submit the following report:

Your Committee on Uniform Accounting, in submitting its report for your consideration, presents the following explanatory notes in a manner as brief as is consistent with clearness.



The classification is divided into three parts:

First, classification of income (receipts).

Second, classification of construction (installation and equipment accounts).

Third, classification of expenditures.

The classification herewith submitted aims to reduce the number of accounts and so to classify same that it will be feasible for the smaller companies to use the classification as submitted, and equally possible, by a further subdivision of the accounts herein named, for the larger companies to conform to and follow the lines laid down.

Your committee has endeavored to arrange those accounts that are in common with street railways, such as operation, power stations, etc., to conform with the general system of street railway accounting as adopted by the Street Railway Accountants' Association; the principal reason for so doing being that there is a constant and growing marked tendency throughout the country toward a consolidation of street railway and electric lighting enterprises in the same towns or cities; and as the number of these consolidated or combined companies is constantly on the increase, it has become necessary to consider a classification of the expenses of an electric lighting company that should conform in the principal essential matters with the classification of expenses of a street railway company.

Your committee recognizes the fact that a classification of accounts can be arrived at by a committee of operating officers with, if not more, perhaps as much intelligence as is possible by a committee of accounting officers, and your committee believes the classification herewith submitted to be promulgated as much from the standpoint of the practical operating official as from the standpoint of the practical accountant, with, possibly, the added feature that in the classification herewith submitted your committee has gone a little farther than would the practical officer, in so far that your committee has considered a classification that would adapt itself to a simple and direct method of accounting, as well as commend itself to the practical operating official.

Your committee also considered at some length the requirements that are likely to exist for information as to the cost of the "maximum demand system of charges," but has thought it best not to include in this report the consideration of a classification in connection with the maximum demand system, but to consider this at some later date.

Your committee, in deciding upon the means and methods to be used in the accounting branch of the business, was confronted by a great array of blank forms, an examination of which showed that not only did the blanks themselves differ as between different companies, but that some companies had carefully prepared blanks to cover information that other companies seemed to provide for without any blanks whatever; but upon careful consideration your committee thought it wiser to confine the present report simply to a classification, as the committee felt that more progress would be made by taking up one step at a time rather than submitting a report that would possibly defeat its very object by being too voluminous in its scope and intention, it being thought wiser to leave the question of forms and methods either to a subsequent committee or to further action of the same committee, or whatever may be the pleasure of the association.

Your committee has also borne in mind the value and necessity of a classification that would be well adapted to meet the demands made upon it in the compiling and computation of statistics such as costs and incomes per kilowatt hour, etc.

A standard system of blanks and bookkeeping methods is a subject that should receive very careful attention, and should be the consensus of opinion resulting from a broad discussion of the subject. Each particular step is one to be carefully considered and from many different view points, and in submitting to the convention a report on a "Standard System of Bookkeeping Methods," your committee, owing to a change in its personnel, has not had the time to consider the subject as carefully as a report on the same would warrant.

In connection with this report, your committee wishes to acknowledge the obligation furnished it by the report of the committee on a Standard System of Street Railway Accounting.

#### CLASSIFICATION OF INCOME.

Municipal lights—Incandescent, and  
Commercial lights—Incandescent, arc.

Municipal power service.

Commercial power service.

Railway service.

Merchandise sales and job work billed (net profits).

Rentals.

Miscellaneous receipts.

(The subdivisions of light into incandescent and arc are not made general headings, because a great many companies connect both incandescent and arc lamps on same meter, thus rendering such a separation of output and income impossible.)

#### LIST OF CONSTRUCTION ACCOUNTS

- A. Organization.
- B. Royalties, franchise and license.
- C. Real estate and buildings.
- D. Water power plant.
- E. Steam plant.
- F. Electrical generating plant.
- G. Sub-station installation (storage battery, rotary transformer, etc.).
- H. Street and service installation (overhead).
- I. Street and service installation (underground).
- J. Arc light installation.
- K. Meter, meter appliances and line transformer installations.
- L. Tools and instruments.
- M. Office furniture and fixtures.
- N. (To be reserved for future use).

#### LIST OF EXPENSE ACCOUNTS.

##### Cost of Manufacture (Generating).

##### Operating—

1. Power plant wages.
2. Fuel for power.
3. Water for power.
4. Lubricants and waste for power plant.
5. Miscellaneous supplies and expenses for power plant.
6. Hired power.
7. (To be reserved for future development).

##### Maintenance—

8. Maintenance of boilers.
9. Maintenance of engines.
10. Maintenance of electric plant.
11. Maintenance miscellaneous station equipment.
12. Maintenance buildings and fixtures.
13. Maintenance dams, canals and tail races.
14. Maintenance of gates, wheels and governors.
15. (To be reserved for future development).

##### Cost of Distribution.

##### Operating—

16. Operating arc lamps.
17. Operating meters.
18. Renewal of incandescent lamps.
19. Operating sub-stations.
20. Miscellaneous distribution operating expenses.
21. (To be reserved for future development).

##### Maintenance—

22. Maintenance underground system.
23. Maintenance overhead system.
24. Maintenance arc lamps.
25. Maintenance of meters.
26. Customers' repairs and renewals.
27. Maintenance of sub-stations.
28. (To be reserved for future development).

##### General Expenses—

29. Salaries of general officers.
30. Salaries of clerks.
31. Printing and stationery.
32. Store-room expenses.
33. Advertising, canvassing and soliciting.
34. Miscellaneous general expense and office sundries.
35. Legal expense and loss and damage.
36. Rents.
37. Insurance.
38. Taxes.
39. (To be reserved for future development).

## ABSTRACT OF EXPLANATORY NOTES.

No. 1. Power Plant Wages.—It covers wages for all kinds of work in the station that has to do with manufacture, as distinguished from repairs and increase to plant. When regular station men do small repairs, etc., it is not necessary to subdivide the wage charge; but where extra help is hired, or where employees work principally on repairs, the expense should be charged directly to the account benefited.

No. 4. Lubricants and Waste for Power Plant.—It does not include oil for transformers, grease for wagons or oil for lanterns.

No. 8. Maintenance of Boilers.—Where the stacks are of brick, repairs on these should be charged to maintenance of buildings and fixtures.

No. 12.—Maintenance Buildings and Fixtures.—This account refers only to power-station buildings.

No. 16. Operating Arc Lamps.—Includes all wages and expenses of trimmers, patrolmen, inspectors' wages, inner and outer globes and carbons and cleaning of same, and the cost of all labor and sundries account of installing, removing or exchanging of arc lamps.

No. 19. Operating Sub-stations.—Includes the cost of all labor and material for the operating of storage battery, static or rotary transformer, or motor-generator sub-stations.

No. 26. Customers' Repairs and Renewals.—Includes all repairs or small renewals or petty services or connection made on the premises of light and power customers for which the lighting company should bear the expense, either labor or material, such charges as are not properly chargeable to the customers, including free wiring of all descriptions, for the benefit of the customer and all expenses from transformer or end of main line service to be charged against this account and not to investment.

No. 30. Salaries of Clerks.—Includes the salaries of bookkeepers, cashiers, collectors, paymasters, stenographers and clerks, employed in the general office or elsewhere.

No. 38. Taxes.—Includes all taxes on personal property or real estate.

It is practically universally conceded by the latest authorities that taxes should be considered as a separate account under the heading of general expense and not as a fixed charge.

A fixed charge is properly a guaranteed return on invested capital, being specifically represented (first) by interest on mortgage bonds and (second) by guaranteed interest return on any other class of interest-bearing securities, said interest return being always in the nature of a fixed or guaranteed percentage such as interest on debentures or interest on certain classes of preferred stock.

In conclusion, a fixed charge is any guaranteed interest return on securities issued, which interest must be paid and deducted from net earnings, thereby leaving net profits out of which net profits regular stock dividends can be paid.

(The report to the Electric Light Association was signed by G. E. Tripp, chairman; W. M. Anthony, W. F. Ham.)

## REPORT OF THE STANDING COMMITTEE ON A STANDARD SYSTEM OF STREET RAILWAY ACCOUNTING.

C. N. Duffy, chairman.

Your committee on a standard system of street railway accounting begs leave to submit the following report:

We recommend that the classification of construction and equipment accounts, the classification of operating expenses accounts, and the forms of monthly and annual reports, as adopted at the Chicago convention in 1899, remain unchanged, unless this convention directs otherwise.

The Standard System of Street Railway Accounting of this Association is the recognized and accepted standard.

Our worthy and progressive ex-president, Mr. J. F. Calderwood, who kindly volunteered to assist the director of the census in the compiling of statistics concerning street railways, in connection with the census of 1900, is to have the privilege of suggesting to the director of the census certain forms to be used in the work. Under date of Sept. 11, 1901, the director of the census addressed Mr. Calderwood a letter, as follows:

"I returned to Washington yesterday and find yours of the 21st of August. Please pardon the delay in replying.

"I learn that your name is already on the list for all bulletins, so that you are advised of what we are doing up to this time. We shall not consider the question of street railway statistics for some time yet. I shall be glad to consult with you before we do anything. Very truly yours,

(Signed) "W. R. MERRIAM, Director."

This Association was officially represented at the national convention of Railroad Commissioners held in San Francisco June, 1901, by a committee of three, consisting of the chairman of this committee, Mr. H. C. Mackay, and Mr. F. E. Smith.

The business transacted of importance to the Street Railway Accountants' Association was:

1. The Committee on Classification of Construction and Operating Expenses of Electric Railways submitted a report recommending that the president of the Association of Railroad Commissioners appoint a committee to formulate a standard form of report that electric railways are to use in making reports in their respective states to the Boards of Railroad Commissioners; this committee to co-operate and confer with a committee from the Street Railway Accountants' Association of America. The report was unanimously adopted by the convention.

2. A constitution and by-laws were adopted, the Association of Railroad Commissioners never having had them before. This constitution prescribes that the Street Railway Accountants' Association of America and the American Railway Accounting Officers' Association shall constitute a part of the body of the association, to be represented on the floor of the convention by three members from each association.

3. The next annual convention of the Association of Railroad Commissioners will be held at Charleston, S. C., Feb. 11, 1902; the Street Railway Accountants' Association of America is expected to send three delegates to represent this Association.

Unquestionably these conventions are of great benefit in promoting an acquaintance and a better feeling between the railways and those who exercise supervision over them. This is true of street railways and especially of those who make reports to their respective Boards of Railroad Commissioners.

The Street Railway Accountants' Association of America and the Convention of Railroad Commissioners have certainly been brought much closer together than they ever were before. The Accountants' classification of accounts having been officially adopted by the Railroad Commissioners at a prior convention, the next logical step is to formulate a standard form of reports that will be uniform and go hand in hand with the classification of accounts. By the action of the San Francisco convention this is the work that will now be undertaken by representatives of the two Associations, and should be productive of great good to all interests involved.

## CONDUCTORS' ACCOUNTS.

By Elmer M. White, cashier Hartford Street Ry. Co.

This paper was not written because I wanted to do it, neither have I any special desire to get up here and read it, for I do not like to have you know just how far behind our little road up in Hartford is. I received my orders from Washington. President Ham wanted one more paper to fill out his programme, and I guess he thought I would not dare to refuse him.

I hope he will not be disappointed in the net result, and if we can have a good discussion, some of us will no doubt be benefited. Hartford methods, I presume, are not faultless—so that I shall be under obligations to any one than can tell us how to do better. That you may follow me easier I have had distributed sets of day cards and register slips. The day cards have been partially filled out to correspond with the register slip, by our regular conductors and bear their name and number.

## DAY CARDS.

The first step is to provide the conductor with a day card that will give the receiving department all the necessary information and at the same time be plain and simple. The less complicated a day card is the fewer mistakes the conductors will make. The result is that the receiving department will find its work easier, for there is no harder or more unsatisfactory work than correcting errors.

It has been our aim to make our day cards as simple as possible and not require conductors to do anything that could be done better in the office. Our latest change in this line has been to have only one column for tickets, formerly we had three or four columns for different kinds, we cut that down to two, i. e., "Revenue" and "Free," but at last we are down to the one—"Tickets." We found many times in issuing a new ticket it was necessary to make quite an extended notice for the conductor, explaining what column this particular ticket should go. If it happened to be a land sale ticket on which was printed free ticket, but for which we received full revenue, it was rather hard for some of our conductors to remember that a ticket on which was printed "free ticket" was to go into the "revenue" column. The present method saves the conductors from making any errors of entering in wrong column, and the time spent by the ticket counters in separating the various kinds is not as much as time formerly spent in correcting errors.

We use three different kinds of day cards. "A" is our regular city day card and is used when the fare is only 5 cents. "Trips From-To" is used for mileage numbers. Our central starting point (City Hall) is zero. We have a table of distances computed from zero and other prominent points, so that our mileage is very easily figured, the mileage numbers are painted on the poles at all switches and crossovers and ends of lines, so that a conductor on a new run has no trouble in giving us his destination, although he may be obliged to turn back before reaching the end of the line.

I copy the following from our Instruction Book:

#### CAR MILEAGE REPORT.

"Conductors will designate on day card the starting point and ending point of each trip by numbers known as 'Car Mileage Numbers'; these numbers are on the trolley poles in red figures.

"It is necessary that the correct mileage of each car be recorded, and to accomplish this, conductors must use care in making out reports of trips run and be sure that car mileage numbers are down for the beginning and ending of each trip.

"A trip shall be known as the run between any two points, and shall end when the car is ready to return to its starting or some other point. One trip shall occupy one line on the day card and first trip will always begin on first line."

"Starting Time" and "No. of Car" are familiar to all. "Not Registered," "Transfer, Employee & Police." Transfers—Although a few roads continue to register transfers, we have found it better practice to discontinue this registration. Employees and police ride free on their uniforms. A detail of "Not Registered" will be found on the back of day card. Transfer tickets when collected are put in envelopes and deposited every two trips with a collector who is stationed at a central point. "Fares Registered" includes all passengers not mentioned before and each trip shows the number on register when it is reset. The tickets are entered by trips, but cash fares are only entered as a total.

"B" is a day card used on our suburban lines where three 5-cent fares are collected. This is done separately and the register is reset at each limit. On this day card the conductor fills out "Fares Registered" and the ticket counter "Ticket Summary."

"C" is a day card used on the Newington Division, our line running to New Britain, part of the distance over the tracks of the Connecticut Railway & Lighting Co. As we receive its tickets and transfers a different day card is required. In "Summary," however, the conductor fills out only the cash fares.

The conductor makes up report of day's work, putting cash, tickets and day card in a numbered canvas bag and deposits it in a safe provided for that purpose. This safe opens into the receiving room.

The receiving room is open at 8 o'clock in the morning. First the money counters take the canvas bag, empty it, counting cash, and if correct put their initials on the day card, which is folded so that the amount is outside and no unfolding is necessary. The tickets are folded inside and held in by a rubber band. If cash is not correct, it is counted by a second counter, then a short or over slip is made out.

Day cards now pass to the ticket counter, who checks the number of tickets and separates them into "free," 2½-cent and "5-cent," entering them in places provided on day card.

Day cards are now separated into lines and checked for trips from a list of the number of trips run on each line made out by the barn foreman.

The next step is the checking of registers. The register we use is one of our own make and differs from any other in that it prints the fares registered whenever set back to zero, as you can see on the register slip. As nothing can be printed except what is visible, it is easy to see that if the conductor does not put down on his day card what the register calls for, he can blame no one but himself when he gets called up to settle for a short—he knows that it is up to him, as no one else has made any record. By comparing the day card and register slip you can see how readily it is checked up, first the regular, then the relief. There is no need of any total when you can check up each trip. We very often find it convenient to know what the register reading actually was on some particular trip, not what some one said it was.

The day cards are now ready to prove. "Fares registered" are first added; that total, less the tickets gives the cash fares. Any correction in fares registered is made with colored pencil (each one checking having a different color), but cash fares and cash are always corrected in red ink, a short or over slip is made for these errors. The amount on day card after it is corrected is the amount entered as receipts for the day.

The various short and over slips are entered on one sheet, which is sent to the assistant superintendent each day for settlement with conductors. The conductors sign this sheet whether they are short or over. We mean to be perfectly fair with our conductors and as willingly send them back when they have overpaid as we look for a cheerful settlement when the mistake is the other way.

The receiver has a fund to draw from when the short and over balance is on the wrong side, so that we deposit what the corrected day cards call for.

The day cards are now ready to enter by lines, each conductor separately, as soon as all are entered and added; the totals of cash are taken and the deposit is made ready for the bank; this is made by the receiver and agrees with the total cash receipts.

After cash is out of the way the transfer envelopes are checked with day cards and any differences are reported to assistant superintendent for settlement.

The totals of various lines are now copied on a sheet which includes Car Mileage, Car Hours, Transfers, Free Tickets, Ticket Fares, Cash Fares, Total Passengers, Cash Receipts, Ticket Value and Total Earnings, on this sheet is a record in detail of the cash deposited.

For the year ending June 30, 1901, we carried 14,835,939 paying passengers and 3,122,550 transfer passengers. The expenses of the receiving department to handle cash and tickets was approximately one cent for every hundred passengers. Our daily service calls for 71 regular cars with 147 conductors.

I, for one, realize that frequent discussion of prevailing methods and constant watchfulness of details is necessary, in the accomplishment of economies, and that free discussion will lead to greater perfection.

#### REPORT OF COMMITTEE ON A STANDARD UNIT OF COMPARISON.

By H. C. Mackay, Chairman; F. E. Smith, A. H. Ford.

In pursuance of the resolution passed at the last convention, your committee submits the following report:

Whereas, it has been shown conclusively that, in every case where the car hour unit has been given a fair trial by our members, it has demonstrated its practicability and great value, and has received their endorsement.

Therefore, We recommend its adoption as a standard unit of comparison, and offer the following resolution:

Resolved, That this association recommends the adoption of the car-hour as a standard unit of comparison.

Messrs. Frank B. Baker and W. J. Watson, represented the American Electrical Works, of Providence, R. I.

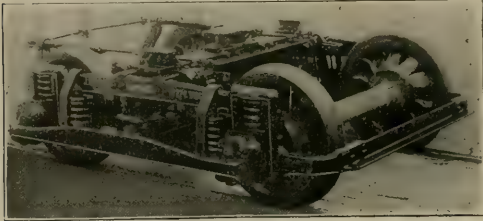
Manager W. E. Ludlow, of the American Standard Rail Joint Department, of the Chisholm & Moore Manufacturing Co., of Cleveland, Ohio, was always on deck. A street railway convention would not be complete without him.



## BRILL NO. 27 TRUCKS.

The two No. 27 trucks at the Brill exhibit have attracted considerable attention, primarily on account of their design, but also because of the evidences of skilled workmanship displayed in the construction. The side frames are solid forgings, but from their smoothness and perfect finish, one would almost take them for extremely smooth castings. To those familiar with iron workings in the blacksmith shop, these frames will be an object lesson as showing what can be done in different forgings at the Brill works.

The trucks are of the equalizing swing beam type. They differ radically from the ordinary swing beam truck in that the links are carried directly from the main frame or wheel piece, and the equalizer is part of the swing motion design, while the swinging links contain the equalizing springs. As these springs lengthen and shorten under the swinging of the body, they soften the action



BRILL NO. 27 TRUCK.

of the equalizer and diminish the amount of its motion. As they are at the ends of the equalizer they never have any leverage against them, and it is claimed that even in the most violent motion occasioned by running over rough track, the wheels never shirk the load and therefore are never in a position to be forced from the rails. The introduction of the journal spring also diminishes the rise and fall of the body when any wheel or pair of wheels rises or falls. The combination of the three sets of springs is a great aid in making the car ride easily. Since the side motion is cushioned as well as the vertical motion, the flange wear of the wheels is reduced and also the wear on the rails. This design has met with great favor among general managers.

The Brill No. 27 G truck while retaining all the principles of operation of the Brill No. 27 has certain additional features which are of considerable importance. In this type the elliptic springs on the plank are removed and their places is taken by half-elliptic springs which are substituted for the equalizing bar. This makes a very compact truck, reducing the wheel base to 4 feet, while providing all the spring power of the Brill No. 27 truck. The frame, journal springs and springs within the links are all retained and its riding qualities are quite equal to those of the Brill No. 27 truck of the same wheel base. It rides easy over a rough roadbed and is safe under conditions where other trucks would leave the track at very much lower rates of speed.

## RAILWAY MOTOR BEARINGS.

While the replacing of motor bearings is only one of many details it often forms quite an important item in the repair accounts during the course of the year, and therefore care should be exercised in the selection of these articles to secure only such as will give a maximum wearing life at a comparatively low cost.

The "Genuine Bell Metal" motor bearings made by the Ohio Brass Co. have achieved an enviable reputation for long wearing qualities and satisfactory service, and the steadily increasing demand for them would indicate that the claims for their superiority made by the manufacturer are borne out in actual service. These bearings are made of a peculiar composition of metal which has been found after extended experiments covering a number of years to give the longest wearing life combined with a minimum of amount of friction. The castings are carefully machined and finished all over, ensuring a perfect fit when placed in position in the

motor. The "Genuine Babbitt" bearings made by the same company have carefully machined iron shells lined with "Genuine Babbitt" metal.

## AN INTERURBAN SNOW PLOW.

The Taunton Locomotive Manufacturing Co., of Taunton, Mass., exhibits a heavy snow plow meant for interurban service. The body has the appearance of an ordinary freight car as regards cab and trucks, except in so far as the application of electricity



makes alteration necessary. The plow is 43 ft. over all, 11 ft. high, 9½ ft. wide with wings in, and 12 ft. wide with wings out.

It will carry an equipment of four 75 h. p. motors and when fully equipped weighs 20 tons. The length inside the house is 26 ft. 7 in., and the width 7 ft. Treasurer William R. Billings attended the convention and Mr. H. L. Hepburn had charge of the exhibit.

## FRANK RIDLON CO.

This company is making an exhibit of its regular line of specialties, which include the Wilson trolley catchers, popular among street railway men; the Kilbourn track sanding device, which has the capacity to use any sort of sand, and use it economically; the Weld babbiting device, which introduces a new trick in re-babbiting old



bearings, making complete finishings without any machine work; the Ridlon track drill, which is also a new machine, made of cut steel in order to stand all sorts of heavy work. There is also on exhibition the Wood gate and the well known Sampson spot chord. The company is represented by Frank Ridlon, president; Charles N. Wood, vice-president; N. L. Wood, H. F. Kellog and Robert Mathias.

## FIFTH REGULAR ANNUAL MEETING

## STREET RAILWAY ACCOUNTANTS' ASSOCIATION

New York City—Oct. 9–11, 1901.

Friday, Oct. 11, 1901.

President Ham called the meeting to order at 10.30 a. m.

Mr. S. E. Moore, comptroller, United Traction Co., of Pittsburgh, then read his paper on "Consumers' Accounts for Electric Lighting Companies," which will be found on pages 731 et seq.

In reply to Mr. Mackay, Mr. Moore stated that the meter readings were carried on the original meter's loose leaf sheet, and all that went on the ledger was the net amount, which was the amount less the discount for cash. Mr. Moore further stated that the ledger was closed each month, and any balance due from the previous month was carried over, plus the discount. They carried over what was unpaid. In the event of payment after the discount date and before the close of the month, the only note made on the ledger was that provided for in the blanks referred to in the report, and it showed the balance carried over, the exact amount due, adding the discount. For instance, the discount day was 10 days after the bill was rendered. If it ran 15 days, the dunning cards were sent out. In the course of three or four days more the current was shut off, and necessarily the amount carried over as falling due from that man, would be the net amount; although afterward, when he paid and the discount was added to it, it would be added in the month that it was paid, this balance being carried from month to month.

The principal objection to the meter reader reporting to the customer the state of his meter was that memories were defective, and relying upon them led to trouble in the office with customers. The only point in that was that it saved trouble at the office.

In reply to Mr. Byan, Mr. Moore stated that if a consumer had three contracts he would be in each of the books, one for power, one for arc and one for incandescent lighting, and one for anything else that they might have, and the consumer got three bills. Then, when they posted the cash they posted the coupons, and each of those coupons had reference to its own book, kept by the different clerks, and there was no conflict at all.

After some further discussion of this paper Mr. H. H. Vreeland, of New York, was introduced and addressed the convention.

Mr. Vreeland said he was very glad to see so representative a gathering of accountants. A great deal of time and money had been spent to make the convention worthy of Greater New York. Vice-President Skidd, of the Manhattan Elevated; President Greatsinger, of the Brooklyn Heights system; Mr. Heins, of the Brooklyn & Coney Island; Mr. Beetem, of the New York & Queens County Road; President Maher, of the Union system, and Vice-President and General Manager Young, of the Consolidated Traction System of New Jersey, Mr. Vreeland said, were all on the general committee and had all joined in the work and had put no limit upon him (the speaker) as chairman of the general committee, in the way of expense to make this a very satisfactory and representative meeting.

The work which the Accountants' Association was doing could not be over-emphasized as to its importance, he said, and he thanked the convention for the opportunity of addressing them.

President Ham said that he wished to say, officially, for this association, that while it might be much smaller in numbers than the American Association, its appreciation of the courtesies extended by the city of New York and street railway companies was fully as great as that of the other association. Furthermore, they appreciated most heartily the attitude of the American Association towards them at all times.

Benjamin F. Chadbourne, railroad commissioner of Maine, was then introduced to the convention. He said it was a great pleasure to him to meet with them on this occasion, and that he had

a high appreciation of the work they were doing, which was brought under his observation many times. He was glad to say that the committee of this association, chosen to attend the National Convention of Railroad Commissioners, were now under the constitution of the latter organization elected to membership therein and he believed they would be the means of doing a great deal of good, because it was a great benefit to every railroad man to understand what systematized accounting meant. It had been his painful duty to observe at times a sort of "now you see it and now you don't" system of accounting, and any movement toward a standard system was of great benefit to railroad corporations, to all commissions having anything to do with them and to the great investing public, who were watching at all times with a critical eye the management and operation of all railroad lines, whether steam or electric street railroad. He had come to this convention to meet the gentlemen of the Accountants' Association from a selfish motive. It was the desire of every man connected with railroads to find out what gave the best account of the workings, the operation and the maintenance of street railroads, and just in proportion as they became educated in these matters, they were more efficient as officers. He thanked the convention for the reception which they had given him, and should they ever come to the state of Maine, he would do his part towards their entertainment, and felt that he was safe in saying that they could find much to entertain them in the northeastern corner of this great country.

President Ham expressed the gratification felt by this association at the relations existing between it and the National Association of Railroad Commissioners, and said that it was due to Mr. Chadbourne as much as to any one else that they owed a portion of the recognition which was afforded them.

Secretary Brockway then read the report of Mr. Tripp, Chairman, of the Committee on "A Standard System of Accounting for Electric Light Companies." This report will be found on page 734, et seq.

After some discussion on this paper a vote of thanks was tendered the National Electric Light Association for its courtesy in permitting the presentation of the report.

Mr. Duffy, chairman, read the report from the committee on "Standard System of Street Railway Accounting," which will be found on pages 735, et seq.

The convention then resumed the discussion of the report of the committee on Store-room Accounting, which was presented and discussed in part at the session of Wednesday afternoon.

The subdivision "Purchase—Requisitions for Purchase" was considered and a vote taken resulted in a unanimous expression in favor of this clause and also in favor of clause 2 of the report, with the exception of the recommendation that the company send out its own billheads, on which point a vote taken showed a preference for this plan on the part of only thirteen members as against seven who did not approve of it.

The subject of lot numbers was then further considered and in the course of the debate on this branch of the report the President asked for an expression of opinion as to the keeping of a stock ledger, showing an account of each individual item, and a vote thereon resulted, ayes 11, noes 7.

President Holmes, of the American Association, was then introduced and expressed his pleasure at being able to appear before the convention and compared present methods with those

prevailing in the seventies when he (the speaker) entered the street railway business as an office boy, and when they would have sometimes to unlock the old-fashioned Slosson fare-boxes to get money enough to pay for corn, at \$1.50 per bushel, with which to feed the mules and horses. He believed the present meeting was the most successful in the history of the American Association, and that the results of the movement toward organizing the different departments of railroading would be of the greatest value. He hoped some day to see the associations again in the West, and to have the pleasure of meeting members personally.

Mr. Duffy moved that the Street Railway Review and the Street Railway Journal be elected to honorary membership in the Association in recognition of the past service that those papers had afforded. The motion was seconded by Mr. Burlington and carried.

The President introduced Mr. S. C. Cooper, of Cincinnati, who addressed the convention briefly.

Adjourned until 2:30 p. m.

#### Friday—Afternoon Session.

President Ham called the meeting to order at 2:45 p. m. Mr. E. M. White, cashier of Hartford Street Railway, read the following paper on Conductors' Accounts, which will be found on page 734.

Mr. White added that since writing the report they had made experiments with the comptometer and found that they could do in an hour, or a trifle over, the work that without it was taking from three to three and a half hours to perform.

Mr. Duffy recommended the use of computing machines to all who had not already adopted them. His company were using the Burroughs register accountant, or, as it was called in Chicago, the Burroughs arithmometer. The comptometer did not record; the arithmometer did. In other words, the latter was an adding typewriter. They had been using the arithmometer since April, 1900, when they got three of them, and found them a wonderful help.

Mr. Hibbe called attention to the invention of Mr. Wilson, of Boston, a member of the Association, of a tabulating typewriter which was well worth looking into, and which Mr. Duffy said he regarded as another step forward.

The President called for a show of hands from those who favored the counting of the returns of conductors by trips or by the day's work, as applied to those only who counted the conductors' money instead of receiving it through a sack. Four members indicated a preference for counting the money by trips, while ten employed receivers to count it at the end of the day's work.

Mr. White showed a picture of the register to which he had referred, and explained the manner of its working. He said it was known as the Hartford Street Railway Register. Before you could reset it you turned a button and that did the printing. The register was locked all day; the conductor could not get at it. All he had to do was to turn the button and print what was visible.

After considerable further discussion of this paper, Mr. Mackay read a report on Standard Unit of Comparison, which will be found on page 735.

Mr. Duffy explained the use of the car hour system, as in use in Chicago since November 1, 1900, and said that he found the task of getting the car hours very easy and simple. They had not increased their office force, nor neglected anything else that needed to be done, and yet they had all this additional information, given by keeping the car hours. There was no question in his mind that as compared with the car mile, it was a far superior unit, more equitable, more practicable and fairer.

On motion, the report of the committee was adopted.

Mr. Judson, accountant of the Board of Railroad Commissioners of the State of New York, then addressed the convention and spoke very emphatically of the help which they had derived from the work of this association. He said, that beginning next year, they would use the car hour basis.

The president read the following telegram received from ex-President Calderwood, of Minneapolis:

"To the boys I send a greeting. Wish you all a profitable and pleasant meeting."

The president stated that it had been the intention to discuss further the report of the committee on store-room account, but on motion of Mr. Ross, of Montreal, further discussion of this question was postponed until the next meeting, and the same committee was continued, with power to add to their number, and with instructions to submit with their next report, the forms which they proposed.



H. C. MACKAY.  
President Accountants' Association.

Mr. Poole, for the committee on resolutions, presented resolutions thanking the various street and elevated railway companies of Greater New York for their many courtesies; the press of New York, and the Street Railway Review and Street Railway Journal for their co-operation. Mr. Hemmingsway, for acting as secretary in the absence of the secretary; and the various officers and committees for their services to the association.

On motion, the report was adopted.

The committee on nominations presented the following report:

For President, H. C. Mackay, of Milwaukee.

First Vice-President, C. L. S. Tingley, of Philadelphia.

Second Vice-President, W. B. Longyear, of Brooklyn.

Third Vice-President, S. C. Cooper, of Cincinnati.

Secretary and Treasurer, W. B. Brockway, of New Orleans.

Executive Committee: W. F. Ham, of Washington; F. R. Henry, St. Louis; Irwin Fullerton, of Detroit, and D. D. Bartlett, of Boston.

On motion of Mr. Duffy the report was accepted with the thanks of the convention for the very good selections made by the committee.

On motion of F. E. Smith, of Chicago, the secretary was instructed to cast one ballot for the officers nominated.

The secretary cast the ballot accordingly, and the president declared the gentlemen named duly elected to the respective offices.

President Ham thanked the members for the successful manner in which the convention had been conducted. He said the attendance had been very gratifying, and that they had added one more to the successful list of meetings of the association.

President-elect Mackay was then conducted to the chair and expressed his appreciation of the honor conferred by his election as president, and assured the association of his best efforts in its behalf.

Adjourned.

#### AMERICAN RAILWAY SUPPLY CO.

All sorts and kinds of supplies are being shown by this company, which is situated in the south gallery. Checks, number plates, tokens, medals, badges and buttons are all included in the commodities displayed, and every attention and explanation is cheerfully given by Mr. Walter Chur, the general manager.

The Chapman Double Ball-Bearing Co. has an exhibit of bearings such as are used in heavy work on road wagons, mill shafting, automobiles and trolley cars. The company is represented by H. C. Wilson, directing engineer, W. M. Holohan, manager of the New York office, and Robert E. Eary.



## A. S. R. A. DISCUSSION.

(Continued from Page 720.)

gentleman out of his trouble without any question. I do not think the Pennsylvania system allows many accidents to occur, but it entails a tremendous expenditure.

Mr. Fuller: I do not think Mr. Wason understands the Pennsylvania system. If I understand it correctly you cannot operate that system on a trolley line.

Mr. C. E. Baker: I would like to ask Mr. Wason if the train despatcher writes fully all orders given.

Mr. Wason: The despatcher transmits the message by word of mouth, does not write the order himself. The motorman and the conductor write the order; on this line that is spoken of the conductor writes the order. The train despatcher does not do any of the writing on the roads out of Cleveland; the despatcher tells the conductor, gives the conductor the order, and he in turn gives it to the motorman.

Mr. Vreeland: I would like to ask if any members of the association present operate under the system of colored lights that is very largely used throughout the United States.

The motorman applies a lever as he goes along and changes the lights at each end of a single track block.

Mr. Fuller: I have a number of roads operated in that manner with the usual result, very unsatisfactory. They are subject to the lights going out in your car, getting destroyed, and the motorman comes to a turnout, the lights won't work, and then there is all of that trouble where some man comes in and thinks the lights are out and that a man put the lights out when really they are destroyed. There is always a chance of that and a misinterpretation of signals.

Colonel Heft: Along the lines of this question I would suggest that the executive committee ask the next committee on standards to make a report at the next annual convention on the best signal system. There are several that have just come into the market, and I know of one that I think will be very satisfactory. It not only enables you to stop at different points on the lines, but enables you to test your signals before your cars are placed on the road. You can see if they are in order, and also it records that in the despatcher's office. I will be very glad to give the committee any information I have on the subject. We have a small system in our cellar; I think it will be very interesting to the members, such a report, and we have a year to get the latest data. At that time a report could be made which would not only be interesting but valuable, in my judgment.

Mr. Wason: I was going to ask whether it would be possible to use a system similar to the Pennsylvania system of signalling on a trolley road.

Mr. Sergeant: I think possibly I can explain that question. What I have to say does not relate to single tracks. In organizing our elevated service in Boston the question arose as to how collisions were to be prevented. We have a system of elevated cars which is run on the subway as well as upon the elevated structure, and the grades in making the transition from one to the other, as well as the grades within the subway, were very severe. We were proposing to run trains at a maximum speed of 40 miles per hour, and have made 45 miles an hour; only, however, for short distances. We felt it necessary, regardless of the expense, to introduce something to keep these trains apart. We questioned whether the ordinary track circuit system could be used on what I may describe as a single trolley road; that is to say, on a road that used the rail for the return circuit. We made some experiments, and some were made by the Union Signal Co., and they were quite satisfactory, so that we finally decided to introduce a block signal system of the electric-pneumatic type, and divide our road into as nearly as possible minute blocks. Of course it introduced a great many signals, but it was necessary to provide for the greatest possible frequency of trains.

When we started out we found as first installed the conductivity of the one rail we devoted to the track circuit, using the other one for the return circuit; in the subway it is not sufficient, and our signal failed. There seemed to be a tendency of the return current to rise and escape.

By introducing additional copper for return in the subway we

overcame that difficulty entirely. On the elevated structure the structure carries the return current much better, and they do not have that trouble. The general result has been that after placing individual men for the first week or so at every signal in the subway to flag the trains on, we got the system working all right, and it has been very satisfactory, and shows that it is possible to use the track circuit system on a trolley road, a single trolley road. I think that was the question that was asked and there is the practical demonstration of it.

On the country roads, as we call them, the single track roads from town to town, I think it has become apparent to nearly all of us that the conditions of operation have not been surrounded, as Mr. Vreeland pointed out, with those safeguards that are absolutely necessary; and the endeavors, as I understand it, of the signal inventors to overcome these difficulties have been complicated by this old horse car system of running what they used to call double headers, which are now quadruple headers, endeavoring to get greater travel—two, three and four cars, one behind the other. Obviously that prevents the use of the track circuit system in the ordinary sense.

The roads have not, so far as I know, undertaken to meet that difficulty by putting the cars into trains. I believe they will be operated with far greater safety if, under those conditions, the cars were coupled so that there would be one unit going over the block instead of four or five. I do not know, but it has been tried in a good many places, but it has not come under my notice; and in that connection it is quite possible that those roads by using some form of unit control would save a great deal of money and waste, because in that class of traffic there is always ample time for one conductor to go through a train and get his fares; perhaps not in the city, but surely some motormen might be saved by that system, and I believe that safety would be promoted by it.

Mr. Harrington: In Philadelphia we have a system, a modification, system used by the Reading Railroad, a block system, with semaphore lights, and it seems to operate very satisfactorily. They have double track roads and it is laid out in the block system for ordinary railway and suburban lines. The points that have been made in regard to the forms of signals I must say I agree with; everything that we have tried has been unsatisfactory and has been abandoned. We are using the ordinary switch-backs and stacks as well. In the night time we have a red lantern on the back of the car and a red light in front. If we could get a signal that would not cost as much as the Pennsylvania system and which could be operated in a satisfactory way, we would like to adopt it on our suburban extension.

Mr. Powers: I came in only after this discussion had progressed to some degree, but it is a matter that vitally concerns us all. On the railroad I represent, the Hudson Valley Railway, which runs from Troy northeasterly to Lake George, with a branch line running from Saratoga, out of something like 103 miles of railroad, something like 85 miles are on a private right of way intended to be operated at high speed. Of course the first consideration was to give them something that was reliable, and for that reason we have in the first place adopted a telephone dispatch system, having employed men trained in the steam railroad dispatch service and using triplicate orders, one at the telephone office, two copies taken by the conductor and motorman and the third copy deposited in a receptacle for it so that in case of a mistake in carrying out the order the third copy cannot be destroyed. That system has proved somewhat cumbersome, and we are now preparing a triplicate ticket to be taken by the conductor, the motorman receives the order over the telephone, to be repeated back by the conductor and O. K'd by the despatcher, and then the three slips to be taken, one by the conductor, the second by the motorman and the third deposited in the box. This seems to be a good deal quicker, but there is a great deal of delay, the motorman being not very rapid at writing.

The first point seems to be to provide some system that would insure safety on the portions of the road which are crooked, that is where the cars cannot see one another for any considerable distance, and we have worked on that line by taking up the old staff system and are putting that in force on three or four sections where the danger is greatest. In order to make the thing perfectly sure get it beyond the mere memory of the motorman, for a motorman may forget his stop and go into a block, as well as forget his switch and the passing of a car at the proper switch,

we have modified the system somewhat by putting a spring derail at each end of the rail to be locked with a duplicate padlock, the key to be attached to the staff so that the motorman can get his car out of the block; he cannot get into it without having possession of the staff and the attached key.

Of course that would not do on the complete block system, because the delay would be too great. It is perfectly safe. The system, if the travel becomes heavy enough to require doubly heavy cars, is simply to allow the admission of the first car to unlock the block and hold the lever over until the cars enter the block, and the second car carrying the staff, the cars carrying the regular signals of lights by night and flags by day the same as are used on the standard steam roads. That is as far as we have gone in this matter.

It seems to me after a long study of this matter occupying 40 years, having had control of some of the interurban roads in the country, that we are after all working in the wrong direction and we should have to make the system of blocking as complete as possible, not a stationary block on the railroad but an indicator of some sort on the car itself. I have had some conversation with persons who have a great deal of electrical capacity in the direction of original research and I have asked them whether it would not be possible to provide on each car a signal of some sort for instance, an incandescent lamp which would glow on the approach of another car within say a thousand feet. That sounds like a difficult problem, but I think that is the direction to be looked for. I think there should be something used like the signals employed in elevators today in the city and elsewhere to indicate to the operator of the elevator that he is desired to make a stop at the next floor; one of which will indicate the presence of a car in advance and another of a car in the rear within the limited distance. I believe that is perfectly practicable to attain. Indeed, we are working at the thing ourselves having a man for that purpose.

We have tried several of the block signal systems. We do not believe that any of them that we have investigated will be satisfactory or sufficiently reliable to warrant their use, and today we are standing in the position of simply getting along with something that is absolutely safe as far as we can go.

In times of fog we do not allow any car to leave its switch except on the passing of the regular car that was to meet it at that switch, and we do not vary from that rule, even if we hang up our line for half a day. We believe a delay of that character is much better than taking a chance in a fog. It does not pay to take chances in operating cars at high speed on a single track.

The territory we cover consists of a number of towns, and in the entire 103 outside of Troy and Cohoes with 150,000 people, we serve a population of about 100,000, and we are not able at this time (and probably will not be for some years to come) to double track much of the road. Of course that is the final remedy for this sort of thing, but we do believe that we can by these expenditures reduce the danger of accidents very greatly; but what we do insist upon is that whatever devices we adopt shall be as nearly perfect as possible and no single device that we have ever seen is anything more than taking another chance, for a signal device that does not work occasionally is far worse than none at all. I hope the problem will be worked out so that we may have a satisfactory system of signalling, but I believe the proper way is to advise the motorman of the presence of a car and have him know in which direction the car is. If that is done, I think we will have eliminated a very large proportion of the dangers of collision.

President Holmes: Gentlemen, I propose we close the discussion, as our time is limited, and I will now ask for the report of the Nominating Committee.

The report was read as follows:

Your Committee on Nominations begs leave to submit the following report:

It recommends as nominees for officers of the Association the following names:

President, H. H. Vreeland, of New York;  
First Vice-President, C. W. Wason, of Cleveland, O.;  
Second Vice-President, E. C. Foster, of Boston;  
Third Vice-President, H. M. Sloan, of Chicago;  
Secretary and Treasurer, T. C. Penington, of Chicago.

#### Members of the Executive Committee:

Walton H. Holmes, of Kansas City;  
John A. Rigg, of Reading;  
D. B. Dyer, of Augusta;  
T. J. Nicholl, of Rochester;  
G. W. Dickinson, of Seattle.

Your committee has received several invitations for the entertainment of the next convention. It recommends the acceptance of the invitation received from the Everett-Moore Syndicate to hold the next convention at Detroit, Michigan.



H. H. VREELAND.  
President A. S. R. A.

Colonel Heft: I move that the secretary be empowered to cast one vote for the nominations as read. Carried.

Colonel Heft: I move that it be resolved that we accept the invitation of the Everett-Moore Syndicate to hold the convention at Detroit the ensuing year. Carried.

Mr. Sergeant: If general business is in order, I move you that the thanks of this association be tendered to the Metropolitan Street Railway Co., the Brooklyn Rapid Transit Co., the Manhattan Elevated Railroad Company and the other corporations and individuals that have done so much in behalf of the association, and enabled it to have such adequate provisions for this convention and such a satisfactory convention altogether. I believe that a great deal has been done for us, and that we all appreciate it, and that a motion of this sort is certainly in order. Carried.

A vote of thanks was also tendered to the gentlemen who prepared papers and those who led the discussion.

Mr. Lyon: I offer the following resolutions:

Resolved, That the thanks of the association be and is hereby extended to the president, Mr. Walton H. Holmes, for the able and impartial manner in which he has presided over its deliberations.

Resolved, That it is the sense of the association that the present highly satisfactory condition of its affairs is in great measure due to his zealous and untiring efforts, which not only reflects great credit upon the association, but himself, as the youngest man ever elected to the office.

President Holmes: I thank you very much indeed for the resolution, and I hope that what little work I have done for you will be of benefit to us all in the future. I have had the able assistance of a good executive committee, and the papers which were prepared were ably prepared and ably discussed. I think, if we continue in the same line of policy as this, that really our meetings will grow more interesting each year.

I hardly think it proper for me to say much at this time, as I expect to say something to-night, but I am going to thank you all for your attention and the promptness with which you have attended these meetings, and for giving such careful attention. We would welcome you back to Kansas City, our people have asked that every one of them that met you there last year, to be remembered, and some day hope to have the pleasure of seeing you out West again.

There is one more matter. Will Mr. Cooper please explain this letter in regard to the mail service?

Mr. Cooper: Mr. President and Gentlemen: I mailed report of the committee appointed by the Postmaster-General in 1896 (Act of Congress, June 9, 1896), making appropriation for the service of the Postoffice Department for the year ending June 30, 1897, pro-

viding for the transportation of mail, \$150,000 dollars. That report was made to Congress—I mean to say \$150,000 was appropriated for the transportation of the mails by electric cars—and I will read some excerpts from the report of the committee bearing on the consideration of that \$150,000 for the transportation of mails by electric cars.

One says: "Our conclusion is that a rate of 16 cents per car-mile for cars not exceeding 16 ft. in length, inside measurement, would cover operating expenses and in most cases allow a fair margin of profit. The most notable exception would be the West End Street Railway Co., of Boston, and even in that case, we believe it would pay the additional expense incident to the service."

Then, in another place, it recommends that the change of rates for carrying the mails be postponed for a year. The effect of that is that railways operating postal cars 16 ft. in length will get 16 cents per car-mile. In Cincinnati we get 11.62 per car. That is hardly what the operating expenses amount to, and our executive committee some time ago passed a resolution that they would discontinue service. We had some correspondence with the Postoffice authorities, and they asked us to wait awhile; and my object in bringing up the matter is to suggest that we offer a resolution, to memorialize or petition Congress to grant a further appropriation for this service so that it may be adequately paid. I had some correspondence with Mr. Penington on that. His cars, I believe, are 20 ft., so that he is getting less than we do, that is, taking into consideration the length of the cars.

President Holmes: Mr. Cooper, do I understand that you offer a resolution requesting that a committee be appointed to memorialize Congress to increase the appropriation?

Mr. Cooper: Yes, I put it in that shape. Carried.

President Holmes: The next president, Mr. Vreeland, will do that, I know.

Mr. Vreeland: The next president does not care to do it; having been connected with it 20 years, I understand the government position very thoroughly. I have absolutely refused to take the mail business in New York City on a non-paying basis. If the government of the United States cannot pay a proper compensation for carrying the mails (we are certainly taxed enough in other ways), I do not propose to carry them. The elevated railroads have done just exactly what the steam railroads did some years ago. The Second Assistant Postmaster General came to me when I notified them that I would discontinue on Third avenue, and said: "You accept our rates, and we will try to get an appropriation." I said: "I will accept your rate, if you will get your appropriation." The railroads have taken the question up, but have not considered it on a paying basis at all. I feel satisfied that I can take care of my property without the help of the United States mail, and I, for one, would not be in favor as a member of the association of putting ourselves on record as sending a memorial to Congress to ask it to do something which they should do before we do the business.

Col. Heft: I think, then, Mr. Vreeland is the very man to take this thing up, because he has refused to do anything with it, unless they do pay.

President Holmes: I am sure I do not want to shirk any responsibility. I fully agree with what Mr. Vreeland says.

Mr. McClary, of Birmingham: I ask the gentleman to embody in his resolution that Congress shall be memorialized to increase the rate per mile on suburban roads. Quite a number of roads are carrying the mails and Congress allows 3 cents a mile, which is not adequate compensation.

Mr. Wheatly, of New York: I want to say that the question of handling the mails is something that concerns us over in Brooklyn quite as vitally as any railroad in the country, perhaps. We have been handling United States mails for some years under an arrangement to which we fell heir, an arrangement I think the present management would not have made had it been left to them. We handle the mail in 16-ft. cars. As I understand the present arrangement we are paid 12 cents a car-mile, which we think is insufficient. We have had numerous cases of unavoidable delay and failure to make proper time with the mail, and we have been subjected to fines by the government, which in many cases amounted to double the revenue that we obtained for the particular service in question. I think this is a question which this association might very well take into consideration, provided there are any considerable num-

ber of roads that are interested, or likely to become interested in the future. It seems to me that the small appropriation of \$150,000 for the handling of mail matter on the street railways of the entire country is utterly inadequate, especially taking into consideration the fact that the government is now desirous of making arrangements with the suburban and interurban roads, which are being developed all over the country to carry the mail. I think all of the gentlemen present will agree with me that 12 cents per car-mile is not sufficient compensation.

Col. Heft: I move that this matter be referred to the executive committee for future action. Carried.

Col. Heft: I move that we tender a vote of thanks to the supply men for the magnificent manner in which they have conducted their exhibit at this meeting. Carried.

The meeting then adjourned, to reconvene at Sherry's at 7:30 o'clock, Friday evening, for dinner and the installation of officers.

#### ALLSTON FOUNDRY CO.

The Allston Foundry Co., of Boston, has a pulley on exhibition in the annex that Mr. W. W. Whitcomb, the president, declares is destined to revolutionize the pulley business. By means of cork inserts in the face of the pulley, the danger of the belt slipping is overcome, as the cork is not affected by water or oil. The corks, one inch in diameter, are forced into cored sockets about 2 1-2 in. apart and protrude slightly above the smooth face of the pulley. This is to give a uniform bearing surface to the belt. There were over 100 tests of the pulley at the Worcester (Mass.) Polytechnic Institute, with excellent results.

Other specialties exhibited by the Allston Foundry Co. are "compo" brake shoes and "compo" friction clutches, the cork principle being applied to each. The Crompton & Knowles Loom Works has a five-year license to manufacture the "Compo" friction clutch for looms. Tests of various brake shoes at Purdue University last June resulted very favorably for the "Compo." Mr. Whitcomb is assisted at this exhibit by Mr. William S. Sanborn.

#### BLIND LEADING THE BLIND.

An amusing instance of mistaken criticism is given in the Electrical Review of London, in which the critic assumes that a "short circuit" refers merely to a small length of conducting wire. The item runs as follows:

#### A VERY FREE LANCE.

"As an instance of the pseudo-scientific rubbish we are so constantly treated to by the lay papers," says a writer in the Free Lance, "we were told that a 'short circuit' of 'electric wires' was responsible for a fire. An electric current for the want of, or for the breaking down of, proper insulation, may become 'short circuited,' and so cause 'sparking,' and thus a blaze, but if the insulation is satisfactory, and the wire does not offer too great a resistance, an electric current can be sent over a long or short circuit with equally satisfactory results." As an instance of the blind leading the blind, this would be hard to beat. Fancy the Free Lance taking to task its lay contemporaries for their pseudo-science! That lay paper was perfectly correct; short circuits of electric wires have been responsible for many outbreaks of fire, and the expression "short circuit" has nothing whatever to do with the length of the wires. The Free Lance writer seems wholly unconscious of the utter absurdity of his attempt to enlighten the lay papers, but where ignorance is bliss, etc.

During the past three days there have been some twenty letters and telegrams received at the office of Mr. Nathan, the Director of Exhibits, for whom the owners have not been found. If not called for today they will be returned. Every effort was made to find the parties addressed, but without avail.

Public telephones have been installed at the stations of the Chicago Elevated Loop. They are put on both the entrance and exit sides of the turnstiles.



## KNELL AIR BRAKE CO.

This company is exhibiting its new compressor for maximum traction trucks, which was described in the "Daily Review" for Thursday. The advantage of this innovation lies in the fact that the bottom of the gear case is several inches higher than that in ordinary use, and so affords ample clearance from the roadbed. This company has hit on an extremely pretty idea in the way of souvenirs, as it presents bunches of flowers to the ladies. The Knell Air Brake Co. is represented by Messrs. Charles T. Thomas, president; Jowell C. Hopkins, secretary; A. H. Metzelaar, sales manager; George W. Young, William F. Knell, machinist; James R. Bunce, engineer, and P. Hoffmaster, treasurer.

## DEARBORN DRUG AND CHEMICAL WORKS.

One of the interesting features of this hustling Chicago company's exhibit, in the annex, is a collection of samples of scale formation, showing deposits in steam boilers from waters of different chemical composition. Many waters form scale, while others contain elements which have a corrosive effect, pitting the boilers and connections. The Dearborn company makes a specialty of analyzing waters and correcting with its vegetable methods of treatment the deleterious action of boiler feed waters. The largest power stations, not only of street railway and lighting companies, but steam users generally, are users of the Dearborn vegetable feed water treatment.

This company also makes a fine line of lubricating oils and greases, using the highest quality of Pennsylvania oil, and many samples are displayed.

The Dearborn booth is a Mecca for many of the visitors to the convention, who are cordially welcomed by Mr. Robert F. Carr, the genial vice-president and general manager, and Mr. W. B. McVicker, the Eastern agent. In the booth may be obtained considerable "literature" pertaining to the subjects in question, as well as various souvenirs for which this company is noted, such as a key to the town, for gentlemen, and a bottle of souvenir perfume, the product of the company's laboratories, for ladies.

## MAYER &amp; ENGLUND CO.

The Mayer & Englund Co., of Philadelphia, has a complete general display of full lines of materials and practically all of the manufacturers represented are grouped under separate divisions or booths. The factories making exhibits are: Speer Carbon Co., St. Mary's, Pa.; Sterling Varnish Co., Pittsburgh, Pa.; Simplex Electric Co., Boston; Garton-Daniels Co., Keokuk, Ia.; Universal Tread Co., New York; W. T. C. MacAllen Co., Boston; William Hall & Co., Boston; Strieby & Foot Co., Newark; Trolley Vestibule Shade Co., Bridgeport; Sun Electric Mfg. Co., Philadelphia; Protected Rail Bond Co., Philadelphia.

## AMERICAN BRAKE SHOE CO.

The "Diamond S" brake shoe is being exhibited by this company. Its qualities are softness combined with toughness, and it is a quick acting shoe for high speed brakes. The whole combination provides the maximum retarding power and durability in the shoe. Mr. F. W. Sargent, engineer of the company, is in charge, assisted by Otis H. Cutler, general manager of the Ramapo Foundry Co., and Messrs. Arthur Gemunder and W. W. Gardner, also of Ramapo.

## KINNAR ROLLING DOORS.

The rolling doors made by the Kinnear Manufacturing Co., of Columbus, O., for car barns, etc., are shown in full size in the Annex. The New York agents are Wm. H. Brodie & Co., 45 Vesey St., Manhattan.

## WM. WHARTON, JR., &amp; CO.

The exhibit of William Wharton, Jr., & Co., Inc., is located near the entrance to the main hall. This well known firm exhibited samples of its special track work constructions, particularly its "Manganese" steel hard centre work, the merits of which are well known to street railway men. The notable features of the exhibit were an artistically arranged centre group, consisting of a crossing, switches, frogs, cast welded compromise joints, and some pieces showing the ductility of "Manganese" steel; also a portion of a curved crossing for electric underground conduit construction, such as this firm has been furnishing to the Metropolitan Street Railway Co. of New York in a large number of layouts; also crossing and frogs of solid "Manganese" steel T-rail construction. A number of fine photographs illustrating special work layouts furnished to various cities in the Union and to foreign countries adorned the exhibit.

The firm is represented by Mr. William Wharton, Jr., president; Mr. Victor Angerer, vice-president and general manager; Mr. W. Rodman Wharton, engineer; Mr. J. C. Robinson, Boston representative, and several others.

## CORNING BRAKE SHOE.

The Corning Brake Shoe Co. displays various types of brake shoes, including the standard type of shoe used by the Brooklyn Heights surface and elevated cars and the standard used by the Coney Island & Brooklyn, Manhattan Elevated and various other railroads operating in Greater New York. The company is represented by Mr. J. B. Terbell, president; Mr. C. G. Bacon, vice-president, and Mr. H. T. Mercur, general sales agent.

## IMPROVED FOLDING CAR GATE.

The R. Bliss Manufacturing Co., of Pawtucket, R. I., is showing two styles of car gates, both Wood's patents, in the annex. The patent safety gate for single door cars is familiar to railroad men, there being over 41,000 in use in the United States and Canada. Attention is especially called to a new folding gate, designed for street, elevated and steam cars, with which the Boston Elevated and Brooklyn Heights roads are now equipped. It is applicable to double door and vestibule cars and is used on some of the largest railroads.

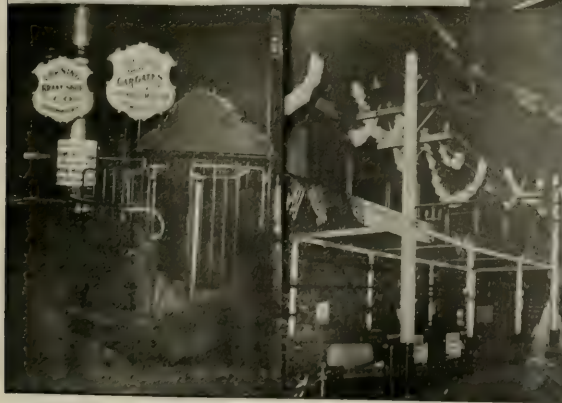
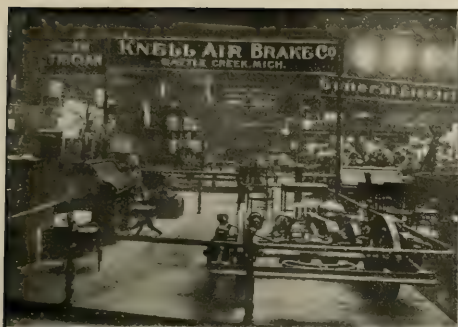
The new gate is of the double folding type, having two leaves, which swing from the bulkhead of the car by upper and lower brackets. A rod is connected to the outside leaf, which not only acts as a brace when the gate is closed, but makes a convenient grab handle along the top of the gate when it is open. The gates cannot be opened by passengers leaning on them. When the platform is crowded the gate slips in behind passengers without disturbing them.

General Manager N. H. Colwell came on from Pawtucket especially to demonstrate the advantages of the new gate.

## CREAGHEAD ENGINEERING CO.

On the right hand of the gallery, near the main entrance, the Creaghead Engineering Co., of Cincinnati, has a large section for the display of its specialties, including the famed Creaghead Flexible Bracket, trolley fittings and trimmings, other overhead line materials and construction tools. It shows also several large photographs of very fine railroad construction in the South especially, equipped with the flexible bracket, both for centre and side poles. Eighty or more electric roads are so equipped and more orders are underway.

As a souvenir the company presents callers a celluloid pocket rule for standard and metric measurement. The representatives in attendance are President T. J. Creaghead and Mr. J. M. Kennedy, Jr.









## RELIANCE MANUFACTURING CO.

The Reliance Manufacturing Co., of Brockton, Mass., shows automatic block signals for single roads, automatic block signals for double track roads, automatic crossing signals and automatic car spacer signals, all of the "Valentine" patent; also signals to use in conjunction with telephones and the "Valentine Reliance" circuit breaker tripper. Attention is especially called to the crossing signal and car spacer for use in cities where cars are not allowed to be run closely together. When the car passes a

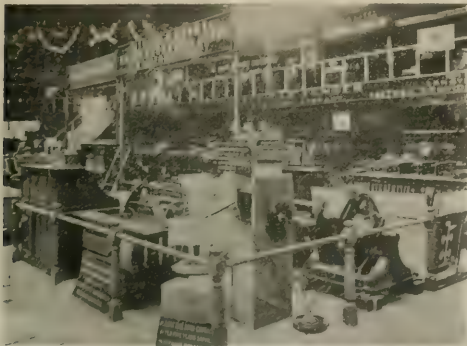


given point, it sets the signal, and when a certain distance has been covered the signal is released.

Mr. D. Valentine, president of the company, received a number of orders while here and numerous inquiries.

## PLASTIC RAIL BONDS.

One of the prominent features of the exhibit is a testing plant in Mr. Harold P. Brown's booth, with dynamo giving 3,000 amperes. With Weston instruments of the large laboratory type reading with accuracy to the fifth-point decimal, Mr. Brown is testing rail bonds or other electrical devices submitted by visitors, as well as showing the merits of the Edison-Brown latest types of plastic rail bond. This bond has undergone and withstood severe practical tests during the past four or five years.



Experiments at Mr. Brown's booth show the bond material to be a better conductor than the rail. The plastic plug bonds are applied after the track is completed in holes bored nearly at right angles to plate flanges near the vertical webs, the holes extending not quite through the base of the rail. Mr. Brown personally explains the matter to many interested listeners daily. He is

assisted by James Hollowood, Lora F. Jenks, J. Maxwell Coote, E. A. Mardorf, William Temple and John Roach.

## ILLUMINATED CAR SIGNS.

Secretary L. P. Hunter, of the Hunter Illuminated Car Sign Co., of Cincinnati, O., has a constant stream of visitors to his corner of the balcony to view the new street advertising sign the company is exploiting, as well as the illuminated signs for the cars and street corners. There are about 20,000 of these car signs in use, there being 2,600 in St. Louis, Mo., alone. They are also in use on the cars in Kansas City.

The H. B. Camp Co., of Akron, O., makers of underground ducts and conduits, has space on the left side of the main floor near the entrance, and displays its products to good advantage.

## ST. LOUIS REGISTER CO.

Mr. Giles S. Allison, who represents, among others, the St. Louis Register Co., whose specialty is the St. Louis Security and Self-Recording Register, has a booth in the main entrance. Particular attention is called to the self-recording and self-inspecting features of these registers, which are single and double. It is claimed to be impossible for the conductor to beat this register.

## GENERAL ELECTRIC CO.

The General Electric Co., of Schenectady, N. Y., has a very commanding position in the center of the main hall directly in front of the entrance. What with electric signs, carpeted floor, Persian rugs and art squares, inviting rockers, facilities for reading, writing or smoking, together with a collection of towering palms and other potted plants, as well as an artistically arranged exhibit, the General Electric is a good booth to visit, as hundreds can attest.

The principal apparatus shown by this company includes the following: Alternating current switchboard made for the Manhattan Railway Co.; direct current switchboards with circuit breakers for 25,000 amperes, also for the Manhattan company; an electrically operated oil circuit breaker for 11,000 volts, of which 154 have been sold to the Manhattan people for controlling their generating station having an ultimate capacity of 60,000 kw.

The company also shows its type "M" controller for operating electric railway motors in multiple. This is the type of which there have been 900 equipments sold to the Manhattan Railway Co. The General Electric Co. is represented on its space by R. H. Beach,



J. J. Mahoney, W. B. Potter, F. E. Case, E. D. Priest, E. H. Mullin and F. H. Gale. Beside these, many prominent representatives from out of town are in evidence.

## STANDARD VARNISH WORKS.

This company has a complete line of insulating varnish, shown on different styles of armature coils and paper. Delegates visiting



are presented with a handsome souvenir. The company is under the care of John C. Dolph and E. L. Phillips.

## STUART-HOWLAND CO.

The arrangement of materials in the exhibit of the Stuart-Howland Co., New York and Boston, which has a large, square section in the annex, is novel in the extreme. The exhibit is fenced in by tops of poles fitted with cross arms, brasses, pins, and glass insulators showing a full assortment of all the styles of insulators. Three posts have been erected, also, for the display of samples of the different styles of bracket arms. At the back of the booth is an attractive exhibit of the "Peerless" lamps, with vari-colored globes, and the "Helius-Upton" arc lamps are also shown.

There is a full line of overhead material in different types, carbon brushes, fare registers, trolley catchers, gears and pinions, and a trolley wheel that will make 5,000 miles. An excellent souvenir in the shape of a bronze paper weight was given to friends of the company, and it was so good that the demand exceeded the supply. The exhibit is in charge of Herbert W. Smith, manager of the railroad department, assisted by Mr. William Wampler, Middle States representative, and Mr. T. C. White, manager of the factory.

## THE BRILL CO.

The principal features of the Brill exhibit have been described in detail in the "Daily Review" during the past three days. The com-



pany's space is always filled with a crowd of interested visitors, who find much of interest and value in the new designs of Brill cars and trucks shown this year.

## PROTECTED RAIL BOND CO.

The Protected Rail Bond Co., of Philadelphia, has an elaborate display of a full line of rail bonds in the booth of its general sales agents, the Mayer & Englund Co., and a line of tools for apply-



ing the bonds to the rails, both with hand screw compressors and hydraulic punches, and compressors for applying them to the foot of T-rails and to the tram of girder rails.

Hydraulic tools are in operation to show the method of applying bonds in the same manner as is being done on the Manhattan Elevated Railway with whom the company has a contract for furnishing all the rail bonds. Also there is shown the method of applying the bonds to girder rails in paved streets. About 12 inches square of paving material is removed at the rail joint to allow for the punch with which a hole is punched in the tram of the rail. The bond is then inserted in the holes in the under side of the tram and compressed with the hydraulic compressor. It is claimed that this method of bonding can be done for less than 20 cents per joint, exclusive of the cost of the rail bond itself. This method of bonding has been adopted by the United Traction Co., of Philadelphia, which has installed about 100,000 bonds.

The company is represented by Charles J. Mayer, president; A. H. Englund, treasurer, and Edwin B. Ross, secretary.

## MORRIS EXHIBIT.

The Morris Electric Co. exhibits the following: Morris rail bonds and "Monarch" fare registers, Keystone electric instruments, McGuire trucks and snow sweepers, Hunter illuminated car signs, Partridge carbon brushes, Franklin incandescent lamps, "Globe" electric headlights, American electric track switches, iron poles,



brackets, etc.; "Ideal" and copper trolley wheels, and "Monarch" insulating paint. Mr. Ewing, Mr. Morris and a staff of representatives are on hand.



CONTINUOUS RAIL JOINTS.

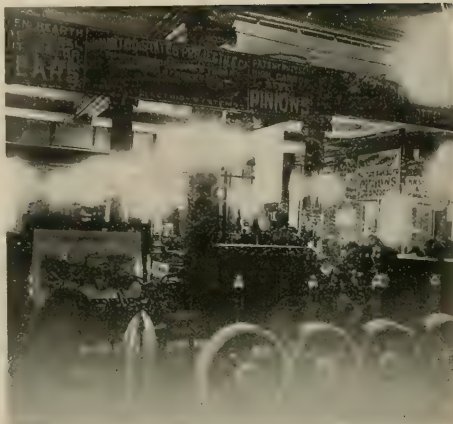
Over 10,000 miles of railroads in the United States are equipped with the products of the Continuous Rail Joint Co. of America, whose exhibit is on the main floor, about in the centre. The continuous rail joint is not a novelty and is in use on about 150 roads. It is claimed for it, among other things, that it is rolled of the best quality steel, fits any section of rail, prevents the rail being battered and makes it as strong at the joint as at the centre; it has but two parts and the surface and alignment are perfect. The company is represented at the convention by General Manager L. F. Braine, H. M. Montgomery, B. G. Braine, J. H. Brothers, W. A. Chapman, J. H. Allen, B. M. Barr and S. P. McGough.

#### THE SPEER CARBON CO.

has the most elaborate exhibit it has ever displayed at a street railway convention. The company is pushing its business, knowing that the material will stand inspection. The progress made by the company in the past year is greater than ever before in a single year. The company is represented by Andrew Kaul, jr., secretary and treasurer, and J. S. Speer, general manager.

#### METAL SALES CO.

The Metal Sales Co., of Cleveland, still finds the demand strong for its new metal for motor bearings, the good points claimed for it being that it reduces friction to a minimum, will not rust out, requires little lubricant and pours without blow holes. Bearings made of this metal will easily last a twelvemonth, it is said, although in constant service. A special mandrel for babbiting armature boxes is another of this company's products that has found favor with the trade. Manager F. R. Marks is here looking after the interests of his company with his usual avidity.



U. S. PROJECTILE CO.

The "U. S. Projectile brand" of pinions and gears exhibited by this company were well worth inspection. The pinions are turned out by a novel process. A billet of 30-carbon steel is used and, after treating to harden it, it is put over a die, through which it is forced in 30 seconds, by hydraulic pressure of over a million pounds. The steel is proportionately hardened by solidifying, it is said, and a continuous grain is obtained. The company's open hearth cast steel cut motor gears are cut so as to produce mechanically correct teeth. The company is represented at the exhibit by Secretary Charles E. Porter, and Messrs. B. Willis Stone and Louis Robert.

#### JOHN STEPHENSON CO.'S CAR.

On Madison avenue, near the main entrance to the Garden, is a long semi-convertible car made by the John Stephenson Co. for service in Utica, N. Y. It is mounted on the Stephenson No. 20 truck, and differs from other semi-convertible cars in that the windows are in two sections and the top windows slide into the roof, while the lower and heavier windows slide into the body of the car. The change can be made very quickly, from open to closed. The car is equipped with "walkover" seats and other improvements. General Manager P. Kling, is in charge of the exhibit, assisted by Sales Agent E. J. Lawson and Messrs. F. H. Munsberg and C. L. Lippincott.





## WESTINGHOUSE ELECTRIC &amp; MFG. CO.

The Westinghouse company has a very large exhibit, occupying nearly half of the general portion of the main floor, and including the following: Various sizes of standard railway motors; Peckham truck, equipped with two No. 49 Westinghouse railway motors; Brill maximum traction truck, equipped with Westinghouse No. 81 railway motor; railway power station switchboard; ammeters and voltmeters, lightning arresters, switches, circuit breakers, fuse boxes car diverter, car diverter column, partly assembled to show construction; gears, gear cases, pinions, axle bearings, etc.



The company also shows the Westinghouse magnetic brake and car heating apparatus, installed on a Brill double-truck closed car. Many visiting street railway men thoroughly inspected the brake, which was mounted on a car traveling over a section of track in the center of the hall. Many of the companies' representatives are assembled here.

## ROBBINS CONVEYING BELT CO.

This exhibit consists of a working model on a scale of 3 in. to the foot, representing two 20-in. patent belt conveyors 100 ft. long. The company is represented at the convention by President Thomas Robins, Jr., Treasurer Pierre Jay, and Chief Engineer C. Kemble Baldwin. The exhibit is in charge of Mr. J. F. Symington.

## UNITED STATES ELECTRIC SIGNAL CO.

This company has on exhibition a complete block system, consisting of two signal boxes and two trolley switches in operation. The exhibit is in the west part of the gallery, and is represented



by J. H. Nickerson and J. J. Ruddick. They state that the signal is becoming very popular among the suburban roads, they having in actual operation at the present time signals on fifty different roads. The company also exhibits a "Henderson" car sign illuminator.

## OHMER CAR REGISTERING CO.

On the principle that it is impossible to get all the virtues on earth for two dollars a day, the Ohmer Car Registering Co. has invented a machine which prints in duplicate the record of the total number of passengers carried on each half trip, the amount and class of fare paid by each, and the conductor who made the collections is charged for the same by his badge number, which is also recorded on the register. The appliance has to be opened by a conductor's key, on which is stamped the number of his badge, and also by a lock key. If this will not prevent any possible dishonesty, the Ohmer Car Registering Co. believes that it will take nothing more or less than a miracle to do so. This mode of registration certainly seems to be a safe method, and any conductor who wishes to work honestly will not find his task onerous. Messrs J. F. Ohmer, William F. Breidenbach, M. Macdonald, Ed. S. Atwood and J. H. Stedman are all on hand to make any necessary explanations.

## MCGUIRE MANUFACTURING CO.

The McGuire Manufacturing Co., of Chicago, has its well-known products which are receiving careful attention from delegates. The McGuire specialties include single and double trucks; the "New Columbia" car heaters; "Royal Flush" fenders; spring guards; and ratchet brake handles. Its No. 39 double truck is used by the Chicago Traction Co. and there are about 10,000 of its fenders now in use, the "Royal Flush" being employed by nearly all the lines in and about Chicago.

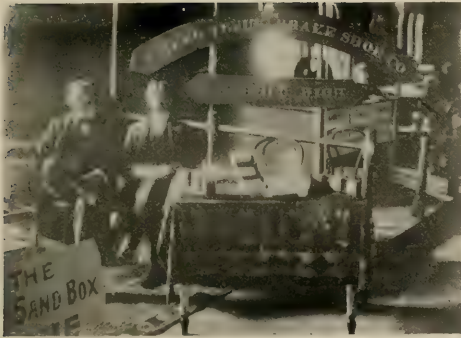


The McGuire company also makes snow sweepers, several of which were adopted by the Metropolitan Street Railway Company, of Kansas City. It has 700 of its trucks, the A-1 suspension "Pittsburg" type, in use in Pittsburg, Pa. Another specialty is a combination snow plow and sweeper, of which over 500 are in use, the St. Louis Transit Co. being one of the roads on which it is running. It can be stripped of brooms and plows in summer and used as an electric locomotive.

The "New Columbia Stove" exploited by the company is a magazine pattern that carries enough fuel for a whole day's run in the coldest weather. It is claimed for it that it adds to the appearance of the most modern car, is more economical than electric heaters by half and is very handsome. The company is well represented at the convention.

Mr. D. S. Roche, of the Scott Spring Co., of Philadelphia, is in attendance. Mr. Roche has attended the conventions for many years and is well known to the street railway trade.

Dallett & Co., Philadelphia, announce to the trade that they have recently taken the selling agency for the Pearson Jack Co. and the Dornier Manufacturing Co., of Logansport, Ind., track scrapers. They are making contracts with other manufacturers, and expect to put in a full line of railway equipment.



STERLING-MEAKER CO.

The specialty of this company's exhibit is the Sterling safety brake, a hand-power brake that has been on the market six years and of which more than 6,000 pairs are in use on all sizes of cars up to 25-ton, double truck cars.

The company also shows the Sterling No. 1 register, chiefly used by the Metropolitan Street Railway Co., of New York; Sterling No. 3, a clock face register; the Sterling double register; and the well-known Meaker register. All the registers were tested adequately during the exhibit, being prominently placed where any and everybody passing in and out could "pull the string."

The Sterling sand box and Sterling fender, or wheel guard, is also exhibited. The company is represented by Mr. J. H. Carson, president; C. S. Ackley, secretary; J. A. Stone, treasurer, and E. F. Wickwire, representative on the road.

#### UNION STOP SIGNAL CO.

General Manager O. W. Hart, of the Union Stop-Signal Co., of Fall River, Mass., personally superintended the company's exhibit and explained the merits of its device to many during the past three days. The system consists of a telephone line and signal wire extending the length of the road, with telephone stations in suitable boxes where easy access can be had. In conjunction with the stations are dispatcher signal boxes, designed to set a signal from the dispatcher's office to call the motorman's attention to the fact that a message is to be given his car and that his conductor is wanted at the telephone. In the dispatcher's office is an instrument that automatically calls stations, sets signals and records the entire operation. Mr. Hart says the company has orders for six months ahead and is now equipping the New Bedford & Onset, Mass., road.

#### CHASE-SHAWMUT CO.

The Chase-Shawmut flexible rail bond comes in for a good deal of notice, and visitors are given a pamphlet containing "A Short Talk on Rail-Bonding," that leaves little to be said on the subject. This bond is formed of a series of flat strips of annealed copper, bent in the form of an arch to ensure the greatest degree of flexibility, with a pair of flat feet to provide a contact surface. The strips of each foot are soldered together, making a solid terminal, while the intermediate strips of the arch are unattached in each other. The feet of the bonds are soldered to the rail securely. Much is claimed for this bond, efficiency, inexpensiveness and simplicity of application being foremost.

Mr. George L. Osborn, manager of the bonding department, has charge of the exhibit and other representatives present are Messrs. Wendell & McDuffee, the New York agents; H. P. Moore, E. M. Hamlin and F. D. Masterson. For souvenirs, the company has distributed paper weights in the shape of bonds of No. 0000 capacity.

#### STREET RAILWAYS AND THE TELEPHONE.

In large cities the nearness of a public telephone to the street railway line precludes the necessity of a system to parallel the track. In suburban districts, however, a telephone at each turnout has become a necessity; or, another method is to have a telephone in each car, which can be connected to a line parallel to the road.

A great drawback to the general adoption of the telephone for such use has been in the unreliability of the transmitters. To avoid this a transmitter has been placed on the market by the Ericsson Telephone Co., of 296 Broadway, New York, which invites inspection of its apparatus.

#### DALLETT & CO.

Dallett & Co., Philadelphia, general railway equipment dealers, make a specialty of second-hand motors, cars, rails, etc. Their exhibit in the Front Annex is in charge of Mr. Charles F. Johnson, who is exhibiting samples of a special lot of second-hand GE 800 and GE 1200 motors which they have ready for delivery.

#### PAIGE IRON WORKS.

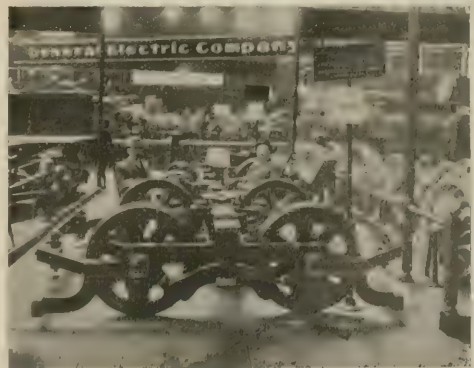
Owing to the failure of the railroad company to deliver the material, the Paige Iron Works, of Chicago, had no exhibit. Desk room was secured in one corner of the annex, however, in conjunction with the Buda Iron Foundry & Mfg. Co., also of Chicago, where friends were gladly welcomed and made happy by the presentation to each of a pocket magnifying glass.

The Paige Co. showed several photographs of elevated tracks, and there is also exhibited a large picture of a hand car with tower for line repairs, designed for use on interurban roads, which the Buda Foundry Co. is working out. Mr. F. A. Ingalls, vice-president of both companies, and Mr. Edgar S. Nethercut, chief engineer of the Paige Co., did the honors.

#### BALTIMORE CAR WHEEL CO.

Two styles of the "Lord Baltimore" trucks are shown by this company, one being a standard short wheel base, center-bearing truck, and the other its standard maximum truck. The company's booth is the third on the left of the left center aisle. President W. S. G. Baker is on hand to greet all friends, and all inquiries are cheerfully answered by Secretary J. Paul Baker.

The Cincinnati, Hamilton & Dayton Traction Co. is in the market for an auto car or any device that will give an independent movement of a passenger car for suburban travel. Address D. G. Edwards, C. H. & D. Traction Co., Cincinnati, Ohio.



## CURTAIN SUPPLY CO.

The Curtain Supply Co., of Chicago, is showing a varied assortment of curtains on open and closed car frames. It has a commodious booth on the right balcony, where the representatives, General Manager W. H. Forsyth and Sales Agent A. L. Whipple, are pleased to receive customers, as well as those who are not customers.

## PEARSON JACK CO.

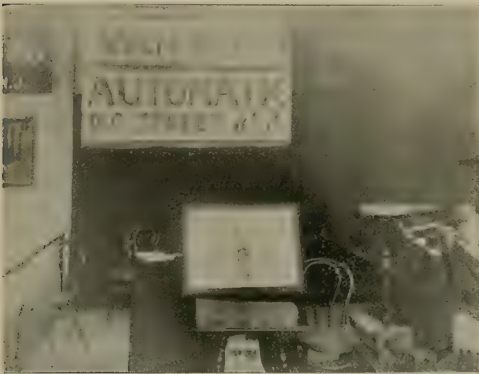
This company is showing for the first time in a street railway convention a Mogul spike and bolt puller. It is the invention of a practical railroad blacksmith after twenty years' experience, and seems to have all the elements of success. A Pearson ratchet pulling jack is also included in the exhibit. This is a popular device for car houses, and is used also by bridge builders, iron workers, etc. Mr. A. H. Richardson, the president and general manager, is looking after the interests of the company, assisted by William W. Borman, M. S. Friede and J. E. Wooster.

## NATIONAL LEAD CO.

The National Lead Co. is laying great stress on its souvenirs, which take the form of a handsome medal. Messrs. J. R. Boyd and R. L. Weithers look after the interests of the company.

## W. T. VAN DORN CO.

It is hardly necessary to dilate at length on the Van Dorn Automatic Coupling. It has been on the market for nearly a decade, and has been adopted on all the elevated roads of the country. The company has now thirteen distinct patterns of different sizes, with which it is enabled to meet the requirements of any and all of its



customers. Mr. W. T. Van Dorn represents the company in person.

## STERLING VARNISH CO.

The Sterling Varnish Co., of Pittsburgh, Pa., and Birmingham, England, shows some curiosities in the shape of clear varnish sheets. These display much strength and durability. The company also exhibits insulating varnish of all kinds and insulated linens and papers. The company is represented by Mr. H. Lee Bragg, general salesman, and S. C. Schenck, general Eastern salesman.

## MERRITT AIR BRAKE CO.

The exhibit of this company is located in the north gallery, where delegates find in operation an independent motor-driven air brake equipment for street car use. The special feature to which attention is called is the automatic controller and graduating engineer's valve.

## F. H. NEWCOMB.

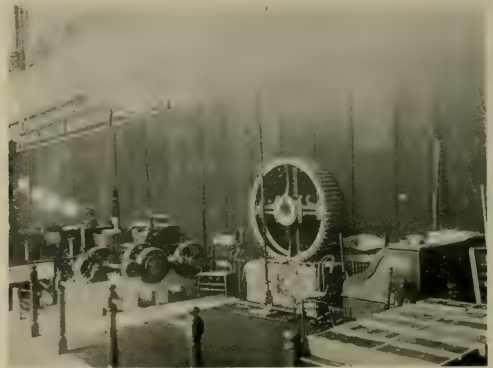
Mr. Newcomb's specialty is uniform caps of every description. Conductors, policemen, expressmen, messenger boys, railroad men, can all be supplied in any quantity and style. Numerous testimonials eulogize the quality, frame and workmanship of these caps, and additional information is furnished by Mr. F. H. Newcomb himself, who is assisted by Mr. E. P. Martin, Jr. A word must be said about the valuable souvenir donated, which is a lizard-skin pocketbook.

## BRIDGEPORT BRASS CO.

Mr. H. D. Madden, who represents this company, reports business as excellent. The company makes the following statement: "Phono-Electric" wire is taking the place of silicon, phosphor and other bronzes, and for strength, endurance and durability is superior to all other wires. Tests have been made, which prove conclusively the valuable qualities of this wire, and it seems as if the problem of getting a sound, reliable wire of uniform and persistent tensile strength, has at last been solved." Mr. Madden is kept busy receiving calls, and giving all needful explanations, in addition to recording numerous orders.

## DE WITT SAND BOX CO.

President E. F. De Witt personally demonstrates the good points of his company's specialty, aided by Mr. Charles Parks, the maker of the sand box. It is claimed for it that if stones should get into the box with the sand they would readily pass through without locking the box. To prove this Mr. De Witt uses large gravel, instead of sand, in his exhibitions, in order to give the box a very severe test.



## THE ORIGINAL ALBANY GREASE.

In a corner at the far end of the main floor the Adam Cook's Sons, of New York, show, neatly piled upon a table, sample cans of "Albany" grease and an electric motor grease, for which is claimed much merit. Adam Cook's Sons were the first makers of the "Albany" product. The company representatives in attendance are J. B. Merritt, J. Hernandez and O. J. Squire.

## GLOBE ELECTRIC MANUFACTURING CO.

This company is displaying its multiplex reflector, which has two adjustments; one giving rays forming a bright beam of great intensity, which penetrates to a far distance, while the other set of rays has a much larger field, of less intensity. The company is represented by Mr. George C. Ewing, its president.



## FRIDAY'S REGISTRATION.

## DELEGATES.

Baltimore, Md. United Railway & Elec. Co. R. H. Staub, Jr.  
 Bridgeport, Conn.—J. B. Richardson, Robert A. M. Cullough, Chas. F. Heath, A. L. Mason, Camden, Gloucester & Woodbury Ry. Co.,  
 Cleveland, Ohio—R. L. Andrews, F. H. Kirkham, Cleveland & Easton Ry. Co.  
 Montreal, Canada W. G. Ross, Montreal St. Ry. Co.  
 Maynard, Mass.—W. R. Dame, Concord, Maynard & Hudson Ry. Co.  
 New Orleans, La.—H. A. Davis, Charles J. Hardy, New Orleans & Carrollton R. R. Co.  
 Oil City, Pa.—John R. Fobes, Venango Power & Traction Co.  
 Philadelphia, Pa.—W. S. Twining, Walter Ellis, T. H. Lincoln, Union Trac. Co.  
 Portchester, New York—L. R. France, W. M. Hoyt, A. L. Bell, R. L. Miller, New York & Stamford Ry. Co.  
 Pottsville, Pa.—Clarence P. King, Pottsville Union Trac. Co.  
 Rochester, New York—W. B. Farnham, Rochester Railway Co.  
 Toronto, Canada—E. McKenzie, W. H. Moore, Toronto Railway Co.  
 Westwood, Mass.—Jno. A. Duggan, F. S. Gore, Norfolk Western St. Ry.  
 Wheeling, W. Va.—Paul O. Reyman, Wheeling & Elm Grove R. R. Co.  
 York, Pa.—H. Laudis, Geo. P. Frusecr, York St. Ry. Co.

## MISCELLANEOUS.

Abbeypood, Arthur E., D. S. & M. Ry, Springfield, Ohio.  
 Abbott, H. B., Street Ry. Journal, Chicago.  
 Alden, Charles A., Penna. Steel Co., Steelton, Pa.  
 Andrews, William C., Street Railway Journal, New York.  
 Babiste, C. A., Street Ry. Journal, New York.  
 Bacon, A. L., Electric Sand Box, Franklin, Mass.  
 Baird, M. E., Milwaukee Electric Co., New York.  
 Batcher, General Electric Co.  
 Barry, J. A., T. L. & P. R. R., Trenton, N. J.  
 Bates, F. H., Buffalo, H. & A. Ry. Co.  
 Beard, W. K., Street Railway Journal.  
 Bennesschmidt, W., Arthur Koppel.  
 Birch, E. S., J. C. H. & P. R. R., St. Ry.  
 Berry, R. N., Street Railway Journal, New York.  
 Blake, Henry W., Street Railway Journal, New York.  
 Blank, J. P., Rep. Arthur Koppel.  
 Broughton, A. C., Elect. World & Engineer.  
 Bodler, F. F., J. C. H. & P. R. St. Ry. Co.  
 Boyd, J. Robert, National Lead Co.  
 Brew, William P., Ball Engine Co., New York.  
 Brodie, Wm. H., Kinnear Mfg. Co., New York.  
 Brown, M. H., Street Rail Bldg., New York.  
 Brown, P. Wesley, Railroad Snikes, New York.  
 Buckminster, Geo. H., Pettigell Andrews Co., Boston.  
 Bushnell, W. G., General Electric Co., New Haven.  
 Bittenheim, Harold S., Street Railway Journal, New York.  
 Bradley, T. E., Cleveland Sash Co., Hempstead.  
 Brown, Jacksonville St. Ry. Co.  
 Cadmy, J. H., Crane Co., New York.  
 Calender, W. D., The National Provisioner, New York.  
 Candoff, F. R., Sprague Electric Co.  
 Carroll, C. B., Sprague Electric Co.  
 Chadbourne, Benj., F. R. R. Commission Maine.  
 Chambers, Elmer E., The National Engineer.  
 Chapman, Alfred E., Jer. City, Hob. & Pat. St. Ry. Co.  
 Cho, W. N., W. H. Co. Mfg. Co., Providence.  
 Connell, J. N. H., Eng. & Contractors, New York.  
 Cole, C. H., J. C. H. & P. R. R. Co., Paterson, N. J.  
 Condit, R. D., Crane Co., New York.  
 Cook, W. N., Elmira W. I. R. R. Co., Elmira, N. Y.  
 Colman, J. B., Sterling Meeker Co., New York.  
 Croaman, J. Heron, Hunter Illuminating Sign Co., New York.  
 Grandall, Bruce V., Railway Master Mechanic, Chicago.  
 Goss, J. W., Anglo-American Magazine, New York.  
 Dale, John A., The Tide Company.  
 Darling, Geo. B., Trolley Wheel, New York.  
 Darlington, F. W., Darlington Elec. Fountain & Supply Co.  
 Davis, Quindler, Dear, Dear & Ferris.  
 Davies, Henry J., National Carbon Co., Cleveland.  
 Davis, J. A., Penna. Steel Co., Steelton, Pa.  
 Davis, W. J., General Electric Co., Schenectady.  
 Dean, N. C., Lappin Brake Shoe Co., Bloomfield, N. Y.  
 Deere, Wm. C., South Shore Ry. Co., New York.  
 Deere, Wm. C., South Shore Ry. Co., New York.  
 Downs, Wm., Green Fuel Economiser Co., New York.  
 Doyle, W. L., Roadbuilding Sons Co., Trenton, N. J.  
 Dwyer, E. S., Electrical Review.

Duncan, W. S., N. J. St. Ry. Co.  
 Dunn, Mrs. Chas., N. J. St. Ry. Co.  
 Edwards, J. D., Dallett & Co., Washington, D. C.  
 Electrical Review, New York.  
 Ellis, Frank H., Barbour Stockwell Co., Cambridge, Mass.  
 Emery, John J., Vice-Pres. D. & M. Ry.  
 Farmer, John L., Green Fuel Co., New York.  
 Forsyth, C. H., Am. Mason Safety Iron Co., Boston.  
 Garsman, H. J., Wheels.  
 Garton, W. R., The W. R. Garton Co., Chicago.  
 Gaudet, E. F., E. P. Gleason Mfg. Co., New York.  
 Gouzenbert, E., Cleveland Construction Co., Hempstead, L. I.  
 Gilpin, V. C., Elec. Supply Dealers' Assn., New York.  
 Giles, Wm. C., Newark & Hackensack T. Co.  
 Glostein, Harry, American Elec. Co., New York.  
 Goulding, Frank C., St. Ry. Journal, New York.  
 Griffin, G. A., Griffin Wheel Co., Chicago.  
 Griffin, T. F., Griffin Wheel Co., Chicago.  
 Gulesian, M. H., Acme Track Sledge, Boston.  
 Gunning, J. H., Sawyer Mann, Inc., New York.  
 Hannier, E. W., Gen. Elec. Co., New York.  
 Hedley, A. R., W. R. R. Ry., Chicago.  
 Hall, L. L., W. R. R. Ry., Chicago.  
 Hall, C. M., Pittsburgh Reduction Co., Niagara Falls.  
 Hammond, L. P., Crocker Wheeler Co., Amper, N. J.  
 Harding, C. K., Chicago.  
 Hawkins, J. H., J. Mfg. Co.  
 Hewitt, H. H., Maguire Metal Co., Buffalo.  
 Hill, G. H., Sprague Electric Co., New York.  
 Holmes, Jr., S. W., Dept. Docks & Ferries.  
 Holmes, Percy, Webster, Chicago.  
 Holmes, George, U. C. R. R., Detroit.  
 Iovara, M. E., Malone, N. Y.  
 Hoyt, Nath. Lock Washer Co.  
 Hurd, W. H., Standard Traction Brake Co., Boston.  
 Ivins, D. Foster, Roadbuilding Sons Co., Trenton, N. J.  
 James, M. C., J. C. H. & P. R. Ry., Jersey City.  
 Jenkins, J. C., Ohio Brass Co., New York.  
 Jennings, P. S., Hildreth Varnish Co., New York.  
 Johnson, W. R., Lexington & Boston St. Ry. Co.  
 Jenkins, T. M., St. Louis & Suburban Ry. Co.  
 Kennedy, John M., The Crescent Eng. Co., Cincinnati.  
 Kinsman, Joseph H., Bridgeport Brass Co., New York.  
 Kleinschmidt, H. F. A., Lorain Steel Co.  
 Knowlton, Howard S., Stone & Webster, Boston.  
 Knox, F. W., Rockford, Ry. L. & P. Co.  
 Kyle, E. F., Cam. Ry. & L. Co.  
 Lane, Nat. P., Parrott & Co., Bridgeport, Conn.  
 Lane, J. W., J. H. Lane & Co., New York.  
 Lehman, Jos. H., Harrison Bros. & Co., New York.  
 Little, R. B., J. J. Brill Co.  
 Libby, E. H., Sprague Elec. Co., New York.  
 Land-dale, C. H., St. Louis Suburban Ry. Co.  
 Lindner, Chas. T., Tuolumne Power & Development Co.  
 Long, S. C., Supt. Bedford Div. P. R. R.  
 Littlefield, Walter D., Gen. Elec. Co., Schenectady.  
 Ludwig, Joseph, Dayton Mfg. Co.  
 Lyall, Willard R., Gen. Elec. Co., Boston.  
 Lowthian, J. J., Gen. Elec. Co. (Foreign Dept.), Schenectady.  
 McCarthy, J. P., Western Electric Co., Philadelphia.  
 McCarthy, J. A., Asst. Auditor J. C. H. & P. St. Ry. Co.  
 McCarthy, W. B., America Electric Fuse Co., New York.  
 McNeil, Albert E., Gen. Mgr. Exeter Hampton & A. St. Ry. Co., Exeter, N. H.  
 McDonald, Henry M., New York & Mfg. Co.  
 McGraw, James H., Pres. Street Ry. Journal, New York.  
 McGraw, Louis W., Street Ry. Journal, New York.  
 McTigue, Henry, Buffalo, Niagara Falls & Rochester R. R. Co.  
 Martin, T. C., Editor Electrical World & Engineer, New York.  
 Martin, Robert Stuart Rowland Co.  
 Matthe, A. M., Chief Engineer Westinghouse Elec. & Mfg. Co., Pittsburgh.  
 Maxwell, T. C., New York Foundry & Machinery Co.  
 Meeker, W. C., Allston Foundry Co., Jersey City.  
 Meeker, F. G., Barbour Stockwell Co., Jersey City.  
 Meyers, Frank, St. Ry. Journal, New York.  
 Miller, J. D., of J. D. Miller & Co.  
 Miller, L. J., Goss, McLean Co., New York.  
 Morgan, Geoffrey, Gen'l. Manager The Niagara George R. R. Co.  
 Morris, Stephen, Secy. Merritt & Co., Philadelphia.  
 Mortimer, H. C., Jr., Crocker-Wheeler Co., Amper, N. J.  
 Mustie, A. H., Bullock Elec. Mfg. Co.  
 Mumford, J. H., Hildreth Varnish Co., New York.  
 National Lock Washer Co., Newark.  
 Neff, Elmer H., Brown & Sharpe Mfg. Co., New York.  
 Newcomer, J. W., Ohio Construction Co., Cleveland.

New York Switch & Crossing Co., Hoboken, N. J.  
 O'Neill, James, N. J. St. Ry. Co.  
 Old, A. F., Hale & Kilburn Mfg. Co., New York.  
 Page, A. D., Gen. Electric Co., Harrison, N. J.  
 Parker, J. A., Diamond State Steel Co., Wilmington, Del., New York.  
 Pennell, E. W., American Car & L. Co., New York.  
 Phillips, Howard, Crocker-Wheeler Co., Amper, N. J.  
 Plummer, W. B., Met. St. Ry.  
 Poole, Cecil P., Amercan Electrician, New York.  
 Probasco, Wallace M., Asst. to Manager, The Westinghouse Companies Publishing Dept., Pittsburgh.  
 Pulver, G. W., Westinghouse Electric & Mfg. Co., Syracuse.  
 Quantin, D. Scott, Darlington Elec. Fountain & Supply Co.  
 Rawley, E. P., J. G. Brill Co., Philadelphia.  
 Respass, R. B., St. Ry. Journal, New York.  
 Reyman, Paul O., Wheeling & Elm Grove R. R. Co.  
 Richards, Frank, Associate Editor American Machinist, New York.  
 Risley, Lincoln S., Con. Railway & Lighting Co., New Britain, Conn.  
 Ries, Elias E., The Ries Electric Ry. System, New York.  
 Schumacher, A., Arthur Koppel.  
 Siebach, Chas., Sterling Meeker Co., New York.  
 Seelye, Jr., W. E., U. S. Projectile Co., New York.  
 Shipman, C. M., North Jersey St. Ry. Co., Newark.  
 Shoemaker, Mrs. David Louis.  
 Shottick, David, Brooklyn Rapid Transit.  
 Smith, E. L., M. H. Gulesian Co., Boston.  
 Smith, Francis B., Bullock Elect. Mfg. Co. of Cincinnati, St. Louis.  
 Spier, Chas. L., Atlantic Coast Electric Ry. Co., Asbury Park, N. J.  
 Spear, Wm. C., Fowler & Roberts Co., New York.  
 Stivers, S. C., Auditor Jersey City H. & P. Ry. Co., New Jersey.  
 Strickland, A. H., Supt. Rochester Car Wheel Wks., New York.  
 Stromeyer, J., Crescent Brake Shoe Co., Philadelphia.  
 Strauss, G. W., R. Ry. Supply Co.  
 Swetion, J., Franklin, Sig. & Sigler Co., Cleveland, O., New York.  
 Symington, John F., Robins Conveying Bell Co., New York.  
 Thornton, J. S., The People's Tramway Co., Putnam, Conn.  
 Tingles, M. G., John A. Roebling's Sons Co., Trenton, N. J.  
 Thomas, C. K., American Electrician, Chicago.  
 Thomas, W. H., The Ind. Sig. & Troy Co., Springfield, Ohio.  
 Thompson, Camden G. & W. R. Way.  
 Thayer, Rooney, Secy. Thayer & Co., New York.  
 Tillotson, J. K., Winnabago Traction Co., Oshkosh, Wis.  
 Trip, J. E., Camden & Suburban Ry. Co.  
 Tucker, John B., Crosstown Dept. R. R. T.  
 Turner, J. S., Lappin Brake Shoe Co., Brooklyn.  
 Underwood, C. W., Westinghouse Elec. & Mfg. Co., Buffalo.  
 Unson, M. L., Buffalo, East Ottawa & Catt. Ry., Buffalo.  
 Van Arsdale, R. M., American Engineer & R. R. Journal, New York.  
 Van Winkle, H., Am. Electrician, New York.  
 Vogt, Lawrence, Peckham Truck Co., Kingston, N. Y.  
 Wainwright, A. V., Conn. I. & P. Co.  
 Wakeman, J. M., Pres. Electrical World & Engineer, New York.  
 Warner, R. L., Mer. Boston office Westinghouse Elec. & Mfg. Co., Boston.  
 Watson, Benj., New York.  
 Watson, Edward Y., The Watson Ry. Joint Mfg. Co., New York.  
 Watson, K., Green Fuel Economiser, New York.  
 Watson, Thos., Toronto Ry. Co.  
 Wendell, Jr., Jacob, Wendell & MacDuffie, New York.  
 Westinghouse, Church Ken. & Co.  
 Wheeler, S. Bowman, Ridgway Dynamo & Engine Co., Philadelphia.  
 Wering, F. A., Cook Spring Co., New York.  
 Witherby, J. B., White Ivoroid Euchre Counters, New York.  
 Wise, Wm. F., Camden & S. Ry.  
 Weiss, O. M., Macartyne, McElroy & Co.  
 Wise, F. W., Auto Electric Street Co., West New Brighton, N. Y.  
 Wight, Arthur M., Ham Sand Box Co., Troy, N. Y.  
 Wood, Ralph K., National Lead Co., New York.  
 Woodson, Geo. L., C. H. Brown & Co., New York.  
 Whittlesy, Curtis E., Trans. St. Ry. Journal, New York.  
 Warfinger, B. F., Crane & Co., New York.  
 Weaver, W. D., Editor Elec. World & Engineer, New York.  
 Wheelock, C. W., Olmser Car Restorer Co., New York.  
 Wines, Elmer, with Arthur Koppel.  
 Wood, E. F., American Electrician, New York.  
 Wolcott, T. H., with C. E. Atkins, New York.

"YOU CANNOT ALWAYS, SOMETIMES TELL."

I did not see No. 89 for a few nights, and when I did he gave me an anticipatory grin and, as soon as he got a chance, he said:

"Didn't get a chance to smoke that see-gar you give me."

"How was that?"

"That motorman of mine pinched it out of my coat while I was a-makin' out my report, an' he smoked it goin' home, an' all the time I thought it was safe in my pocket. If he ain't too weak when he gets his run again I'm goin' to learn him to let my pockets alone!"

"Has he been sick?"

"Yes; was taken ill that night; doctor says he had symptoms of some kind of foreign language poisonin'"——

"Ptomaine?"

"Yes. Sounds like it; anyway his wife feels very bad about it, 'cause he's jealous of her an' suspicious, like!"

I had only one cigar in my pocket, a really fine one that I had been saving to go with my slippers after dinner, but I felt that reparation "was up to me," and so I meekly offered it on the altar of the motorman, and No. 89 accepted it, smelled it, fingered it, and remarked:

"Taint as purty as the other one, but you can't always go by looks," and there was a dry twinkle in his eye, as he tucked it carefully away in his vest-pocket that made me wonder if I had not been a little mistaken in his "binding."

"No, it don't pay to take looks as a guide all the time. I found that out once after I began to run as reg'lar. You see, it all came about through my driver, Bill Hendricks. The road had just changed hands an' there was a lot of new officers an' one day an' ol' fellow in common-looking clothes gets on the front platform an' stands there. Now, there was a rule agin that, but we never enforced it unless there was some of the officers around, but that morning Bill felt sort o' grumpy, and somethin' about the way the old duck stood there set him on edge an' he up an' says, says he: 'You'll have to go inside!' The ol' fellow sort o' grinned and says, 'Oh, I guess not!' says he, an' that made Bill mad, so he says, 'You go inside or you get off,' says he, just that way.

"Well, the ol' fellow smiled some more an' says he, cheerful like, 'I guess I won't do either!' an' Bill looks at him ugly an' says, 'Why won't you?' an' the old boy answers, just as chipper as you please.

"'Because I'm the president of this road and I wish to ride here!' an' he says it in such a way that Bill knowed it was so, but he was an obstinate cuss an' didn't never like to back down, so he says, 'I don't 'now nothin' about your bein' president, an' it wouldn't make no difference if I did! My orders is not to let nobody ride on this platform 'cept it's an employe, an' you gotter go inside or get off, one!' An' with that he slowed up the team an' put on his brake an' the old gent looks at him an' seen he was in earnest so he looked at his number an' the number of the car, an' off he hops.

"Well, Bill calls me front an' tells me about it an' I says, says I, 'Well, you're in for a lay-off if nothin' else,' and sure enough, when we got back to the barn, Tom McGregor, the foreman, came out an' says he to Bill, 'Hendricks, you're wanted at the office!' an' Bill went in to get his medicine. Well, he walks into the office, an' there sat the same ol' fellow, an' he ups an' says to Bill, says he, 'You're the man that was goin' to put me off the car this mornin' for violatin' the rules, aren't you?'"

"An' Bill allowed he was. 'Well,' says the old fellow, 'What you got to say about it?'"

"Bill, he didn't have nothin' to say, because it struck him about that time that he'd made a dum fool of hisself, so the ol' fellow went on. 'Well, my man, as you don't seem to have anything to say, I'll say something,' an' then Bill felt that it was a month sure, 'I'm glad to see,' the ol' gent says, 'that there's one man in our employ as values his duty more than his position an' here's five dollars to show it, an' the first chance that comes for a promotion you shall have a chance at it!' he says. 'Now, take your car, sir!'"

"Well, first off, Bill thought that he was guyn' him, but the fiver was there in his hand sure 'nough an' so he answered back somethin'—didn't know fairly what he did say—an' came out on his trip an' goin' along he told me about it. Well, for some time after that the way them rules was read up an' observed was a caution—especially if there was strangers aboard—but it couldn't last long,

wasn't nat'ral to us—an' we'd about got back into the old running when one day Bill says to me, says he, 'I guess some o' the boys 'll have a chance to make a fiver soon!'"

"Says I, 'Why so?' 'Well,' he says, 'we're goin' to have a new superintendent soon an' from what I heard it's agoin' to be old Johnny's son,' (You see we'd named the new president,—Bill's friend—'Old Johnny.') an' they say he's a mighty fresh youngster an' like as not, he'll be playin' the same game as his father did!'"

"Does he know anythin' about railroadin'?" says I."

"Not a mite," says Bill, 'from what the ol' man tells me this mornin' he's comin' here to get what he calls "practical experience" an' I guess the boys will give him a little an' make no charge for doin' it!' says he."

"What's he been doin' before this?" says I."

"'Playin' baseball an' rowin' boats at some college,' says Bill with a grin. 'Puttin' on muscle to knock you out when he catches you knockin' down,' says he.

"Have you seen him?" says I."

"Yes, I seen him this mornin' with ol' Johnny,' says he, 'an' he's young—very young,' says he, just that way.

"Well, that talk set me thinkin' an' I made a prop'sition to Bill the next day an' at first he wouldn't hear to it, but after some more talk he come 'round an' you'll hear pretty soon what my prop'sition was, for it was only the next day that Bill gave me five bells, as we'd agreed on, an' I went front an' give him my punch an' trip-slips an' some change an' tickets, an' I took the lines while he went back an' conducted. Well, sir, as we passed the next corner who should sling hisself aboard the front platform but the young man, just as Bill and me had planned. He didn't say nothin' an' I let him stand there a minute an' then I ups an' says, says I,

"'You'll have to go inside, sir, 'gainst the rules for passengers to ride on this platform,' just that way.

"'Well,' says he, 'that don't count in my case,' he says, 'I'm your new superintendent,' he says."

"'Well, says I, kind o' respectful like, 'that may all be but I don't know it,' I says, 'all that I got to do is to 'bey orders, an' my orders is not to let no one but employes ride here!' says I.

"He seemed sort o' impressed by that, but he didn't make no motion to go inside. Instead o' that he stands there an' he say, says he, 'Well, I'm an employe, an' I got a right to stand out here!' Well, that wasn't accordin' to program, but as I'd made the bluff I had to follow it up, so I says, 'Well,' says I, 'there's on'y one thing for me to do, either you go inside or get off this car or else I'll have to put you off, an' I'll be sorry to have to do that, but orders is orders,' says I, 'an' as long as I takes the company's money I'm goin' to obey the company's orders!'"

"You see, I'd been practicin' on that speech all day, an' it came out quite slick but it didn't appear to faze him one bit, for he ups an' says, says he, 'Now don't you be a fool, my man! I've told you who I am an' I'm goin' to ride out here an' learn things, so you'd better make up your mind to that fact!'"

"Well, sir, that sort of knocked me out, I had not counted on his takin' that sort of a stand, but I knew that Bill was watchin' the procedin's an' I seen I had to go through with it, so I says to the boy, says I, 'Well, Mister,' says I, 'you may be all that you say an' you may not, but I ain't had any orders about you an' if you will stand out here I guess I'll have to put you off,' an' with that I pulled up the team an' put on the brake an' turns round to him—an' next minute I found myself on my back in the street, and the next thing I knowed I was picked up an' shook an' set back on the platform an' the young fellow gets on with me an' puts my cap on my head an' says—just as quiet as if he hadn't moved a hand—says he, 'Now, my friend,' he says, 'you've done your duty as you see it an' made your protest an' now,' says he, 'suppose you be movin' or else you'll likely get behind your schedule!' just that way.

"Well, I knowed that it wasn't any use talkin', I seed that he was more than my match all ways an' it come over me pretty sudden that I'd made a mess o' things, so I takes up the lines, slacks off the brake an' starts her an' the young fellow he went on talking just as if nothin' hadn't happened. Says he, 'I hear that the Dad' (that's what he calls his father), 'I hear that the Dad gave you five dollars for obeyin' orders,' he says; 'well he says, 'I'm goin' to be more liberal than he was, for I'm goin' to give you ten—DAYS—not for obeyin' orders, but for disobeyin' them, for exchangin' badges





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VOL. XI. OCTOBER 15, 1901. NO. 10

This year for the third time the "Street Railway Review" published a Daily Edition for the purpose of reporting the annual conventions of the American Street Railway Association and the Street Railway Accountants' Association and thus enabled all those interested in the proceedings and unable to attend, to secure full reports of the meetings long in advance of the time that they could otherwise be obtained. As at Chicago in 1899, and at Kansas City last year, the "Daily" was an unqualified success at New York, and it would be difficult to imagine any stronger evidences of appreciation than were shown by those in attendance at the conventions. The "Daily" was eagerly looked for and closely read each morning that it appeared.

The publishers of the "Review" feel that they have reason to be proud of the results achieved, for it was no light task to remove to a strange city, a thousand miles from home, and there issue on four consecutive days papers which in the aggregate had almost twice the number of pages of reading matter that appears in our regular monthly number. The four "Daily Reviews" published in New York contained 124 reader pages. The increase in the number of advertising pages as compared with the previous issues of the "Daily" indicates that the value of the "Daily" as an advertising medium was better appreciated than ever before.

Heretofore the convention papers and discussions published in the "Daily" have been reprinted in the next succeeding monthly issue of the "Review." This seemed hardly fair to our readers, and this year the pages of the four daily issues are numbered in sequence with the monthly issues so that they may be incorporated with the latter when the volume is bound.

So much for the past—for the future we promise to be at Detroit in 1902.

The New York convention of the American Street Railway Association which has just come to a close has been generally pronounced the most successful meeting which the Association ever held. A great part of this success was due to the very large attend-

ance, the registrations aggregating over 1,700, including delegates and supply men. The very large display of exhibits was also a notable feature of this convention. The enormous floor space of Madison Square Garden, including the large hall in the front usually devoted to restaurant purposes, was filled with excellent exhibits of electrical street railway apparatus and the large outlay of money which was required to install exhibits of this character shows the great importance which is attached to the supply men's share at the conventions, especially when it is considered that the exhibition exists for only three days. The character of the papers read was excellent and it is to be noted that these papers grow more and more technical each year with the advance in engineering problems connected with street railways. It is highly complimentary to the versatility of the members of this association that many of the papers of a high technical order are prepared by men who have grown up in the ranks of the railway officials from the time of the ancient horse car. Another thing in connection with the papers which is to be noted is their advance distribution among the members so that at the time of the convention they were generally read by title only, leaving ample time for their discussion, which in many cases brought out a great deal of valuable information. The association is to be congratulated upon the high rank it has acquired as a technical as well as a business organization.

The fifth regular annual meeting of the Accountants' Association was in no way behind the previous conventions of the association. The program was an interesting one and all the papers and reports elicited lively discussion. The papers of Mr. J. M. Smith on keeping car-mileage, of Col. T. S. Williams on capital accounts, of Mr. S. E. Moore on consumers accounts for lighting and power companies, and of Mr. E. M. White on conductors' accounts, were all upon special subjects which nearly every member of the association has to consider and in consequence nearly all the delegates had something to offer in discussion on one or more of these subjects. At the instance of the Accountants' Association our reports of these discussions are confined to abstracts only; the verbatim report will be published by the association and furnished to members only.

The brevity of the reports of the two standing committees on standards are an excellent indication that the association has practically accomplished the tasks attempted in regard to providing a standard system of accounts and a standard unit of comparison. The next standard, that of accounts for electric light companies, that will engage the attention of the association was introduced by Mr. G. E. Tripp, who presented a report made at the last session of the National Electric Light Association.

The relations of the street railway company to the public in the matter of taxation, legislation, conditions of franchises, etc. were discussed in a paper by Mr. C. S. Sergeant, who advanced one proposition which seems eminently desirable. This is that legislation should be enacted in regard to street railways which is substantially uniform in its character throughout all of the states of the Union, and such legislation should also be reasonably permanent and definite so as to establish relations between street railway companies and municipal and state government on an equitable basis. The desirability of such uniform legislation can hardly be questioned and it would help in a great measure to establish street railways as desirable investment properties. Banking interests would be spared careful consideration of the special conditions in some small town before making loans and it would also result in lowering the rate of interest upon money invested in railway properties.

In regard to the question of municipal ownership the author argues with reason that the street railways in this country at least have long since outgrown municipal boundaries in the sense of one company being confined to one municipality, and the extent of these roads is now an important factor in preventing their acquisition by a municipality. Further than this a large number of the roads are also outgrowing state boundaries.

It is also pointed out that the rate of interest which has been earned upon money invested by municipalities in Great Britain for street railways has been extremely small and the facilities afforded the public have been decidedly inferior to those



found in this country. The policy of laying as little restriction as needed upon street railways, which has been generally in vogue in this country, has led to a number of important benefits such as the development of real estate and increase of taxable property, while under the restrictive policy of Great Britain the development of the street railways has been far short of that found in this country. For this reason it seems a mistake on the part of our legislatures and municipalities to make restrictions or levy taxes calculated to reduce the profits of tramway operation to an extent which must necessarily restrain future development and extension of the railways.

The relations between interurban and city street railways as presented by Mr. McCormack elicited considerable discussion and brought out a number of facts which show that there are many problems in regard to running suburban cars over city lines. The financial side of this question, that is, the division of the receipts between the urban and the suburban lines is a matter that is easily arranged and no trouble is usually found in agreeing upon an equitable basis of division of the fares between the two companies; but when it comes to mechanical considerations the problems are numerous and complicated.

In considering this subject two rather distinct classes of interurban roads are recognized, one class being in the nature of extensions of city lines to neighboring places and the other the independent suburban line running between the city limits of the places which they connect. The former class of interurbans usually operate with the city cars at the usual city speed of 10 or 12 miles an hour, while the latter class use very heavy cars running at high speeds and their equipments throughout approach the M. C. B. standards. It is with the latter class of interurbans that grave difficulties arise when it is attempted to extend the service of the heavy cars into the city.

Among these difficulties may be mentioned the excessive wear on the tracks of city lines by suburban car wheels with deep flanges. This is particularly noticeable on the special work at crossings, switches, etc., which is rapidly worn out by the heavy cars. Another point is the space between tracks. In many instances the double tracks are so close together that large double truck interurban cars will barely pass each other on straight lines of track and cannot possibly pass each other on curves. The motor equipments of the heavy cars also becomes a troublesome problem on account of the high speed for which the cars are geared. In many cases the speed on interurban lines attains to the neighborhood of 50 miles an hour between stops and when entering the city lines this speed must of course be reduced to about 10 or 12 miles. This means a very inefficient arrangement as far as current consumption is concerned.

There seems to be in cases of high speed interurban lines only two alternatives when they are to enter the city. One is to change the track and special work of the city lines over which they operate so as to conform to their own requirements and the other is to enter the city over their own right of way as, for example, on elevated or underground tracks terminating at a central point in the city. There is of course the method of running as far as the city limits and transferring at that point to a city car, but this is not so satisfactory to passengers as it is to make a through trip, and there is always danger of exasperating delays due to poor connections at the transfer point. Many passengers will prefer a steam road service to the chances of a long delay in transferring, and one of the best advertisements of the interurban is that it carries passengers to a central destination in the city without change of cars.

In connection with this subject it is interesting to notice that the uses of the T-rail is gradually making its way into cities of considerable size, and where this style of track is allowed its use is very advantageous to the railway companies on account of the ample flange room it presents for the wheels of heavy cars. Among the larger cities where this style of track has been introduced may be mentioned Brooklyn, N. Y., Sandusky, O., and New Haven, Conn. With proper paving it has been found entirely suitable for paved streets and it has the advantage of being entirely unsuitable for the use of wagons so that the obstruction of street car lines due to wagon traffic is greatly reduced thus enabling the cars to make much better speed.

The question of bonding and of the character of the return circuit on electric railways is always a live one to street railway men and it is noticeable that opinions as to the proper method of constructing the return circuit are generally as numerous as the parties to the discussion. Mr. Connette's paper on the "Best Manner of Conducting the Return Current to the Power House" reviewed a number of the frequent bond troubles common to the early roads and from which the more modern roads are by no means exempt. The writer advocates a complete unbroken metallic return to which each rail is connected, this connection to the rail being made watertight to avoid the danger of electrolysis. Considerable objection to supplementary ground wires was heard in the discussion of this subject, one of the principal ones being the excessive cost of this construction. The value of cross bonding at frequent intervals and the use of supplementary wires around special work such as switches, crossings, etc., is universally conceded but the experiences of different roads in regard to bonding are sufficiently varied to indicate that it is probably impossible to standardize the construction of the return circuit so as to make it applicable to every case with equally good results.

The conditions of the return circuit involve variable quantities in nearly every case, such as the kind of soil, atmospheric conditions, weight and stability of track, kind of pavement and numerous other items which need special study and special treatment in almost every case. There is no other explanation of the fact that what has proved very satisfactory on one road has proved a failure on another road.

The use of cooling towers for condensing purposes was discussed by Mr. J. H. Vail, of Philadelphia, in a carefully prepared paper in which the results obtained in several stations equipped with cooling towers were tabulated. The use of these devices has extended considerably within the past few years and they can no longer be considered in the experimental stage. The advisability of their use in any particular case, however, is a question that must be decided from the commercial and engineering aspects of the case. In many instances very large outlays have been made in locating a station on a waterfront convenient for condensing purposes, where the combined cost of coal delivery, pole lines, or underground conduits has amounted to considerably more than the cost of a cooling tower, while the results obtained would not compare favorably.

The writer advises that where the installation of a tower has been decided upon it is good practice to provide a liberal margin of capacity as under adverse atmospheric conditions a very large supply of cooling water may be required in the case of a heavy load.

The annual report of the Brooklyn Rapid Transit Co. shows the amazing amount of \$1,250,000 was paid out in one year in the settlement of damage suits and in running its claim department. The company figures that not more than \$100,000 of this amount represents really legitimate claims and that it is actually robbed of the difference. The number of serious accidents on the Brooklyn street railways is by no means unusual, and it is certain that fraudulent damage suits constitute a very large percentage of the total number of suits brought. It certainly is a serious matter that a company can be robbed continually of such large sums and it suggests that active measures should be taken to suppress this evil. It is known that there are many unscrupulous lawyers who make a business of hunting up persons who have been injured in street cars, no matter how slightly, and bringing damage suits for them against the company. It is very difficult to find a jury that is not more or less prejudiced against corporations and especially against street railway companies, and although many of the suits must be carried through by means of false witnesses the result is that the street railway companies are largely at the mercy of unprincipled lawyers. The plundering of corporations of all kinds by fraudulent damage suits has become more or less common and the most stringent methods should be inaugurated to check this practice.

The Rutland (Va.) Street Railway Co. is building an extension of its lines, which will include West Rutland, Castleton, Hydeville, Fairhaven, and White Plains, N. Y. The length of the new line is 25 miles.

## Urban Transportation in Havana.

BY G. F. GREENWOOD, GENERAL MANAGER HAVANA ELECTRIC RAILWAY CO.

Generally speaking, good transportation facilities enable a people to increase their wealth, and insure the public welfare and safety. Improvements in methods of transportation are, therefore, of prime importance, and should receive the greatest encouragement at the hands of a progressive government. All aids to transportation should be called into use, and not the least among

pany undertaking this work, had many obstructions to overcome; not only physical difficulties, such as narrow streets, dense traffic, entire lack of sewerage and paving, but legal obstacles as well had to be met and removed.

In determining the several parts of an electrical system suitable for Havana, the elements of sanitation and climate had to be considered, as well as all other conditions affecting tramway lines,

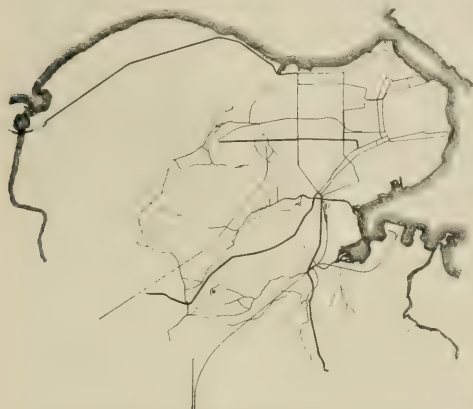


DIAGRAM OF HAVANA STREET RAILWAY LINES.

these is electricity. The electrical experience of the United States has been applied in Havana to complete and extend the various systems of transportation entering the city. In calling this agency to its aid the military government has endowed Havana with one of the most modern tools for city health and development. Prior to the introduction of electricity on the tramways of Havana there existed a steam dummy line, a horse car system, and four stage lines, furnishing indifferent means of communication throughout the city. Aside from the inferior transportation facilities there existed the zone system of fares, which, with the slow speed



EXTERIOR VIEW OF POWER HOUSE.

and to provide for these the government required that a road-bed and track of the most substantial kind be laid, a solid mass of concrete having no open spaces or hidden cavities where filth could find lodgment.

The type of car was also the subject of considerable discussion, the one determined upon being considered the most suitable for all classes who use the tramway lines, due regard being had to the local prejudices and conveniences.

The unusual plan of using two trolley wires over each track was decided upon, as the method that would least affect vested rights,



VIEW ALONG THE CALZADA DEL CERRO.

Showing one of the suburban lines through a fashionable district of Havana.

adopted, was largely responsible for Havana's over-crowded condition.

Present day requirements of a large city demand a frequent, rapid, and cheap system of transportation, and this can be secured only by the use of electricity. In furnishing Havana with electrical transportation facilities, the government as well as the com-

and at the same time assist operation during the periods of dry weather, during which time the rails would be more or less covered with finely powdered lime dust. This dust would operate to prevent good metallic contact between the car wheels and rails, and interrupt the electrical circuit if the single trolley method had been adopted.

Before securing the franchise for extending and electrically equipping the street railway lines in Havana the company was required to submit an elaborate application showing clearly the changes it desired to make. This application included specifications, plans and estimates for the complete system, including loca-



VIEW OF BOILER ROOM.

Showing complete ventilation and method of supplying coal to furnaces.

tion of routes, track and overhead work, details of power house and of the cars and equipments.

The accompanying map shows in outline the extent of the various routes in the city. Besides the streets previously occupied thirteen additional streets were laid out with track. The whole system

which were torn down to make room for the new establishment. The dimensions of this building are 199 x 129 ft. The foundations of the generating plant rest directly on the coral rock formation, and have been built up of concrete. In the basement of the engine room a deeper excavation was made, some 6 ft. below water, in which was placed a pipe serving to conduct the salt water that

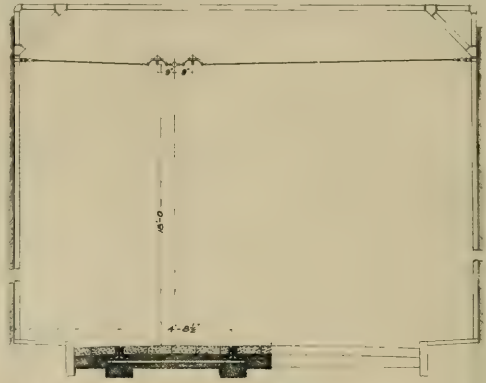


DIAGRAM OF SINGLE TRACK CONSTRUCTION.

is found in large quantities in the fissures of the coral rock, and used for condensing purposes. Above the concrete foundations there has been erected a steel structure, carrying a traveling crane capable of easily handling 45 tons. This crane is operated with electric motors.

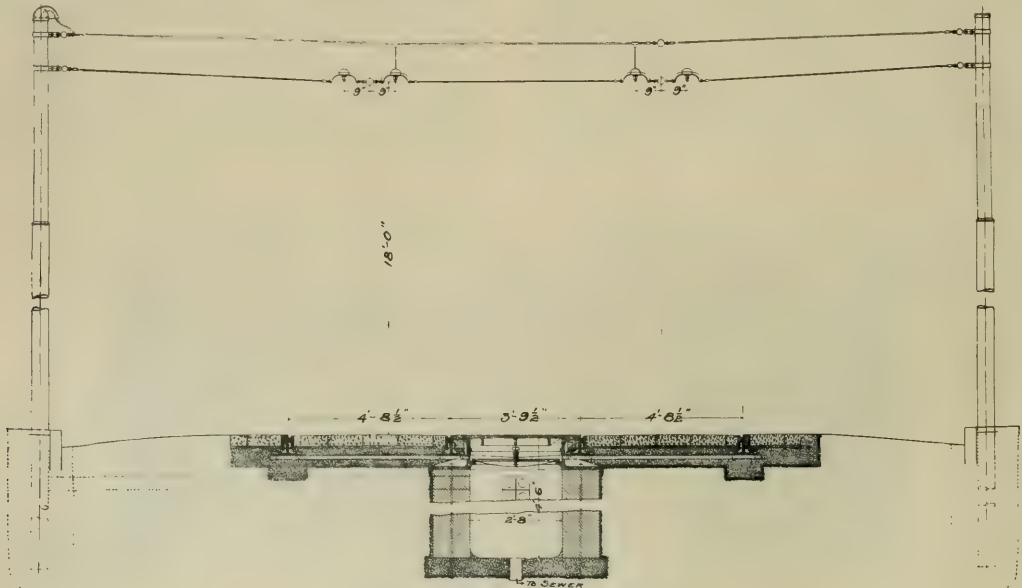


DIAGRAM OF DOUBLE TRACK CONSTRUCTION.

is divided into nine routes which are included in four main divisions of the system of two routes each and one connecting line.

The work on the power house and tracks was fairly started in June, 1900, and was carried on continuously until the first line was opened to the public, Mar. 21, 1901. The power house is built on the site of the old Van de Water foundry, the buildings of

In the engine room the steel columns supporting the roof and crane girders have been surrounded with brick work, and so arranged to give the best appearance possible, considering the use to which the building is put. The roof, of a novel construction, is of iron and concrete, and provides for complete ventilation of the engine room. In the engine room are three large Allis com-



pound-condensing vertical engines rated at 1,500 h. p. each, with Wheeler condensers. Each engine drives a General Electric 550-volt generator of 850 kw. capacity. Steam for the engines is supplied from vertical boilers of 250 rated h. p., each equipped with a mechanical stoker or chain grate. The steam pressure is 160 lb. Coal for the furnace is delivered by means of a moving elevator driven by electric motors. Beyond the boiler room are

trucks, with 7 ft. wheel base. There are also 30 trail cars made by the John Stephenson Co. The cars are of a modern type, low steps and platforms, and with seats so arranged to permit the passenger to ride facing the front of the car, the seating capacity of each car being 32 passengers. Electrically the car is equipped with two 25 h. p. motors, and with all the auxiliary appliances, such as life guards, illuminated signs, electric lights and safety



#### VIEWS ALONG THE HAVANA STREET RAILWAY LINES.

Monte St. opening into Egido St., showing business houses erected on the former site of the old City walls.

Looking down Sol St., showing pipe trusses, feeder connections, and narrowness of street.

Principe car barn, at the terminal of the Principe line.

Looking down Neptune St., past Parque Central, from the corner of the Prado and Neptune St.

Entrance to Sol St. and Egido St., showing the construction of overhead line work.

Car barn at Carmelo, where cars are placed for extensive repairs, and those operating on the Vedado line are stored at night.

situated coal pockets, and these will be kept supplied with coal directly from the water front, by cars specially constructed for this purpose.

The company has 110 closed motor cars which are 29 ft. 6 in. over all, 8 ft. wide and 8 ft. 5 in. high from the bottom of the sills to the top of the roof. They are mounted on McGuire A-1

gates, which go to make up a convenient and satisfactory car. The motors are the G. E. 52.

The track is laid with 90 lb. rails, Pennsylvania Steel Co's. section No. 255 for straight track, and No. 215 on curves below 100 ft. radius. The subconstruction is of concrete 6 in. deep, and steel ties 5 ft. x 7 in. x 5-16 in. are spaced 10 ft. between centers.

Six-bolt tram rail joints are used. The pavement is either asphalt block or vitrified brick.

The accompanying illustrations show in cross section the details of the overhead and track work.

The trolley wires are supported on tubular steel poles where the

been built at the ends of divisions. These stations are all of steel and brick construction and are as follows: Curmelo, 269 x 134 ft.; Cerro, 96 x 99 ft.; Jesus del Monte, 185 x 68 ft.; Principe, 110 x 50 ft.

The system comprises 31.2 miles of track, of which 20 miles is

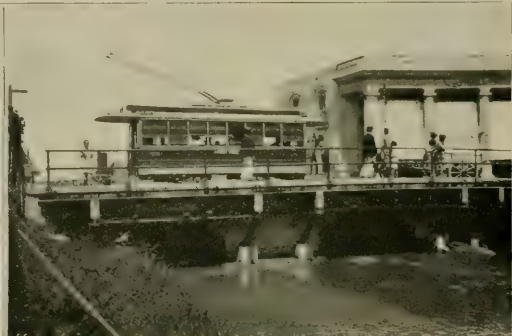


LA PUNTA, SHOWING MORRO CASTLE IN THE DISTANCE.

streets are wide enough to permit of the poles being set by the curb, but on narrow streets where every inch of room is needed pipe trusses have been placed across the streets and against houses. The poles are 26 ft. over all in two sections, 5-in. and 6-in. pipe. The feeders, of which there are 97,764 ft. of 1,000,000-c. m. cable

double. The company employs 240 conductors and 240 motormen, who are paid \$1.95 in Spanish silver for 10 hours' work. Trackmen receive \$1.25 in Spanish silver for 10 hours' work.

Since the Vedado line, the first line opened for traffic operation, started the 10 other routes have been added, until now the cars are



#### STREET SCENES IN HAVANA.

Corner Dragones and Zulueta Sts., showing the Marti Theatre, where the Cuban Convention met to draft the Constitution for Cuba.

Looking along the sea shore on the Vedado line, with the City of Havana and Morro Castle in the far distance.

Chavez Bridge, showing one of the Havana Electric Railway Company's cars passing.

Montserrat St., showing the remains of the old City walls built in 1763 by the Spanish.

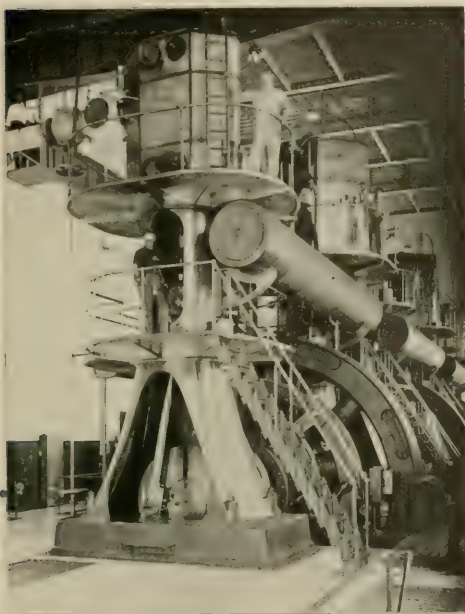
and 59,364 ft. of 500,000-c. m. cable, are all laid underground in terra cotta conduits, connection with the trolley wire being made by wires carried up inside the poles. Much of the material was furnished by the Morris Electric Co., as manufacturer's agent.

Four terminal stations in which to clean and repair cars have

making 3,800 round trips each day, and the aggregate number of miles traveled daily amounts to 12,000. For every mile run five passengers are carried; in other words, over 60,000 passengers are daily transported over these lines, or about one-fourth the population of Havana is carried every day. Even the short time dur-



ing which the cars have been in operation, one may point out many changes that have taken place in the city of Havana, among which may be mentioned the large number of new houses that are being erected in the Vedado. As time passes the advantages of a modern system of transportation will be more and more appreciated by the people of Havana, permitting the population to spread out, the beneficial effect on working classes providing a larger area within which to economically work, and more important still, exerting an educational influence on the Cuban people by encouraging them to provide better and cheaper transportation facilities than they at present enjoy, and in this way working out a successful and staple form of government. The views of Havana presented in connection with this article show some of the difficulties



GENERATORS IN POWER HOUSE.

met with in constructing the electric tramway, but at the same time they present Havana's many advantages.

The Havana Electric Railway Co. is capitalized for \$10,000,000, and has \$6,000,000 bonds outstanding. The officers of the company are: President, Edwin Hanson; secretary and treasurer, A. Marcus; general manager, G. F. Greenwood; superintendent, James M. Gorman; attorneys, William Page, of New York, and Carlos Font y Sterling, Havana.

### BROOKLYN EXTENSION OF NEW YORK SUBWAY.

A meeting was recently held by a special commission, appointed by the Supreme Court, to decide upon the New York end of the Brooklyn extension, at which chief engineer Parsons showed the plans which had been worked out for the tunnel. The route which is proposed will be begun at the post office in New York City and end at the junction of Atlantic and Flatbush Aves., Brooklyn. The work would be done, according to Mr. Parsons, by means of a shield of steel which would be forced through the ground under the river by means of compressed air. It would be necessary to go to a depth of 50 feet in some places and the excavation would in rock almost all the way under the river. The entire route could be covered in from 12 to 15 minutes by train and the cost of the extension would be from \$8,000,000 to \$10,000,000.

### THE JOSSE BINARY VAPOR ENGINE.

We described in the "Review" for May, 1900, some experiments of Prof. E. Josse, of the Royal Technical High School at Charlottenburg, with a binary vapor engine in which sulphur dioxide or SO<sub>2</sub> is the substance used in connection with steam. The condensed steam of the steam engine is used to vaporize the SO<sub>2</sub>, and the vapor thus produced is used to drive an auxiliary engine. In the tests formerly described the steam consumption of the compound engine used amounted to 18.96 lb. per i. h. p. hour. The auxiliary engine working with the SO<sub>2</sub> vapor reduced the steam consumption from 18.96 lb. to 12.13 lb. per i. h. p. hour, or for the same steam consumption it increased the output 56 per cent.

Some further experiments with this engine have recently been published by Prof. Josse in which the Josse engine was used in connection with a 150 h. p. triple expansion engine, the two engines being attached to a common crank shaft. The condensation in the cylinder of the SO<sub>2</sub> engine was so small as not to require the use of drain cocks.

The steam engine when working alone with superheated steam at 300 lb. gave an economy of 11.15 lb. of steam per i. h. p. hour, and the steam consumption of the combined engines was reduced to 8.34 lb. per i. h. p. hour. This means a saving in waste heat of 33.7 per cent in the latter case as against 56 per cent in the former, a result to be expected, as the triple expansion engine working more economically than the former compound one leaves less waste heat to be utilized. The greater the specific steam consumption of the steam engine the larger will be the proportion of the power developed in the waste heat engine. There is also a larger proportion of gain with saturated steam than when superheated steam is used.

While these experiments have been in progress at the Technical High School, a cold-vapor engine plant has been constructed, put in operation, and tested in actual daily service at the central station of the Berlin Electrical Works in Markgrafen Strasse. This is the oldest of the power stations of the company and is equipped with what is now considered relatively small units, viz, vertical compound engines of 360 h. p., which have an average steam consumption of 18.35 lb. per i. h. p. hour. With a steam consumption as high as this, there is abundant chance for economy by utilizing the waste heat. Moreover, this was a case in which more power was urgently needed at the station. Either the cold-vapor auxiliary plant or new steam boiler and engine had to be supplied.

Accordingly, a cold-vapor engine of 175 h. p. was put in operation in May of this year. It is a single, horizontal engine, the piston being 17 3/4 in. in diameter, with 20-in. stroke, and, unlike the smaller engine at Charlottenburg, is geared independently to a directly coupled dynamo, which feeds into the service cables of the company. Working thus as a separate unit, the efficiency of the cold-vapor engine can be measured and recorded with great precision, and the net result may be condensed into the statement that at an average speed of 130 r. p. m. it delivers 150 b. h. p.—an addition of 41.7 per cent to the working energy of the compound steam engine, from which it receives and utilizes the waste heat in the form of exhaust steam. What this means will be made more plain when it is considered that the combined power stations of the Berlin Electrical Supply Co. contain steam engines which, with an average steam consumption of 12.3 lb. per i. h. p. hour, have a total output of 142,300 h. p., to which, by the use of cold vapor engines, there may be added 55,000 h. p. without increasing by so much as a pound the consumption of coal. The system adapts itself with especial readiness to large plants which, like power and lighting stations in growing cities and towns, have to meet a steadily increasing demand for current. This the cold-vapor engine enables them to do without increase of boiler or steam-engine capacity, by simply saving heat energy which has previously gone to waste.

The report of Professor Josse goes extensively into the question of comparative costs of installation. His conclusions are that a combined steam-waste-heat plant of 1,600 h. p., including compound steam engines of 1,200 i. h. p. and a cold-vapor plant of 400 i. h. p., complete in every detail, would cost in Germany \$50,456, while a triple-expansion steam engine of 1,600 h. p., without vapor engine, would cost \$49,028, a difference of only \$1,424, which, with steam coal at \$4.15 per ton, as at Berlin, would be saved in a short time by the cold-vapor auxiliary.



Coming down to actual experience the net cost of the 175-h. p. waste-heat engine plant at the Markgrafen St. power station was \$11,828.60, and of a gas-engine plant, also of 175 h. p., \$11,334.75, a difference so slight as to be negligible in the presence of other and more important considerations.

The street railway companies of Salt Lake City propose to employ no men whose eyesight is defective, as motormen and conductors. After January 1st, it is announced, men wearing glasses will be no longer retained in the service.

At a meeting of the Pittsburg councils, September 30th, the 13 ordinances providing for elevated railroads in that city were postponed for consideration until April. J. S. Wightman, who had introduced the ordinances, presented a resolution withdrawing them from the committee.



EXTERIOR, WHALOM PARK THEATER.

## NEW YORK-PORTCHESTER INTERURBAN.

The New York & Portchester Railway Co., which has applied for a charter to construct a high speed, four track electric line from 132d St., New York, to Portchester, was given a hearing on Sept. 30th by the State Railroad Commissioner. Mr. John B. McDonald, the subway contractor, is to build the new line if the charter is granted. Arguments for and against the road were heard by the commissioner, the objections to the road coming mainly from the New York, New Haven & Hartford, the New

## THE OPERA SEASON AT WHALOM PARK.

Whalom Park, the summer resort conducted by the Fitchburg & Leominster Street Railway Co., has just completed the most successful season in its history. The general amusement features of this park which have been described from time to time in the columns of the "Review" were extensively improved and enlarged last spring, the most notable addition being the new theater and the new bathing pavilion.

The development of the past few years in the entertainments offered at Whalom has been remarkable. Originally the entertainments consisted merely of an occasional fireworks display, balloon ascensions or a dog show, which were viewed by the spectators from a few settees gathered from different parts of the park. The next advance was the building of a pretty rustic theater, the forerunner of the present structure. Here the attractions were somewhat more pretentious. Still there was no

admission charged; but in order to provide a place where ladies and children and their escorts might be exclusive, if desired, some eighty chairs were enclosed by a white birch railing and a charge of 5 cents was made for each seat. The patronage of the theater grew, and with no disposition to make a profit from the operation of the theater, the management sought to increase the worth of the attractions. With somewhat of fear and trembling, an opera organization was engaged for six weeks at an expense that would have been disastrous without greatly increased patronage. This form of entertainment found immediate favor and was a success



INTERIOR, WHALOM PARK THEATER.

York Central and the Union Railway companies. Mr. McDonald testified the line could be constructed without very great expense. He stated that the facilities of the New York, New Haven & Hartford were entirely inadequate for the present conditions, to say nothing of the conditions after the subway is completed. He stated it was feasible both from an engineering and commercial point of view to run cars from Portchester to the subway and from there to City Hall. A representative of the Bronx Alliance, an organization of 4,000 residents of the Bronx, also testified as to the necessity for a new line. The hearing was continued.

from the start. Better stage settings, scenic and electrical effects were continually employed and their success as drawing cards has been highly gratifying. The time came when, in order to secure the best seats, the people came to the theater as early as six o'clock, sitting there continuously until ten. In order to obviate the discomfort and inconvenience of this it was decided to reserve certain chairs, selling them in advance. This was done at first with a section of about three hundred seats.

At the close of the summer season of 1900 at Whalom, several things were apparent in regard to the theater. First, that the

enclosure was inadequate to meet the demands of its growing patronage, second, that arrangements should be made to enable every part of the largely increased audiences to hear and see the stage entertainments, and third, that some covering should be provided to keep the sun and rain from the auditorium and stage. In view of these considerations, it was decided to build a new theater, retaining as much as possible the rustic effect which had been the pleasing feature of the old structure.

The designs for the new theater were furnished by Mr. W. W. Sargent, superintendent of both the park and the railway system. The new structure, of which exterior and interior views are shown herewith, was completed early in the spring of 1901. The auditorium is circular in shape, with a diameter of 144 ft. It is 42 ft. high to the center of the roof, and the floor is partly of cement and partly of wood. It has a capacity for seating about 3,000 people comfortably, so that everyone has a full view of the stage. The roof is trussed in such a manner that there are only two posts in the whole auditorium and these are 80 ft. from the stage. The roof is supported by Georgia pine timbers and is well above the proscenium arch to the center of the theater, a lower fan-like roof

The season opened with a vaudeville entertainment on Decoration Day and the opera season commenced June 17th, lasting until September 2d. At the close of the opera season another vaudeville entertainment was given for two weeks, two performances being given daily.

Another great success as an entertainment feature was the new bathing pavilion which was also built this year. The building, which is illustrated herewith, is 140 ft. long and contains 70 rooms besides a laundry, which is thoroughly equipped with modern machinery for quick drying of the suits, towels, etc. The beach has been greatly improved by the addition of a large amount of fine sand laid over the pebbles and stones. From the top of the bathing pavilion, 40 ft. above the surface of the water, a toboggan slide extends down to the lake for the use of the bathers. This is provided with rollers and is steep enough to send the toboggans one hundred feet or more over the water. This pavilion has also been a financial success and very popular with the public.

The different buildings in the park, including a hotel, theater, bathing pavilion, boat house, bowling alley, dance hall, zoological



BATHING PAVILION, WHALOM PARK.

spreading from this to the eaves. The higher roof is graveled and the lower roof is covered with moss green stained shingles. The top of the roof is surrounded by a parapet fence. The stage is 50 ft. wide and 40 ft. deep with a drop curtain 23 ft. high. It is built of white oak in the natural state. The proscenium arch is of Gothic design and is illuminated in the evening with electric lights. It is also made of white oak.

The company employed an opera troupe of 30 people last season. The operas presented were *Said Pasha*, *Heart and Hand*, *Boccaccio*, *Maritana*, *Girofle-Girofla*, *Little Duke*, *Rip Van Winkle*, *Three Black Cloaks*, *Fatinitza*, *La Grand Duchess*, *Claude Duval* and *Olivette*.

The stage was equipped with different colored electric effects and settings every week, which proved very attractive and the patronage of the theater during the season was enormous. The earnings were in the neighborhood of \$10,000 for 12 weeks. The admission is 5 and 10 cents, the 10-cent admission including the price of a reserved seat. There are 1,600 reserved and 1,400 unreserved seats. No orchestra was used, the score being rendered on a piano by the musical director.

building, etc., have all been very carefully designed to meet their respective requirements and the theater and bathing pavilion especially are considered by all who have seen them as particularly well adapted to the purposes to which they are applied.

Much of the success with which this resort has met is due to the excellent management of Mr. W. W. Sargent, general manager of Whalom Park and of the Fitchburg & Leominster Street Railway Co., Fitchburg, Mass.

#### TROLLEY COMPANY ROBBED.

On the morning of September 23d eight masked men forced their way into office of the Frankford, Tacony & Holmesburg Railway Co. and bound and gagged the two watchmen on duty. They then opened the office safe by means of a charge of dynamite and took \$1,200 in cash, with which they disappeared.

The two watchmen succeeded in unbinding each other and ran a trolley car to the police station to report the matter. Mounted men were sent out to make a search in the surrounding country, but without success.

**C. W. WASON.**

Mr. C. W. Wason, of Cleveland, who was chosen first vice-president of the American Street Railway Association to serve for the year 1901-1902 is a gentleman who has had a very extensive experience in electric railway work. He was instrumental in financing and building several of the Cleveland interurbans which now constitute a part of the Everett-Moore system and is closely asso-



CHARLES W. WASON,  
First Vice-President A. S. R. A.

ciated with Messrs. Everett and Moore in the management of the consolidated properties. Mr. Wason is president of the Cleveland, Painesville & Eastern Railroad Co. and purchasing agent of the Cleveland Electric Railway Co.; he is a director in both of these companies.

**EXCURSION TO BRILL WORKS.**

One of the most pleasant entertainments of convention week was the excursion to the works of the J. G. Brill Co., on Saturday, October 12th. The expedition was personally conducted by Messrs. W. H. Heulings, jr., and D. B. Dean, of the Brill company, and nothing looking to the comfort or pleasure of their guests was left undone.

A special car was attached to the noon express for the accommodation of the party, which included: W. H. Heulings, jr., and wife; D. B. Dean and wife; W. S. Dimmock general manager of the Richmond Railway & Electric Co., and wife; Andrew Radel, vice-president Middlesex & Somerset Traction Co., and wife; Thomas F. Walsh, of the New Brunswick Traction Co.; M. S. Hopkins, general manager Columbus (O.) Railway Co., and wife; H. M. Sloan, general manager Calumet Electric Street Ry., Chicago; F. L. Fuller, general manager United Power & Transportation Co., Philadelphia; T. C. Pennington, treasurer Chicago City Ry.; George Yuille, president West Michigan Traction Co.; Capt. W. H. Lanius, president York Street Railway Co., York, Pa.; W. D. Ray, Detroit, Rochester, Romeo & Lake Orion Ry.; Wm. Walmsley, general manager South Chicago City Ry.; W. H. Stulb, United Railways & Electric Co., Baltimore; Howard Yardley Pennsylvania Car Wheel Co.; Charles E. Carpenter, of E. F. Houghton & Co., Philadelphia; Daniel Royse, editor "Street Railway Review."

Lunch was served on the train and when the party reached Philadelphia the ladies were taken for a drive about the city by Mrs. Heulings while the men went at once to the Brill works. In the evening those who did not have to return to New York were entertained at dinner.

While at the works we learned that the J. G. Brill Co. had just received two gold medals for its exhibit at the Pan American Exposition.

**COURTESIES EXTENDED IN NEW YORK.**

Among the firms and individuals, in addition to the transportation companies of Greater New York and New Jersey, who extended courtesies at the convention were:

The General Electric Co., which lent the switches for the electrical installation at the Garden.

The H. W. Johns Co., which lent Sachs Noarc fuses and blocks.

The Crocker-Wheeler Co., which provided motors.

The Sterling Electric Co., which furnished the incandescent lamps.

The New York Telephone Co., which installed 60 telephones in the different booths and furnished telephone service to delegates and exhibitors free of charge.

The American Telephone & Telegraph Co., which furnished long distance service gratis.

The American District Telegraph Co., which provided free messenger service.

F. H. Newcomb who furnished hats for the ticket attendants.

The American Circular Loom Co., which furnished all the circular loom required in the electrical installation.

**FROM THE WEST.**

The Seattle (Wash.) Electric Co. will double track its Green Lake branch as far as Park Junction.

An extension of the West Temple line and the completion of the Seventh East St. line in Salt Lake City is projected.

The exchange of the new bonds of the Consolidated Railway & Power Co. for the old bonds of the Salt Lake Rapid Transit Co. is completed.

The Santa Barbara (Cal.) Consolidated Railway Co. has been incorporated with a capital of \$250,000 to absorb the street railway companies in that city.

The equipment of the Consolidated system in Salt Lake City is in fair condition but will be improved by the addition of new rolling stock this season.

A company is being organized at Boise, Idaho, to build a 40-mile electric line from Boise to More Creek, to be extended eventually to Idaho City.

Insurance companies will pay the Consolidated Railway & Power Co., of Salt Lake City, the sum of \$21,850 for losses on the burning of its car sheds, cars and supplies on September 16th.

A steel bridge 110 ft. long and 46 ft. wide to accommodate four street railway tracks will be built by the Los Angeles & Pasadena Electric Railway Co. at Raymond Hill.

In Salt Lake City, commutation tickets are good throughout the entire street railway system. Shortly after October 1st a new rule went into effect whereby transfers are issued at all connecting points.

Contracts have been awarded for rebuilding the car sheds of the old Rapid Transit company, at Salt Lake City, which were destroyed by fire. The building will be of brick and stone, 180x50 ft. in dimensions, with a capacity of storing 30 cars.

The motive power for the Salt Lake City lines has been furnished under contract with the Utah Light & Power Co., but so soon as the lease expires the Consolidated company, which has purchased a plant in the Big Cottonwood canyon, will generate its own power.

The Los Angeles & Pasadena Electric Railway Co. is making extensive improvements at its power house. An addition to the building, to include the superintendent's and train dispatcher's office, is in course of erection, and new machinery will be installed at the plant by January 1st at a cost of \$20,000.



The Consolidated Railway & Power Co. has taken out a mortgage on the new corporation to secure the payment of the new consolidated bonds. The mortgage bonds amount to \$3,000,000, are to run for 20 years, drawing interest yearly at the rate of 3 per cent, payable semi-annually from Aug. 15, 1901, and all are secured by the pledge of the franchise, street car lines, equipment, real estate, power plants etc., of the consolidated companies. The mortgage is executed to the City Trust Co., of New York.

It is recited in the deed of trust that all but five shares of the Utah Power Co.'s stock, of 99½ per cent of the capital of the three original companies, is included in the consolidation, and it is provided that 1,360 of the bonds, or \$1,360,000 in value shall be issued for the payment of the properties included in the consolidation, the remaining \$1,640,000 to be reserved for redemption of the outstanding bonds of the Salt Lake City Railway and Rapid Transit companies, nearly all of which bonds are owned by the Consolidated Railway & Power Co. The effect of the latter part of this provision will be that the money represented in the retired issues of the old companies' bonds will be available when needed to extend the lines and improve the equipment of the Consolidated Co.

### NEW FLORIDA RAILWAY.

A prospective railway, known as the Florida & East Coast Railway, has recently been capitalized for \$6,000,000 and is to run across Florida from Palm Beach to Punta Rasa, a distance of about 160 miles. The main object of this road is to connect the Plant and the Flagler system and to facilitate travel across that section of the state.

Mr. John M. Roach, president of the Union Traction Co., of Chicago, is one of the largest stockholders in the proposed road. Mr. Roach is also erecting a forty-room hotel, which will be managed by his son, Mr. F. Lyon Roach. This is situated at the northern extremity of his winter resort, Useppa Island, on the Gulf Coast of Florida. This island is about 25 miles from Punta Gorda on the northwest coast of Florida and was purchased a few years ago by Mr. Roach for a summer resort. This has been a favored resting place for those who visit Florida waters and the absolute lack of accommodations for its many visitors gave Mr. Roach the idea of erecting a hotel. It is expected that work on the trans-Florida railroad will be begun at once.

### WORK CARS AT QUINCY, ILL.

The accompanying illustrations show two interesting views of work cars built by the Quincy Horse Railway & Carrying Co., of Quincy, Ill., and sent us by courtesy of the manager, Mr. H. E.



DEEP CUT AT QUINCY, ILL.

Chubbuck. This road as our readers doubtless know, is operated by electricity.

The deep cut where the cars are shown was originally made by the Wabash railroad and is parallel to what would be South Third

St. if it were cut through. The electric railway in building its new line south along the river, was obliged to widen this cut some 10 ft. and later the city will excavate the width of a street east of the new track for what will be known as New South Third St.

The work cars made by the company for use in making the cut were a motor car and a flat car, the former is equipped with W. P.



WORK CARS AT QUINCY, ILL.

50 motors which had been left on hand when the change was made to modern equipments.

The two cars are of equal capacity and hold about six yards each without additional side boards; with the boards and heaped up, as they are generally used, the two cars carried 16 yards. On an average five trainloads per day were hauled, making 80 cu. yd. per day. This required one foreman and six laborers at a cost of \$11 per day.

### NEW INTERURBAN IN MICHIGAN.

The Western Michigan Traction Co. is the name of a new corporation which will build an electric railway from Benton Harbor to Grand Rapids, Mich., running through the richest fruit country in that state. The same company will also run two lines of steamers from Benton Harbor, one to Chicago and the other to Milwaukee. The boats for this line are now being built in Toledo. The capital stock of this company is \$1,000,000, and it is owned almost entirely by members of the United States Steel Corporation. The road will be bonded for \$2,500,000.

Work has already been commenced on a tunnel at Benton Harbor. The excavation will be 200 feet in width and extend for half a mile through the city. Its eastern end will terminate in a basin 400 ft. wide where a union depot will be built. This station will be used jointly by the Western Michigan Traction Co. and the Big Four railroad. The trolley cars will use the Big Four tracks for a distance of three miles east of Benton Harbor for the present. The principal feature of this road is expected to be its freight traffic. During the fruit season a large income will be derived from the freight traffic in fruit to Milwaukee and Chicago. About 30 miles of road will be built this year.

The Cincinnati, Newport & Covington comparative statement for the months of July, 1900 and 1901 is as follows: Gross receipts \$76,620, last year, \$72,703; operating expenses, \$33,458, last year, \$31,134; net earnings, \$43,161, last year, \$41,509; tolls, taxes, damages, rent, etc., \$12,562, last year, \$30,629; net profit, \$30,599, last year, \$10,940; ratio of expenses to earnings, .4366, last year, .4282; same including taxes, damages, rents, etc., .4980; last year, .7427.

## Comparison of Storage Battery Traction and the Overhead Trolley on the Lines of the Chicago Electric Traction Co.

BY E. R. GILBERT, GENERAL MANAGER CHICAGO ELECTRIC TRACTION CO.

Mr. E. R. Gilbert, general manager of the Chicago Electric Traction Co., has been identified almost continuously with street railway operations ever since he started in practical work. He was born and received his education in Hartford, Conn., leaving there to work in the factory of the Eddy Electric Manufacturing Co., at Windsor. He started at the bottom of the ladder as a shop hand and finally became manager of the Boston office before he left the employ of the company. The Hartford Street Railway Co. secured his services as purchasing agent and from there he went to Philadelphia to take up the duties of general manager of the Holmesburg, Tacony and Frankford Electric Street Railway Co. Thus far his experience had been with trolley roads, but when Mr. Condit resigned as manager of the Englewood & Chicago Electric Street Railway, Mr. Gilbert was called to Chicago to fill his place. Under his management the road was operated by the storage battery system, afterwards changed to trolley and is now being operated on the latter system with a most satisfactory increase in net results.

About five years ago the Englewood & Chicago Electric Street Ry. (now operated by the Chicago Electric Traction Co.), was built in order to exploit the storage battery system of traction for street railways. Its promoters were interested in the storage battery and were convinced that in order to make a successful test of its usefulness in connection with street railway work, it would be necessary to equip and operate a complete road, rather than to attempt tests on roads already being operated by means of other systems. Therefore the road was built with every convenience for handling the batteries, and with every possible device for making a successful showing.

The road, at that time, consisted of about 12 miles of track extending from 63d St., Chicago, to Blue Island, Ill., with a branch line of about 2 miles running into Morgan Park, Ill. The power station, where the batteries were charged, was located at 88th St., which is about half way between 63d St. and Blue Island. The road was comparatively level, excepting a grade of  $9\frac{1}{2}$  per cent on the Morgan Park branch. Afterwards the road was extended about five miles south of Blue Island to Harvey, Ill., with a branch line, three-quarters of a mile long from Blue Island to Calumet Grove.

It was principally on account of the difficulty in operating these branch lines economically that it was finally decided to change the road over to trolley, as under the battery system it was necessary to run cars on these lines to the power station every trip for a charge, thus wasting a considerable mileage.



E. R. GILBERT.

Although it is not the intention to give a technical description of the entire plant in this article, a limited description of the methods employed in charging the batteries, and some figures concerning the mileage made by them, etc., will doubtless be of interest, and will perhaps make it more clear to the reader why the change to trolley was made. (A description of this road, and the

results of a complete test of the power plant may be found in the "Review" for February, 1898, page 73 et seq.)

The batteries, which consisted of 72 cells each, were made up of Electric Storage Battery Co.'s No. 9 T plates; 5 positive and 4 negative plates composing each cell. These batteries were set in trays which were swung in under the center of the car trucks, and were removed from the cars for charging, by means of a type of side-walk elevator. The batteries complete weighed  $3\frac{1}{4}$  tons each.

Several methods of charging batteries were tried. The first, and the one for which the station was originally designed, was a system of using three separate voltages in the charging room. The batteries as they were taken from the cars, were placed in a row in the battery room and the charge was commenced at 165 volts. After the charging current dropped to 20 amperes the battery was placed on the second bar, having a voltage of 175. When the number of amperes again dropped to 20, it was thrown onto the third bus bar, with 185 volts, where the charge was completed. The batteries were placed in charge and taken out of charge in rotation. This system required a great deal of attention on the part of the battery men, as the voltage and current of each separate battery had to be looked after,

The method which was finally adopted was to charge the batteries in groups. Each group consisted of enough batteries to give a full load to one of the station generators. The charge was started at 165 volts. The station generators, being shunt wound, allowed the voltage to increase as the current dropped until it reached 185, at which point the batteries had become fully charged. This was by far the most successful and economical method tried. At no time would the number of amperes run over 100, and the time for each charge amounted to about the length of time the battery had been used on the road.

In this class of work the best results will be obtained by following the rule of charging batteries at a little higher rate than the rate of discharge, and for the same length of time the battery is used on the road. Both operating expenses and depreciation will be reduced to a minimum by using this method.

A few figures from the battery records while this system was in use will doubtless be of interest. The greatest number of car-miles run by any one battery, composed of entirely new plates, was 27,449.6, and the average mileage of 62 batteries was 23,125.1 miles.

Since the date of the writer's previous article in the "Review" (July, 1898, page 476), on Storage Battery Railroad, battery depreciation increased to a considerable extent, principally owing to the fact that it was found that one set of negative plates would outlast two sets of positives. The work of putting in the new positives and the natural increase in the cost of caring for the batteries owing to the old negatives, gradually brought the cost of depreciation up until its averaged 2.276 cents per car-mile.

On account of the distance from Harvey to the power station, it was decided to build a charging sub-station there. This plant was intended only to partly charge batteries as they would not be fully discharged when reaching this point. The distance of this sub-station from the main station was about 11 miles. A 40-kw. generator and a 50-h. p. gas engine were installed. (See "Review" July, 1899, page 500.)

This was not an economical plant, but was the only available means for operation to Harvey by the storage battery system. It added an average of \$400 per month to operating expenses, which was a large item when it is taken into consideration that but 11 cars were being operated at this time.

From a mechanical point of view everything ran successfully and smoothly, but expenses were so heavy that it was thought best to make the change to trolley, thus avoiding the operation of sub-stations, and the necessity of running all cars on branch lines to the charging station. It would also allow the economical operation of other contemplated branches and extensions which were out of the question while using batteries. During the last year, the change was made and the overhead trolley system was installed, and it has been in operation for several months.

The following figures show the difference in operating cost of the two systems. July, 1899, has been taken to illustrate the storage battery, and July, 1901, the trolley system, these being the most economical months of operation under both methods. The result is most decidedly in favor of the trolley system. It must be remarked, however, that some allowance for the battery system must be made as the car-mileage was greater in 1901 than in 1899. On the other hand the trolley cars are equipped with two 35-h. p. motors each, while the battery cars carried one 50-h. p. motor.

The comparison of power station expenses is interesting as it shows so much difference in the cost of operating under a variable load in the case of trolley, and a constant load in the case of storage batteries.



## OPERATING EXPENSES FOR ONE MONTH.

	Storage Battery.	Overhead Trolley.
Car-miles .....	78676.5	98340.7
Car-days .....	542.	609.
Total expense per car-day .....	\$16.224	\$11.886
Total expense per car-mile .....	.11176	.0736
Total power station expense .....	\$1,171.79	\$1,659.84
Total kw. hours .....	125487.930	114801.000
K. W. hours per car-mile .....	1.59	1.167
Pounds coal consumed .....	1,080,000.	1,336,000.
Pounds coal per kw. hour .....	8.606	11.6375
Power station expense per car-mile ...	\$.0149	\$.0168

The writer is of the opinion that there is today no better, cheaper, or more satisfactory system of street railway traction, with the exception of overhead trolley, than storage batteries; provided that the charging stations are at the ends of lines, that no more than 10 miles are run upon one charge, that there are no grades of over four per cent and that the number of cars run from each charging station is at least twenty.

## MT. TOM RAILWAY AND PAVILION.

Mt. Tom, near the city of Holyoke, Mass., is the central figure of the Holyoke range. Its summit rising to a height of over 1,200 ft. above the sea level. The summit was not easily accessible before 1897, when the Mt. Tom Railroad was built. Now, the street cars of Holyoke, which connect with the Springfield street cars and also the Boston & Maine and the New York, New Haven & Hartford Railroads, run to the lower terminus of the Mt. Tom Railroad. This incline railway which is operated on the balance system, by means of a cable connecting the cars on the up and the down



MT. TOM SUMMIT HOUSE.

grade, was described in detail in the "Review" for 1897, page 426. This mountain line transports passengers from the base to the summit of the mountain in less than 10 minutes where a pavilion known as the Summit House is located. The cars running to Mt. Tom also pass through Mountain Park, an extensive tract comprising more than 400 acres which lies between the foot of Mt. Tom and the Connecticut River. This park is operated by the Holyoke Street Railway Co. which also leases the Mt. Tom Railroad.

The original pavilion on the summit was destroyed by fire on Oct. 8, 1900, and was replaced by a new building, shown in the accompanying illustration, which was completed in May last. This new building is a large substantial structure 76 ft. wide by 104 ft. long and four stores high. Piazzas 14 ft. in width surround the three lower stories, those on the first and second floors being arranged to be closed in part by sash and by steel shutters. The

third floor piazza is an open one. The stairways are six ft. wide, easy of ascent and well lighted.

The foundation walls are built of trap rock. On the first floor the main room is 42 x 48 ft. and the dining rooms are 30 x 62 ft. and 16 x 22 ft., seating about 150 people. On this floor are also a restaurant counter and wash rooms for both men and women.

On the second floor is the main concert hall 48 x 64 ft. with a stage at the north end. The souvenir and checking counter is located on this floor and is arranged so that it can be shut off from the hall by flexible doors. The third floor contains a hall 34 x 48 ft., large enough to seat 250 people; this hall is for the use of conventions and for private parties. The fourth floor is the observatory room 48 x 80 feet, and is well supplied with telescopes, maps, registers, etc.

Above the observatory rises an octagonal dome about 40 ft. high and containing three stories, the upper one being an observatory room 1,300 ft. above sea level. Over this observatory room is a copper dome 14 ft. in diameter and 12 ft. high, covered with gold leaf. The lighting of the pavilion is effected by means of a direct connected set consisting of a motor, alternator and exciter all mounted on one shaft. The chief engineer of the plant is Mr. C. A. Shaw, of Holyoke.

In the basement are the kitchen, store rooms, cold rooms, etc., as well appointed as in any modern hotel. In other parts of the basement are the heating apparatus and the toilet rooms. All partitions in the basement are fire-proof. The building has been planned to meet the requirements of the situation as made known by four successful seasons.

The prominent feature of Mt. Tom, however, is the view from the summit which is most diversified and extensive, comprising a sweep of from 35 to 50 miles in all directions.

The Mt. Tom Railroad Co. and the Holyoke Street Railway Co. while separate organizations have the same officers, Mr. William S. Loomis being president of both companies.

## THE ST. LOUIS WORLD'S FAIR.

The plans for the International Exposition to be held at St. Louis in 1903 are now well under way. This exposition is to be in celebration of the centennial of the Louisiana purchase, but the scope of the exposition will be such as to include both national and international features.

The territory included in the Louisiana purchase covers an area of 137,735 square miles, and contains at present a population of nearly 15,000,000 and a taxable wealth of over \$6,000,000,000. Letting of contracts aggregating about \$11,000,000 for construction work on the buildings and grounds of the exposition will begin about December 1st. About \$7,000,000 of this amount will be applied on the buildings and \$4,000,000 on the grounds. The site selected embraces the unfinished part of Forest Park. This portion of the park contains 668 acres, and about 300 acres of surrounding property will be added.

The ground plans for the exposition have been drawn up by a commission of architects in which every section of the country is represented. The site has been surveyed and the location of buildings and avenues staked off.

The work of directing the whole work of the exposition is considered too much of a task for one man and for this reason it has been divided between four chiefs of departments, namely: director of construction and maintenance, director of exhibits, director of concessions and admissions and commissioner general, the latter having charge of the accounts of the company.

The plan which will be pursued in the construction of buildings at the St. Louis exposition will be to let an entire building in a single contract, the contractor to have control of all the sub-contractors.

All the work in connection with the buildings will be under the direct charge of Mr. Isaac S. Taylor, of St. Louis, who is both the chairman of the committee of architects and the director of construction and maintenance. Mr. Taylor is a resident of St. Louis, one of its leading architects and has erected some of the most notable buildings in the city.

The plans for the main buildings to be erected first will be ready by November 1. The contracts will be extensively advertised and there will be no geographical restrictions on bidders.



## Late Street Railway Legislation.

### Wisconsin.

#### SHOOTING OR THROWING INTO CAR.

Chapter 84 of the Laws of Wisconsin of 1901 provides that any person who shall wilfully and maliciously discharge any gun, pistol or other fire arms, or throw any dangerous missile into any railroad or street railway car or train, upon which either passengers or employes are being carried, shall be deemed guilty of assault with intent to do great bodily harm under section 4377, Wisconsin statutes of 1898, relating to such assaults, and shall be punished in accordance with the terms of that section, upon complaint duly made by any passenger or employe present upon such car or train at the time of the assault.

#### MISCONDUCT ON STREET CARS PROHIBITED.

Chapter 165 of the Laws of Wisconsin of 1901 provides that any person who shall while riding upon any car of any street railway, use obscene or profane language in the hearing of other passengers, or who shall conduct himself riotously or boisterously to their annoyance or discomfort, or who shall otherwise be guilty of misconduct in violation of the rights of other passengers, shall be punished by a fine not exceeding one hundred dollars or by imprisonment in the county jail, not exceeding ninety days, or by both fine and imprisonment.

### Massachusetts.

#### CERTIFICATE REQUIRED BEFORE ROAD IS OPENED TO PUBLIC USE.

Chapter 368 of the Massachusetts Acts of 1901 amends section 141 of chapter 112 of the Public Statutes by making the same include street railways, so that it now reads: No railroad or street railway or branch or extension of a railroad or of a street railway shall be open for public use until the board after an examination, certifies that all laws relating to its construction have been complied with, and that it appears to be in a safe condition for operation.

#### MAY CARRY NEWSPAPERS AND UNITED STATES MAIL.

Chapter 254 of the Massachusetts Acts of 1901 provides that any street railway company established under the laws of this Commonwealth may act as a common carrier of newspapers in any city or town in which it is authorized to operate its railway, subject to such ordinances and by-laws as may from time to time be made by such city or town, and also subject to the provisions of chapter 73 of the Public Statutes "of common carriers and express companies," and of all other laws relating to common carriers; and may also carry the United States mail.

#### STREET RAILWAYS ON ROADS PROPOSED TO BE PLACED UNDER HIGHWAY COMMISSION.

Chapter 414 of the Massachusetts Acts of 1901 provides that if the selectmen of any town and the president of any street railway company shall make application to the Massachusetts highway commission, and with the application shall submit satisfactory plans, profiles and cross-sections of a road which the selectmen of the town, or the county commissioners of the county in which the town lies, have in writing requested the Commonwealth to take charge of, the Massachusetts highway commission shall indicate on such plans and profiles a location and grade for the tracks of said street railway company. If the Massachusetts highway commission consider the said road suitable for a state highway, and the said commission and the president of said street railway company shall agree as to the proportionate parts of the cost of constructing it that shall be paid by the state and by the street railway company, then the Massachusetts highway commission

is authorized to pay, out of the sums appropriated for the construction and repair of state highways, the agreed upon proportionate part of the damages sustained by any person whose property is injured by the construction of such state highway, and of the cost of grading said road to the lines established by the Massachusetts highway commission. Any highway graded under this act shall remain a town highway, subject to all laws relating thereto, until the said highway is taken charge of as a state highway by the Commonwealth.

#### PROVISION AS TO REGULATION OF FARES REPEALED.

Section 23 of chapter 578 of the Massachusetts Acts of 1898 giving to the board of railroad commissioners a somewhat restricted power of revision and regulation of street railway fares on petition of the board of aldermen of a city, or of the selectmen of a town, or fifty legal voters of a city or town, is repealed by chapter 180 of the Acts of 1901, which provides that hereafter all proceedings relating to regulation of fares upon street railways shall be had under the provisions of chapter 112 of the Public Statutes, "of railroad corporations and railroads," the provisions whereof, so far as they relate to the changes and regulation of fares, are hereby made applicable to street railways.

#### PENALTY FOR OBSTRUCTING STREET RAILWAY TRACKS.

Chapter 452 of the Massachusetts Acts of 1901 amends section 37 of chapter 113 of the Public Statutes by adding a new sentence and thus making the section read: Whoever wilfully and maliciously obstructs a street railway company in the legal use of a railway track, or delays the passing of the cars or railway carriages thereon, or aids in or abets such detention or delay, shall be punished by fine not exceeding five hundred dollars, or by imprisonment not exceeding three months. Whoever commits any of said acts in such manner as to endanger the life or safety of persons conveyed in or upon said cars or railway carriages, or aids or assists therein, shall be punished by imprisonment in the state prison for a term not exceeding ten years, or by fine not exceeding one thousand dollars.

#### MAY CONSTRUCT ROAD ON PRIVATE LAND IN CERTAIN CASES.

Chapter 503 of the Massachusetts Acts of 1901 provides that any street railway company heretofore or hereafter organized under the laws of this Commonwealth or in process of organization thereunder, having first obtained the approval of the aldermen of the city or selectmen of the town in which private land is situated to the construction of its railway thereon, may, for the purpose of avoiding grades and curves in a public street or way and for such other purposes incidental to the use of the public streets or ways as the board of railroad commissioners may in the manner hereinafter provided approve, petition said board for authority to construct and maintain parts of its railway and extensions thereof upon such private land outside the limits of such public ways. The company in such petition shall set forth the purpose for which such authority is desired in each case, and shall file with the petition a plan, in such form and upon such scale as the board may prescribe, of the proposed railway or extension, and of the localities where it is desired to construct the same upon private land, and said board, after public notice and a hearing, and if it is satisfied that public necessity and convenience demand that portions of the proposed railway or extension should be built outside the limits of public ways, substantially on the private land selected, and that the approval of the aldermen or selectmen of the city or town in which the land is situated has been obtained as aforesaid, may authorize the petitioner to construct and operate its railway upon and over private land, and for that purpose to purchase or lease private land or rights therein and thereover, in such cases and to such extent as the board is

of opinion that public necessity and convenience in the construction and operation of the proposed railway require. Said board in granting such authority may prescribe the kind of construction to be used, the grade and alignment of the tracks, and may order such special appliances to be furnished and such safeguards to be adopted in the construction and operation of the railway upon private lands as in its judgment regard for public necessity, convenience and safety may demand. No street railway hereafter constructed upon private land shall be opened for public use until the board, after an examination, certifies that all laws relating to its construction and all requirements of said board have been complied with, and that it appears to be in a safe condition for operation; and said board may, at any time after the opening of any street railway for public use, order such changes and improvements to be made in the construction and operation of any part of the railway located on any private land as in its judgment may be necessary for public safety in the use thereof; and such order shall be complied with by the street railway company. Except as provided in this act and in chapter 404 of the acts of 1898 providing that street railway companies may acquire land for the avoidance of grade crossings with railroads, and except for the purposes of reaching its car barns and repair shops, and of reaching and providing convenient terminals in parks and pleasure resorts situate upon the line of its railway, no street railway company shall, unless heretofore or hereafter authorized by special act of the general court so to do, construct or operate any part of its railway outside the limits of a public highway, street or bridge.

### Michigan.

#### NOT RAILWAY CORPORATIONS FOR INVESTMENT PURPOSES.

In Act No. 114 of the Public Acts of Michigan of 1901 relating to how the capital and funds of fire insurance companies may be lawfully invested it is stated that "street and electric railway corporations shall not be considered corporations within the meaning thereof."

#### UPON WHOM PROCESS MAY BE SERVED.

Act No. 208 of the Public Acts of Michigan of 1901 provides: Whenever in any suit or proceedings, either in law or equity, it shall become necessary to serve any process, notice or writing upon any corporation owning or operating any interurban electric railway in the State of Michigan, it shall be sufficient to serve the same upon any station agent, or ticket agent, at any station or depot along the line or at the end of the railroad of such company, or upon any conductor upon any of the cars of such company along the line of or at the end of the railroad of such company, and such service shall be deemed as good and effectual as if made on the officers, stockholders or members, or either of them, of such company: Provided, That the modes of service herein provided for shall be in addition to these already in existence: And provided further, That the provision for service upon conductors of electric railways shall not apply to conductors on electric railways operating within the limits of incorporated cities.

#### WHEN STREET RAILWAYS MAY BE CONSTRUCTED ON PUBLIC HIGHWAYS.

Act No. 238 of the Public Acts of Michigan of 1901 amends article 2 of chapter 164 of the compiled laws of 1897 by adding thereto a new section, No. 51, as follows: When any corporation is organized under this act for the purpose of constructing, maintaining and operating a street, suburban or interurban railroad, whose cars shall be operated by motive power other than steam engines, such railroad may be constructed upon any public street, lane, alley or highway of any village on such terms and conditions as shall be agreed upon between the railroad company and the village board of such village; and such railroad may be constructed upon any public street, lane, alley or highway of any township on such terms and conditions as shall be agreed upon between the railroad company and the commissioners of highways

of such township: Provided, The railroad company shall have obtained the consent to the construction thereof of two-thirds of the owners of property adjoining the roadbed of such railroad in such township; and if such consent from any owner cannot be obtained by agreement, then for such consent compensation shall be made by the railroad company to such owner, which shall be ascertained as herein prescribed for obtaining property or franchises for the purpose of its incorporation.

#### IMPLEMENTS AND CONVENIENCES REQUIRED ON LONG LINES.

Act No. 178 of the Public Acts of Michigan of 1901, entitled "An act to secure safety and comfort for persons traveling on suburban and certain street railways," provides: Section 1. That every railroad company or railway company operating a suburban railroad or railway, or operating any street railroad or railway except a street railway, the greater part of whose railroad or railway is without the limits of an incorporated city or village, shall provide and carry at one end of each and every car owned or used by such company for the convenience and carriage of passengers, a good and serviceable axe of not less than three pounds weight, properly sharpened, provided with a proper helve or handle, and at all times in condition for immediate use; also a good carpenter's saw with not less than twenty-four inch cut, also properly fitted and at all times in condition for immediate use; each of which implements shall be suspended by brackets or straps upon the inside of each car near the door thereof and within easy view, reach and access of passengers occupying such car. Such railroad company or railway company shall also provide and carry in each car a suitable water tank of reasonable size, and keep and maintain therein a reasonable supply of wholesome water for drinking purposes for the use of passengers in such car. Such railroad company or railway company shall also provide, maintain and keep in proper condition upon each passenger car a suitable water closet with proper conveniences for the uses of the passengers traveling upon such car; Provided, That such closet shall not be allowed to be opened or used while said car is within the corporate limits of any city or village.

Sec. 2. In case any suburban or street railway companies or corporations shall run any train of cars or any car within the limits of this State for the carrying or transportation of passengers, and upon which passengers are transported in violation of any of the provisions of section one of this act, it or they shall be liable to a penalty of fifty dollars, and costs of prosecution for each and every train and car so run, to be sued for in the name of the people of the State of Michigan, and such suburban or street railway company or corporation shall also be liable for all damages which shall be sustained by any person by reason of such neglect: Provided, That this act shall not apply to any street railway or suburban road that is less than twenty miles in length from terminus to terminus.

#### PROVISIONS FOR CONSOLIDATION.

Act No. 143 of the Public Acts of Michigan of 1901 provides: Any street or electric railway company in this State whose line of road, constructed or being constructed, forms or will form a continuous or connecting line with that of any other company or companies within, without or partly within and partly without this State, may consolidate with such other company or companies: Provided: That no such consolidation shall be made between companies owning competing lines. The directors of said two or more corporations may enter into an agreement for the consolidation of such corporations, prescribing the terms and conditions thereof; the mode of carrying same into effect; the name of the new corporation; the number of directors thereof, and the names of those who shall be the first directors, which number shall not be less than three nor more than thirteen, and who shall hold until the first election; the time and place of holding the first election of the consolidated company, which time shall not exceed six months after such consolidation; the number of shares of capital stock in such new company; the amount of each share; the manner of converting the shares of capital stock; in each of said two or more corporations into shares in such new corporation; and such other



details as may be deemed necessary to perfect such consolidation or authorize or limit its bonded indebtedness. Such agreement shall not be deemed to be the agreement of such two or more corporations until it shall have been ratified by a majority in interest of the stockholders in each of said companies, at separate stockholders' meetings of such companies, to be called, upon a notice published at least once each week for two successive weeks, in some newspaper published in each county in this State through which said road runs, the first publication to be at least twenty days before the time specified for said meeting, said notice to be signed by the secretaries of each of said companies proposing to consolidate, and shall state the object and purpose of such meeting. Provided however, That if all the stockholders of said company or companies organized under the laws of this State shall sign and acknowledge said agreement, no meeting and no advertising shall be necessary in this State. Upon such ratification of the agreement the same shall be deemed to be the agreement of the said two or more corporations, and the same, together with a copy of the vote of ratification by the nonresident company, as shown by its record of such vote, certified to be such copy by its president and secretary, shall be filed in the office of the Secretary of State, and thereupon said consolidation shall be deemed complete. Any copy of such agreement and copy of proceedings so filed, certified by the Secretary of State to be such copy, shall in all courts and places be presumptive evidence of the consolidation of said companies and all of the facts therein stated. Such consolidated company shall have all the powers, rights and privileges possessed by said company or companies organized under the laws of this State, and shall be subject to all restrictions and perform all the duties imposed upon it by law.

#### North Carolina.

##### VESTIBULE FRONTS AND FENDERS REQUIRED.

Chapter 743 of the Public Laws of North Carolina of 1901 provides: Section 1. That all city and street passenger railway companies be and they are hereby required to use vestibule fronts, of frontage not less than four feet, on all passenger cars run, manipulated or transported by them on their lines during the latter half of the month of November and during the months of December, January, February and March of each year: Provided, that said companies shall not be required to close the sides of said vestibules: And provided further, that said companies may use cars without vestibule fronts in cases of temporary emergency in suitable weather, not to exceed four days in any one month within the period herein prescribed for use of vestibule fronts. Any city and street railway company refusing or failing to comply with the requirements of this section shall be subject to a fine of not less than ten dollars or more than one hundred dollars for each day. The North Carolina Corporation Commission is hereby authorized to make exemptions from the provisions of this section in such cases as in their judgment the enforcement of this section is unnecessary.

Sec. 2. That all city and street passenger railway companies be and are hereby required to use practical fenders in front of all passenger cars run, manipulated or transported by them, and any company refusing or failing to comply with said requirement shall be subject to a fine of not less than ten dollars or more than one hundred dollars for each day. The North Carolina Corporation Commission is hereby authorized to make exemptions from this provision of this section in such cases as in their judgment the enforcement of this section is unnecessary.

#### Pennsylvania.

##### MAY HAVE PRIVATE POLICEMEN.

Act No. 246 of the Laws of Pennsylvania of 1901 provides, That any corporation chartered under the laws of this Commonwealth as a street passenger railway, and owning or operating the same in said Commonwealth, may apply to the mayor of any city on the streets of which said railway is operated, or the burgess of any borough where said railway is being operated, or any justice of the peace residing in a township through which said railway shall

run or pass over, to commission such person or persons as said corporation may designate to act as private policeman for said corporation. That said officials, mentioned above, upon such application, may appoint such persons, or so many of them as he may deem proper, to be such policemen, and shall issue to such person or persons so appointed a commission to act as such policeman.

Every policeman shall, before entering upon the duties of his office, take and subscribe the oath required by the seventh article of the Constitution, before the recorder in the county in which he was appointed; which oath, after being duly recorded by such recorder, and a certified copy of such oath, made by the recorder of the county, shall be recorded, with the commission, in the county in which such policeman was appointed, and in which it is intended such policeman shall act; and such policemen, so appointed, shall severally possess and exercise all the power of policemen in the county in which they shall be so authorized to act, as aforesaid; and the keepers of jails and lock-ups in station houses in said county are required to receive all persons arrested by such policemen for the commission of any offence against the laws of this Commonwealth, upon the cars or premises of any such corporation, to be dealt with according to law.

Such corporation police shall, when on duty, severally wear a metallic shield, with the word "police" and the name of the railway corporation for which appointed inscribed thereon, and said shield shall always be worn in plain view, except when employed as detectives.

The compensation of such police shall be paid by the corporation for which the policemen are respectively appointed, as may be agreed on between them.

Whenever any corporation shall no longer require the services of any policeman, as aforesaid, they may file a notice to that effect under their corporate seal, attested by their secretary, in the office where the commission of such policeman has been recorded, which shall be noted by the recorder upon the margin of the record where such commission is recorded, and thereupon the power of such policeman shall cease and be determined.

#### CONSOLIDATION AT UTICA.

A consolidation has been effected of the five street railway systems in Utica and the Mohawk Valley, some of which are in operation and others in the course of construction. The name of the new consolidated company is the Utica & Mohawk Valley Railway Co., and it is capitalized in the neighborhood of \$3,000,000. The lines which have gone into the consolidation are the Utica Belt Line & Suburban, Utica & Mohawk, Utica & Deerfield, Oneida Street Railway and the Mohawk, Ilion & Frankfort Railroad. When work on the lines now under construction is finished all the roads will be connected, forming a complete line between Utica and Little Falls, a distance of 22 miles. The roads mentioned are at present controlled by practically the same parties who will make up the consolidated company.

#### EAST RIVER TUNNEL PLAN.

Plans for the proposed new East River tunnel have been filed with the Rapid Transit Commission by President Baldwin, of the Long Island Railway Co., in behalf of the Long Island Railway Extension Co. The tunnel will start from a point near Broadway and 45th St., passing under Seventh Ave. to 33d St., thence to the East River and into Long Island City. The plans represented an outlay of \$5,000,000 for a double-track tunnel for the entire length for carrying both freight and passengers. The applicants bind themselves to begin work on the tunnel thirty days after the franchise shall be granted and to complete it four years after the work is commenced. The applicants state they are willing to pay the city 3 per cent of the gross receipts of the road or any reasonable amount that the commissioners might think proper to stipulate. The motive power for the road is specified as other than steam. The Long Island Railroad is now controlled by the Pennsylvania Railway Co.

The Colonial City Traction Co., of Kingston, N. Y., has changed its name to the Kingston Consolidated Railroad Co.



## Toledo, Fremont & Norwalk Railroad.

The Toledo, Fremont & Norwalk Railroad Co., whose property has just been purchased by the Everett-Moore Syndicate, of Cleveland, O., and made a part of its Lake Shore Electric Railway system, comprising all the electric lines between Cleveland and Toledo, was incorporated Sept. 12, 1899, under the laws of Ohio, with \$1,500,000 capital. The original promoters of this line were S. F. Angus, Henry A. Haigh, W. B. Comstock, W. A. Comstock and A. W. Comstock, all of Detroit.

The franchises from the different counties, and the several cities and towns along the line were secured by Messrs. Angus and Haigh, and afterwards assigned to the company. These franchises are liberal and comprehensive, including the right to carry freight,

and the electric mechanism for operating the derails were illustrated in the "Review" for October, 1900, page 604. Near Bellevue is an overhead crossing with stone abutments and steel superstructure. The other crossings are at grade and are protected by derauling switches in the tracks of the electric line, operated by the conductors.

Toledo is the western terminus of the line and entrance to that city is secured over the tracks of the Toledo Railways & Light, also owned by the Everett-Moore Syndicate, under a contract running during the life of the present Toledo franchises and all renewals. From Toledo the route is southeast to Genoa, 13 miles, where it turns to the south to Woodville, 3 miles. Woodville is



MAP OF THE LAKE SHORE AND CONNECTING ELECTRIC RAILWAY SYSTEMS.

Heavy lines indicate Everett-Moore railways.

Dotted lines indicate roads now building.

Light lines indicate connecting railways.

express and United States mail, as well as passengers. In addition to the franchises, the company owns and occupies a private right of way for about 14 miles of the 62 miles of its total length, and it also owns considerable real estate in fee or occupies it under license which is used for its power house, sub-stations and car barns, or in connection with its railway crossings for the purpose of avoiding sharp curves.

On the way from Norwalk to Toledo, the Toledo, Fremont and Norwalk road crosses the line of 12 steam railroads, under perpetual crossing agreements. At Millbury an underground crossing of the Lake Shore & Michigan Southern was made at a cost of \$25,000 for two abutment and steel structure. At Genoa and at Fremont the Lake Shore crossed at grade, the crossing being protected by electric interlocking plants installed by the Taylor Signal Co. of Buffalo and Chicago; the layouts of these crossings

the center of a great region of oil wells, including some of the most productive of the state.

At Woodville the road enters upon the Maumee & Western Reserve Turnpike, which it follows for a distance of 32 miles. This turnpike, which is 120 ft. wide, has a macadamized road-bed of crushed limestone, unsurpassed in excellence and is one of the old thoroughfares over which many thousands of emigrants made their way to the west. The strip 120 ft. wide was granted by the Indians to the United States government in the latter part of the eighteenth century, and was improved with corduroy and used for military purposes. In 1822 the road was conveyed to the state of Ohio, together with land for a half mile on each side, the proceeds of which were to be used to improve the road; this purpose was carried out, and for over half a century the state retained control of the highway. About 1878 the state

transferred the road to the counties through which it runs. When the counties having jurisdiction granted a right of way over this turnpike to the Toledo, Fremont & Norwalk Company, the attorney general brought suit to prevent the electric line building under the grant. The decision in this case, State of Ohio ex rel. Attorney General v. Toledo, Fremont & Norwalk Railroad Co., was decided by the Supreme Court of Ohio in December, 1899, the court holding that an electric railway is not an additional burden on the fee and that the counties had the right to grant the use of the turnpike to electric railway companies. The electric railways of the state are under deep obligation for the work done by the



POWER HOUSE AND SHOPS AT FREMONT.

Toledo, Fremont & Norwalk Co. in successfully defending this suit.

After leaving Woodville the route crosses the Portage River on a steel bridge built by the Massillon Bridge Co., and continues southeasterly in straight line past the villages of Gibsonburg, Hessville and Lindsey to Fremont which is the head of navigation on the Sandusky River and finely located in the midst of a rich farming community. From Fremont the route continues along the turnpike to Clyde and Bellevue, the latter town being reputed to be the richest, per capita of population, in the state. Bellevue is the eastern terminus of the Maumee & Western Reserve Pike but the electric road continues in practically the same direction to Monroeville where the Huron River is crossed on a steel bridge built by the company. From here the route is along the highway to the city limits of Norwalk, where junction is made with the Sandusky, Milan & Norwalk Electric Ry.

Originally the urban population tributary to this line was as follows:

City of Toledo .....	173,000
Village of Millbury .....	500
Village of Genoa .....	1,000
Village of Woodville .....	1,200
Village of Hessville .....	200
Village of Gibsonburg .....	2,000
Village of Lindsey .....	600
City of Fremont .....	12,000
Village of Clyde .....	2,700
Village of Bellevue .....	5,000
Village of Monroeville .....	1,900
City of Norwalk .....	10,000

Total .....

Now as an integral part of the Lake Shore Electric Railway, connected with the Sandusky & Interurban road and the Lorain & Cleveland Railroad, its eastern terminus becomes Cleveland, and the urban population tributary to it swells to 1,000,000. The intervening county is also thickly settled and at places along the pike buildings are so frequent as to give the appearance of a village street. At Woodville, Genoa, Fremont, Clyde, Bellevue, Monroeville and Norwalk the electric line connects with steam railroads, and it has been observed that a great deal of traffic comes to the electric road from the steam lines which it intersects.

The line from Fremont to Toledo was opened for traffic Sept. 8, 1900; to Bellevue, Nov. 8, 1900; to Monroeville, Jan. 8, 1901, and to Norwalk, May 1, 1901. The freight traffic was inaugurated Jan. 2, 1901, and has grown enormously, the receipts therefrom amounting to about one-tenth the gross earnings of the road.

The principal distances are: Within the City of Toledo, 3 miles; city limits of Toledo to Fremont, 30.5 miles; city limits of Toledo to Norwalk, 60 miles. The track is laid with 75-lb. steel rails on cedar, hemlock and white oak ties and rock ballasted. Besides the underground and overhead crossings of the Lake Shore, bridges were built at Woodville, at Green Creek, at Norwalk and at Monroeville; the last named three spans of 140, 76 and 75 ft. respectively, and was built by the Massillon Bridge Co., of Toledo.

The overhead lines are carried on cedar poles 35 ft. long and 7 in. at the top, set 100 ft. apart with a rake of 6 in. The trolley wires (double) are carried on Wood flexible brackets which have 1/2-in. iron rods for the main guys; the brackets and other line material, excepting the wire, were supplied by the Ohio Brass Co. The trolley wire is the Roeblings No. 000, figure 8 section. Garton lighting arresters are placed on the poles every half mile.

The poles also carry the high-tension transmission lines, bare direct current feeders and two No. 10 galvanized iron wires for the telephone connections. The high-tension lines are of No. 2 hard drawn copper wire, and extend west from Fremont to Hayes sub-station, and east from Fremont to Monroeville; these lines are given a one-third transposition each half mile.

The feeders are as follows: No. 0, Clyde to Bellevue; No. 00, Bellevue to Monroeville; No. 000, Clyde to Fremont; No. 0000, Hayes sub-station to Genoa; 250,000-c. m. Fremont to Hessville; 400,000-c. m. Hessville to Genoa.

The rolling stock comprises 22 passenger cars, 3 freight cars, 1 work car, 2 flat cars and 1 snow plow. The passenger cars were built by the Barney & Smith Co. and are 42 ft. 2 1/2 in. over all, 8 ft. 8 1/2 in. wide; from the rails to the car sills 41 in. The trucks have a wheel base of 6 ft. 10 in. and are placed 28 ft. 3 in. center to center; the wheels are 36 in. in diameter, made by the Griffin Car Wheel Co.

Originally the rear truck only of each motor car was equipped with two Westinghouse No. 76 motors, but this equipment is now being doubled by the new owner, the front truck of each car being fitted with two motors like the rear one. The cars are run always in the same direction; the controllers are the General Electric K 13. The work car, which is also used as a locomotive, is equipped with four 75-h. p. motors. All the cars are equipped with air brakes with motor driven air compressors. The passenger cars have Sterling fare registers, and "Mighty Midget" hot water heaters made by W. C. Baker, of New York.

The power station, of which exterior and interior views are



INTERIOR OF MAIN POWER HOUSE.

shown in our illustrations, is located at Fremont and is an extremely well built structure of brick with slate roof. Its equipment included the following: Five Babcock & Wilcox vertical header type boilers of 16 sections, nine 18-ft. tubes per section, furnishing steam at 155 lb. per gage; the boilers are equipped with mechanical stroke. Coal and ash handling plant with a capacity of 25 tons per hour. Four Westinghouse 500-kw. triphase alternators wound for 390 volts, each direct connected to a 21 1/2 and 37 by 22-in. vertical compound condensing engine running at 214 r. p. m. capable of an ultimate output of 1,350 h. p. at 150 lb. steam and 28 in. vacuum. Two exciter units consisting of Westinghouse 30-

kw. engine type generators direct driven by compound engines. Two elevated jet condensers with dry air pumps. An economizer of 320 pipes, 4 in. by 10 ft., is placed between the boiler and the stack, which is 7 ft. in diameter and only 32 ft. long. A Wefugo water treating plant which has a capacity of 60,000 lb. of water per hour. One 900-h. p. feed water heater used for the auxiliary apparatus. Draft is furnished by two slow speed fans.

The feed water for this plant is pumped from the Sandusky River, which is turbid at all seasons of the year and the water contains enough soluble impurities to make it expensive for use in steam boilers. An analysis of this water made in February, 1901,



INTERIOR OF REPAIR SHOPS.

showed it contained the following impurities, given in grains per U. S. gallon:

Silica .....	1.50
Oxide of iron.....	1.30
Carbonate of lime.....	7.50
Sulphate of lime.....	3.16
Sulphate of magnesia.....	5.45
Chloride of soda.....	2.63
Total .....	21.54

It was decided to put up a purifying plant to remove as far as possible the soluble and suspended impurities from the water before it entered the boilers, and a chemical precipitating method was chosen because it is possible by this means to reduce the amount of soluble lime salts to fractions of a grain per gallon, at a very reasonable cost. The apparatus adopted is the intermittent water softening plant designed and erected by the Wefugo Co., of Cincinnati. The plant has a capacity sufficient to purify 42,000 lbs. of water per hour, and consists of two precipitating tanks, each 19 ft. inside diameter by 19 ft. 6 in. inside depth; these tanks are equipped with necessary apparatus to agitate the water, and with inlet and wash pipes and a floating outlet or discharge pipe. From these tanks the water flows by gravity into a cement sand filter. The chemical purification of the water takes place entirely in the tanks and the filter is only used for the clarification, or mechanical purification of the water, by the removal of the suspended matter which did not settle while the water stood in the tanks.

The cement cistern is 7 ft. in diameter by about 7 ft. deep, provided with a filter-bed of graded sand about 3 ft. deep, resting on top of a nest of piping, provided with brass strainers; a revolving rake is used to agitate the sand-bed when it is cleaned, and this is operated by an electric motor.

The operation of the plant is extremely simple. The tanks are filled alternately with condensing water pumped from the hot well of the siphon condensers; while a tank is filling, the chemical reagents used, which in this plant are lime and soda ash, are put in the tank, and the water agitated by means of the paddles; by the time the tank is full the agitation has been sufficient to perfect the chemical reaction, and the stirring device is stopped. The scale forming impurities which have been precipitated, settle to the bottom of the tank, carrying with them a large proportion of the mud and silt which the river water contains. The tanks are of such a size that the water has still sedimentation of at least three hours, and during this time 90 per cent of the suspended impurities settle in the tanks, and by the time water is drawn from

this tank to the filter not over 10 per cent of the suspended matter remains in it. The filter removes this 10 per cent by mechanical filtration, and the water goes to the boilers perfectly clear and very low in scale forming impurities. Frequent chemical analyses have been made and in a number of instances the lime (CaO) is reduced to 0.6 grain per gallon, and the magnesia (MgO) to 0.7 grain per gallon.

The boilers are kept clean without the use of a boiler compound or tube cleaning machinery, and the heater is run six months between washings. The boilers are washed every four weeks. The amount of time required to operate this purifying plant is extremely small, and of course very much less than the time which would be necessary to clean the boilers and the heater, if this plant were not in use.

The Wefugo Co. has also installed one of its water purifying plants at the power station of the Detroit & Pontiac Ry., Birmingham, Mich., which road is now a part of the Everett-Moore system.

The main switchboard consists of four alternating current feeder panels. Seven 400-kw Westinghouse transformers which raise the voltage from 300 to about 15,500 are located on a balcony at one side of the engine and generator room and below them is the high tension switchboard. The sub-station switchboard in this station, which is similar to those in the other sub-stations, consists of two alternating current rotary panels, two direct current rotary panels and two direct current feeder panels.

Sub-stations, which are brick and stone buildings with slate roofs, are located at Hayes (3 miles east of the city limits of Toledo), Genoa, Hessville, Fremont (main power station), Clyde, Bellevue and Monroeville. The equipment of each of these comprises two 200-kw. rotary converters, three 150-kw. step-down transformers and the switchboards.

Freight and passenger stations are located in Toledo, Genoa, Hessville, Fremont, Clyde, Bellevue, Monroeville and Norwalk, rooms in the sub-stations at Genoa, Hessville and Monroeville being set apart for this purpose.

The car house and repair shop occupy a large brick building at Fremont near the main power station. The car house has 4 tracks accommodating 5 cars each. In the shop are 3 repair tracks and 1



PURIFYING PLANT—WEFUGO CO.

pit track. The machine shop contains a planer, 30x30 in. by 14 ft.; a shaper, 16 in.; engine lathes, 26x44 in. by 14 ft. and 12 in. by 6 ft.; wheel press, drill press, sensitive drill, hack saw, tool grinder, emery wheels, etc., which are driven by a 25-h. p. 500 volt motor.

The rate of fare for short distances was fixed, at as near as may be 2 cents per mile, but for long hauls it is less than this, the cash fare from Toledo to Norwalk, 65 miles, being 95 cents. Single trip tickets are sold at a slightly reduced rate, 85 cents from Toledo to Norwalk, the steam road fare being \$1.60. Mileage books are sold at \$6.50 for 500 miles and \$12.00 for \$1,000 miles, and probably a 2,000 mile book will be offered for \$20.00.



The road can hardly be said to be in full operation even now, yet its earnings for the last three months, or since the rails have been laid through, have been remarkable, considering the difficulties of operating a new road before its construction is quite finished. They have been as follows: June, \$15,232.88; July, \$16,390.13; August, \$19,385.27; total, \$51,008.28, or at the rate of over \$200,000 per annum. The traffic which has produced these earnings has been entirely local, but now since the road has been connected with the other roads to make the Lake Shore Electric Railway, it will get the benefit of the great amount of through traffic from Cleveland to Toledo and Detroit, and its earnings may be expected to increase enormously.

The road was sold by the original promoters and delivery made to the Everett-Moore syndicate, on August 10th last, and the new owners began at once to reballast the track, reduce grades, take out curves and strengthen the bridges. The syndicate will spend \$500,000 in bringing the Toledo, Fremont & Norwalk up to the standard of its other roads, and it is expected that the Lake Shore Electric will be the first electric railroad in the world to operate buffet parlor cars and sleepers.

The operating corps of the Toledo, Fremont & Norwalk has been retained by the new owners, Mr. F. J. Stout, formerly general superintendent of the Wheeling & Lake Erie Railroad, who had been general manager, being made general superintendent of the Lake Shore Electric system.

### TRACK BONDING.

BY ALFRED GREEN, MASTER MECHANIC ROCHESTER RAILWAY CO.

Track bonding, or the negative side of a street railway circuit, has been a subject of a great deal of controversy. In my opinion, it has been similar to a child that was born a cripple, for every few months there has been a consultation of doctors as to what was best to do. It has also passed through the different stages of whooping cough, scarlet fever and measles, and has grown to an age where it has become unhealthy and weak. In my opinion, the subject is not one of complications, but one that needs a little common sense, in order to make it a success.

We, indeed, would be surprised at anyone writing an article on our positive or feeder circuits, because we know that by putting up wire of the necessary cross section, and making a proper joint, we can figure our loss for anything we may require, but with the negative, or return, side of our street railway circuit it has been a different subject entirely, all because too much stress has been placed upon one point, and that is, the amount of carrying capacity we have in the rail itself.

We have never taken into consideration that the serious part of this is, that the rail is broken every 30 ft., or, with our last type of rail, every 60 ft., and to make this joint perfect as to its conductivity, we have tried all manner of schemes, but I want to say right here, that as far as my experience is concerned, we are not as far advanced in regard to this matter as we were ten years ago. At that time they used a copper bond, riveted around the fish-plate. The bond was then attached to a supplementary wire that ran along the rail to the power house. This our theoretical electrician considered a waste of copper, which meant a great deal of money, but the only mistake that was made was that the supplementary wire was not large enough. But we passed from that stage to the iron rivet with the iron wire wrapped around the rivet head, then came the channel pin with the slot for holding the wire, and from that to the copper bond behind the fish-plate, if it were possible to put it there, and added to that was the plastic bond. But with all of those supposed improvements in regard to the bond, it is self-evident that they are not a success, or else there would not be the amount of controversy that there is today in regard to track bonding. Furthermore, it is impossible to make a bond that will be a success, especially in paved streets, where the pavement has to be taken up to examine the joints and give them the proper amount of care.

The bond of today, no matter whether it is a copper or a plastic bond, is a luxury, for the former will corrode, the plastic bond will

harden, break and fall out, the joints will become loose, and by so doing the resistance of the joint will be increased.

In all past experience it has proved that we have placed too much reliance on the amount of material in the rail for carrying this current back to the power house. If this rail was continuous, then we would not need the bond, and the different subjects written upon the ground return would be entirely unnecessary. It was very amusing a short time ago to read an article in one of the electrical papers, where some good soul had written to the paper, and told it how he had run a supplementary wire beside the rail, and what great success he had had with it. In the next column of the same paper were the comments of the different bond manufacturers, in which they tried to prove how foolish the writer was to spend so much money on a return circuit by using a continuous wire, whereby if he had used a bond, whether copper or plastic, he would have gained some splendid results without the extra cost. Such, however, is true to a certain extent, could we have all of the rail joints exposed, so that they could be examined at short intervals, tightened and properly taken care of, if we could have them where they are not exposed to the rain water, and filth of the street. If we could have them where it was impossible for them to corrode, if plastic, so that it would not harden, disintegrate and break, then there is no doubt in my mind but what the theory advanced would be a perfect success, but the tracks of a street railway company are not so situated. They are exposed to the heat and the cold, which causes expansion and contraction, and, as I have said before, they are exposed to the dirt, slush and mud, which causes corrosion, and every time that a car passes over a joint it must stand the pound of the weight of the car and its equipment, and until the time that the rail is made practically continuous there is no bond made, or ever will be made, that will give the necessary satisfaction. Furthermore, the negative side of a street railway circuit should, in reality, be better than the positive side, for the simple reason that you have the loss in your feeder, and the fall of potential through your motors, therefore you have not got the same e. m. f. to send that current back to your generator that you had to send it out over your line to the motors.

Theory is a very good thing in its place, but how often has it failed in practice. Several years ago a long article was written on the resistance of long and short bonds, which, in one sense, was very good, for we know as we increase the length of a lead we also increase the resistance. Furthermore, we know that the shorter the bond, the nearer the end of the rail we must attach the same, and nearer the point of vibration.

Thousands of dollars have been spent upon this bond system, and with all of our years of experience we are practically no further advanced than we were years ago, and in order to get the results that we desire we must do one of two things. Either make the rail itself continuous, something that can be done in paved streets by electrical welding, or else come to a continuous copper circuit without running the risk of broken joints. There is no doubt in my mind but that we will come yet to a supplementary wire, perhaps run a tile duct beside the rail, and have enough connections to that rail to make the circuit complete under all circumstances. If we would use a copper wire wherever that wire is attached to the rail, both wire and rail could be amalgamated, so that there is no possible chance for corrosion. I can not, and never will, believe that you can bond the joints of the rail, no matter what cross section that rail may have, so that it will be a perfect success, and until we get out of our present way of doing things there will always be an opportunity for controversy. We must make the negative side of our circuit just as complete as our positive side, and when we do that we will wonder why we have not saved the many thousands of dollars that have been spent in trying to utilize that which has cost all street railway companies no end of trouble. So in my opinion, no matter what theorists write in regard to this subject, we will still have to get down to good, hard common sense, and do that which we know will be a success.

Recent announcements have been made to the effect that the proposed Milwaukee, Burlington & Lake Geneva elevated railway, for which franchises have been obtained in Milwaukee, will make connections with Chicago lines at Waukegan. John L. O'Connor, attorney for the company, is quoted as stating that surveys for the line will be begun at once.

\* Paper read before the New York State Street Railway Association at Rochester, Sept. 10, 1901.

# STORAGE BATTERIES IN ELECTRIC POWER STATIONS CONTROLLED BY REVERSIBLE BOOSTERS.—II.

BY J. S. HIGHFIELD.

Continued from page 480

The only way to work a battery on a tramway or other variable load to keep the generator output constant, to fully charge during working hours, and to discharge up to its momentary rate, is to use some device to compensate for the variation of the battery pressure. For this purpose I have used a booster of somewhat special design, the booster armature being always in series with the battery. This machine is run throughout the time the generators are working, and sometimes when the battery alone is working the line. The essential connections are shown diagrammatically in Fig. 7. The booster *B* has laminated field magnets, excited by a fine wire coil *c* (the exciter coil), consisting of such a number of turns of such resistance that the pressure given by the armature when run at constant speed is the same as the pressure across the ends of the exciter coil. The exciter *E* is a small generator giving 500 volts, and the necessary exciting current. This generator has a very small drop from no load to full load, which drop is corrected for by a series winding; its armature leads are coupled, one to the battery negative terminal, the other (the positive) to the positive battery terminal, by way of the exciter coil *c*. So long as the exciter and battery pressures are equal, no current will flow in the exciter coil, and hence the booster will give no pressure, but should the battery volts rise a current will move in *c* proportional to the difference of the pressures of the battery and of the exciter (which will be motored). The booster armature will then give a pressure equal to the rise of the battery pressure. Similarly, should the battery pressure fall, the booster will give a pressure equal to the fall, but will have its poles reversed, the exciter running as a generator and giving current to the battery. The booster therefore follows the variations of the battery pressure from the line pressure, and corrects for the variations, so as to maintain the line pressure constant whether the battery be charging or discharging. Generally, as will be readily seen, the exciter runs as a motor when charging, and as a generator when discharging, but since only 240 cells are used, occasionally, when the cells are low, charge begins at a less pressure than the 520 volts on the line, the booster then runs as a motor, and the motor as a generator, returning energy to the line; also when the battery is fully charged, the pressure is generally greater than the line pressure. Should the battery in this condition be called on to discharge, the booster opposes the discharge, and is motored; the motor then runs as a generator, and again returns energy to the line. The current variations in the motor amount to about 7 per cent of the maximum line variation. The booster fields being laminated, and being designed to work at a low induction so that the field strength is as nearly as possible proportional to the magnetising force, the change of polarity is rapidly made, and the booster pressure varies very closely as the difference between the battery and exciter pressures. Such a booster connected in series with the battery will serve to maintain nearly constant the load on the generator, as it will nearly correct for all changes in the battery pressure. There will be times, however, when the current through the booster armature is large and the field very small; the armature reaction will then be an important factor in the workings of such a machine. To overcome this, a coil connected in series with the armature is used, so that it opposes the reaction of the armature in whichever direction the current flows: this coil consists of a few turns only. In order to increase the pressure as the load on the line increases a part of the feeder current is shunted round a coil on the booster field in such a direction as to help the discharge or to oppose the charge, or a part of the feeder current may be taken round the exciter fields so as to raise the exciter pressure, or a part of the feeder may be taken round the motor fields, so that the greater the load becomes the greater is the motor speed, and hence also the exciter and booster pressure in the discharging direction. In working with shunt-wound generators there is a tendency for the motor hunt, so that as the line load increases the battery does more than its share, the pressure therefore rises, and

the motor runs faster; the booster pressure increases and the exciter pressure, and hence the tendency is to take still more load; a similar action occurs as the line load falls off. I have overcome this trouble by designing the motor so that an increase in pressure at its terminals strengthens the field in a greater proportion than usual by designing the motor field on the same lines as the booster field; the result is entirely to check the hunting. The switch gear used with the booster is shown in Fig. 7. The switch, *s* connects as shown on the diagram: in its upper position the battery is directly on the line, in the lower position the battery is connected through the booster armature; *F* is a shunt-breaking switch and fuse in the exciter circuit. This booster is used in series with the battery at all times when the plant is running, or when regulation is necessary when the battery alone is driving the load. The curve, Fig. 8 shows the results obtained. The curves shown are for a Fri-

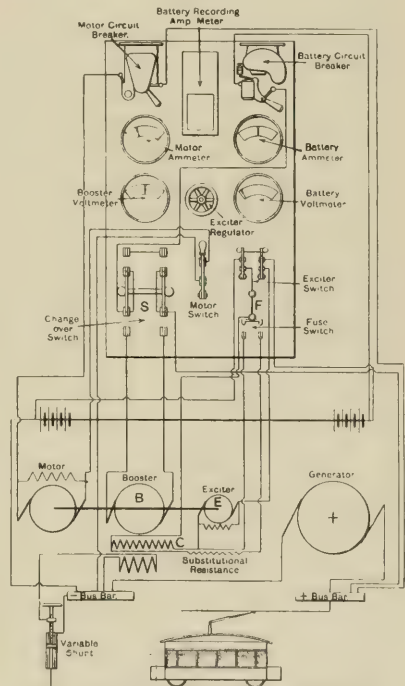


FIG. 7.—DIAGRAM OF BOOSTER CONNECTIONS.

day load, and indicate the working when the variations of the load are most violent. The curve was plotted from readings taken on Elliott's Weston instruments, one observer reading each instrument. After operating the line from 11 p. m. on Thursday night, the night load consisting of late cars up to 1 a. m., and about 50 h. p. of motors at a colliery, and the early cars from 4:30 a. m. to 6:30 a. m. on Friday morning, a 125-kw. shunt-wound unit was connected, and run at full load till 2 p. m., the battery during the time from 6:30 to 8 a. m. gaining a certain amount of charge; from 2 p. m. a 215-kw. shunt-wound unit took the load running with from 300 to 350 amperes, the battery gaining in charge till shutting down at 11 p. m., when it ended fully charged. The figures relating to the day's work are as follows:—

Units generated amounted to	2,119
" to line "	2,045
Battery charge "	272
" discharge "	318
Used by booster motor	66
Maximum load on line	382kw.
Minimum "	20kw.

There is some difficulty in accurately metering the battery units,

owing to the violent changes in the strength and direction of the current. The above figures were obtained from two Thomson-Houston watt-hour meters in series, provided with pawls to admit of revolution in one direction only. The generator units were measured on an Aron meter, and the booster and line units on Hookham meters.

From March 2nd to March 31st the figures obtained were as follows:—

Units generated..	65,615
" sent to line	61,605
" used by booster	2,034
" charge	10,517
" discharge	8,560

Giving the following percentages:—

Units sold to units generated.....	94	per cent.
Booster to units generated.....	3.1	" "
Charge to units generated.....	16	" "
Discharge to units sold.....	13.0	" "
Discharge to charge.....	81.4	" "

The difference between units generated and units metered to line is, of course, due to the units used by the booster motor and the

partly charged condition, the battery characteristic is a falling one, somewhat similar to the characteristic of a shunt-wound generator. The characteristic, however, varies according to the state of charge of the battery. The reversible booster described serves to correct for the varying nature of the battery characteristic so as to make the characteristic of the battery and booster the same whatever the state of charge, and to make it either falling or flat, or rising over a wide range. By making the characteristic flat, the load on a shunt-wound generator working in parallel with the boosted battery will be nearly constant. By adjusting the booster so that the characteristic closely follows the characteristic of the generator, whether shunt or compound wound, the load will be shared by the battery as in the case of two generators in parallel.

There is one other point I should here refer to, that is the nature of the fluctuations of the current taken by the motor driving the booster. Since the number of cells used is 240, the boost on the top charge amounts to 100 volts, that is, the pressure is from 600 to 620 volts on the cells when they are fully charged. The least pressure to which the battery falls on the heaviest discharges is 440 volts, the boost on charge is therefore greater than on discharge, hence with the same current the motor takes more driving

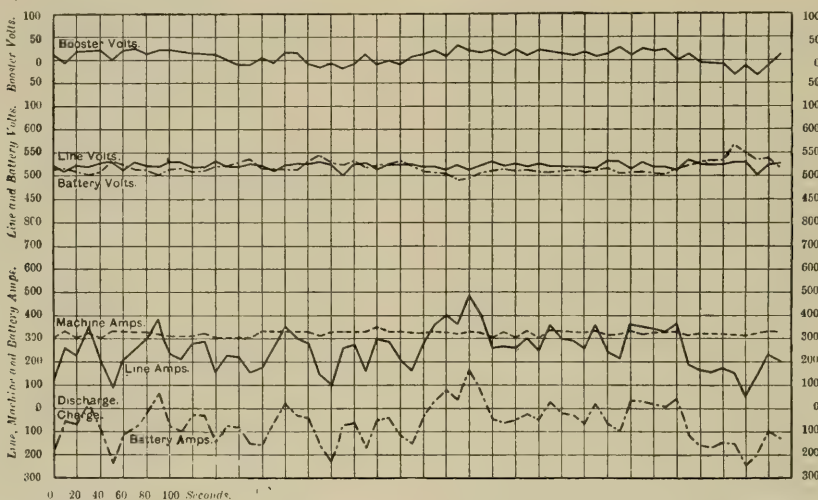


FIG. 8—CURVES SHOWING LOAD ON GENERATOR, LINE AND BATTERY, OPERATING TRACTION LOAD WITH REVERSIBLE BOOSTER.

Generator—210-kw. shunt wound.  
Battery—240 cells, 450 amps per hour.  
Booster—25-kw. capacity.

Cars on Line—1 with 2·25-h. p. motors for 52 passengers.  
" " 21 with 2·35-h. p. motors for 79 passengers.  
Readings taken Friday, March 1st, 1901, afternoon.)

units lost in the battery; the figures, it will be noted, check one another very closely; the former figure is 3,950 units, and the latter 3,991 units. The slight discrepancy is accounted for by the fact that the units metered to the line are read on an ampere-hour meter, and an error in the line pressure would affect the figure. All the other readings are taken on watt-hour meters. The battery efficiency is really rather higher than 81·4 per cent. At the beginning of the month the average specific gravity was 1·205 when the cells were fully charged. At the end of the month the specific gravity had risen to 1·210, showing that more charging was given than would have been necessary if sufficient charge had been given during the previous month. The small percentage of energy taken by the booster motor is confirmed over a long period as shown by additional figures given later.

The percentage of the whole number of units generated which passed through the battery is also rather surprising, considering that the battery takes more than one-half of the maximum line load.

The author here showed a number of curves photographically reproduced from charts taken from Elliott recording instruments showing values similar to those in Fig. 8, but with the booster used in the ordinary way.

I should here note that the ultimate object of the booster is to correct for the varying characteristic of the battery: when in a

on charge than on discharge; and therefore, with the steady load on the generator, the charging current is never as great as the discharging current, as will be seen from the curves. The greatest observed current taken by the motor is 70 amperes, but this is unusual, the normal maximum not exceeding 50, or about 7 per cent of the maximum load.

The battery used consists of 240 cells, giving 450 amperes at a one-hour rate of discharge. The booster is rated for 200 amperes continuously, and will carry 450 amperes momentarily; the brushes work without lead, and do not spark even when a current of 200 amperes is passing without any field.

In considering the use of batteries in connection with large plant operating roads with upwards of 400 cars, it is necessary to take into account the above mentioned fact, that the load will be a fairly even one, and with properly designed engines very little improvement in economy can be attained by a further levelling of the load by a battery. There may be special cases, for instance, where a small all-night service is worked, or where a peak, due to extra cars, exists at stated hours, which a battery could carry, and so save the use of extra boilers or engines for only one or two hours. In general, however, I am inclined to consider that the central station is not the correct place for a battery to be used with plant for this size of road. Consider the case where a system of town



tramways, operating upwards of 400 cars, is driven from a single station situated reasonably near to the center of the load, several of the routes running out some six or more miles in various directions from the center. Each route should be fed by its own feeders to obviate any breakdown on one route affecting the remainder; each route might account for 30 or 40 cars, the load on each set of feeders would be of the same character as the load on a small system with a load-factor of not more than 25 per cent. There is no doubt, therefore, that given suitable sites, batteries in sub-stations worked as described above would serve to keep the load on the feeders constant, and since less than a third of the maximum current would be carried by the rails, the use of boosted rail-feeders would be obviated.

The same arguments also apply to the case where the power station is so far outside the area as to necessitate the use of converted high-tension currents; by using a suitable battery in the sub-stations the load on the converters could be kept constant, the rotaries would then operate more perfectly; they need not be of such great capacity as without batteries, and the high-tension feeders could be designed to carry the mean current instead of the maximum.

A power station supplying energy to a railway, as distinguished from a tramway, will, in general, carry a load of the same character as that of a small tramway plant; but the fluctuations of the load will be of greater amount due to the greater energy taken in starting the heavier vehicles. At the same time, it is more easy to arrange the running schedule for a railway than for a street tramway, so that only a few cars or trains start or ascend heavy grades simultaneously; the stops generally are less frequent, and the road is flatter than that obtaining in the ordinary tramway. The distances run will probably, however, be greater, and therefore the right place for batteries on a railway system will be in sub-stations situated near the load centers.

#### BATTERIES IN COMBINED STATIONS.

In combined stations, supplying both to a three-wire 460 to 500 volt lighting network and to a 500 volt tramway system, the boosting system can be used in a convenient way: 240 cells are sufficient with the booster just described for a tramway circuit at 500 to 550 volts, and are equally suitable for a 460 volt lighting system. Since no regulating connections are used two identical batteries may be installed, each working on to its own panel on the switch-board, the instruments consisting of a double-pole throw-over switch, a double-pole fuse, two voltmeters to show battery and line volts respectively, and an ammeter reading both sides of zero: leads should also go to the middle point on each battery, so that the middle point may be connected to the middle lighting bus bar when desired. By this arrangement either or both batteries may be used on the lighting or traction circuits, and one battery may be charged on either circuit and discharged on the other. In the event of no all-night cars being run, both batteries may be used to drive the lighting load. A very great advantage of working batteries as described on traction loads is that an ordinary shunt-wound generator driven by an engine without any great weight of flywheel may be used, thus enabling the generators to be worked without alteration on the lighting bus bars, and saving the cost and complication of equalizing gear. It seems hardly necessary to point out how much easier is the work put on the running plant when batteries are used so as to give it a steady load, compared with driving the cars direct when all the fluctuations come on and have to be dealt with by the engine.

#### GENERAL CONSIDERATIONS.

It is convenient to summarize the points referred to under the separate heads of: (1) Batteries in lighting stations, (2) batteries in traction stations, (3) batteries in combined stations. In the first case the battery should be used to serve as a regulator for the pressure, to enable the individual units to be fully loaded without the use of several graded sizes, and to enable the number of units to be decreased; that is to say, to enable a few units of greater and of uniform size to be adopted, instead of the many graded units usually installed, and to improve the plant load-factor over the whole year, especially to enable the steam raising and distributing plant to be more uniformly worked; and, in special cases, to effect a saving in feeder copper, and to enable the area of supply to be economically extended. In the second case, although the

engines may be working only at one-third to one-half of their load, the boilers during working hours are economically loaded, and a battery will effect a saving of fuel, from the boiler point of view, by serving to operate the all-night load, shortening the boiler working hours, and ensuring that, when the engines are running, the boilers are working at a good load. The saving of one hour's steaming in the morning, and at night when only a few cars are out, will also effect a considerable saving in fuel. The battery, however, enables the engines to be run nearly at full load at all times; it thus makes the steam used per unit less, and also saves considerable wear and tear of plant; it enables, especially in small systems, a greater number of cars to be operated by a given plant, 20 light cars being easily worked by a 125kw. unit. Used in sub-stations the battery should effect a large saving in copper both for line and rail feeders; it should frequently enable negative boosters to be dispensed with, and it permits of the working of long routes with direct supply at the standard pressure. In combined stations the use of a battery worked in conjunction with a reversible booster enables all the plant to be of the same pattern, shunt-wound generators operating quite as well as compound ones. The arrangement of two identical batteries enables an interchange of energy to be made between the traction and lighting units, a point of value especially in stations of small and moderate size.

The special points to be considered in designing the battery with a view to its economical use are: (1) The capital cost as compared with that of plant. For a lighting station this should be worked out at not less than the three-hour rate of discharge, and at this rate will be found not to differ much from that of plant of the same capacity. For power-stations the capital cost may be worked out at the one-hour rate of discharge, and will be less than the cost of corresponding plant.

The cost of battery depreciation is an exceedingly difficult figure to arrive at. I find that the cost of re-plating throughout for a battery in lead boxes, or in stout wood lead-lined boxes, amounts to about one-half the cost of the battery, when allowance is made for old material. Giving the plates a life of six years, this represents about 7 per cent per annum on the cost of the battery. Allowing for complete re-plating every six years, the repairs on a battery are a negligible amount, and the wages account is also exceedingly small, the labor involved being for filling up the cells every week or fortnight, and for taking the specific gravities every week as before described. The chief considerations, therefore, are the saving in fuel due to working with a better load factor—especially working the steam-raising plant at a better load factor—the saving in wages through working the running plant a reduced number of hours; and, finally, whether the saving effected through these causes make up for the cost of the lost energy in the battery itself. From results obtained over a period of one year the efficiency of working under lighting conditions may be taken as 74 per cent, and, from the few figures I have, the efficiency under traction conditions is 84 per cent.

I have found great difficulty in obtaining reliable figures as to the connection between the cost of coal, oil, water, stores, and repairs, and plant load factor. I have, through the courtesy of the engineer of an electrolytic works, obtained the figure of 0.21d. per kilowatt-hour for the above items on a load factor of close on 100 per cent. I have weighed the coal to one boiler operating a single engine driving the traction load over 16 hours, and, taking a low figure for the cost of oil and repairs at my station, I obtained the figure of 0.3d. per unit for a load factor of 43 per cent; the engine being of 300 i. h. p., gave a fair load for a 30 ft. x 8 ft. Lancashire boiler using superheated steam. I obtained a third point on the curve by calculation from this test, allowing for the coal used in banking and in keeping the steam pressure at not less than 80 lb., the working pressure being 160 lb. The load-factor is arrived at by assuming that the engine and boiler could give 200 kw. steadily. I shall be very much gratified if the discussion throws further light on this question.

It appears to me to be a matter of some difficulty to properly define the term "load factor" in this connection. Taking a single engine and boiler working at or near full load for a given number of hours, hours per day might be plotted on the horizontal line instead of load factor. The ratio between time of working and costs would then depend chiefly on the length of steam pipes which it is required to keep hot when the engine is standing. But

the case might be considered where the engine and boiler are working continuously but at various loads; the curve would then represent the efficiency of engine and boiler at these loads. With several engines and boilers the question becomes more complicated, and I find myself unable to come to any general conclusion, and I submit the curve for what it may be worth.

With regard to the arrangement of batteries the present tendency to connect all the cells together by burning the lugs of the plates in each cell is undoubtedly excellent practice. The shorter and stouter these lugs are made the better will be the self-regulation of the battery. Cells of stout lead, or of wood solidly put together and lined with lead, are preferable to glass boxes on light wood trays. It is of great importance that the positive and negative plates should be designed to wear equally; if one set of plates have much greater capacity than the other the weaker ones will wear out first, causing greater expense for renewals. Watt-hour meters for measuring the charge and discharge should form part of the equipment of all batteries; even daily charging and discharging are essential to the

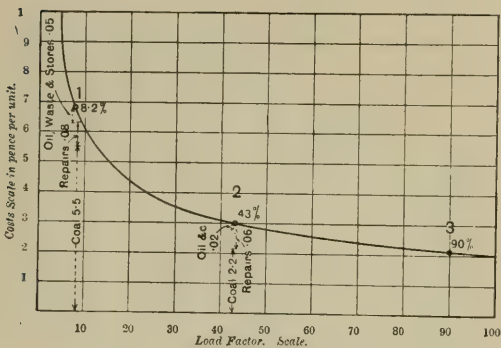


FIG. 9.—LOAD FACTOR AND COSTS.

Figures worked on basis of Lancashire coal at 9s. per ton. Load factor for points 1 and 2 =  $\frac{\text{Units generated}}{200 \times 24}$ . Point 2 is taken from a coal-test over 48 hours with a Lancashire boiler, 8 ft. diameter, 30 ft. long, steam at a pressure of 150 lbs. per square inch superheated. Compound condensing engine 300 i. h. p. Coal used, 18,700 lbs. Units generated, 4,225. Total coal per unit, 4.44 lb. Coal used in banking fires, 560 lb. Point 1 estimated from this test; point 3 from electrolytic works. The oil and stores and repairs are approximate.

life of the plates, and if the daily input for a lighting battery is 25 per cent more than the output weekly readings of the specific gravity will show if the charge is right.

The energy efficiency obtained of 74 per cent on the lighting battery is certainly due, in part at least, to the great ease of operating attained by the methods described.

The increased efficiency observed when the battery is worked as I have described on an intermittent load is interesting. It appears to be due to the fact that the discharges are often of such short duration that the increased pressure due to the gas effect is utilized on these discharges. The fact that the battery alone "floating" on the line operates best when the working pressure of each cell is taken at about 2.08 volts seems to confirm this view.

In conclusion, I must apologize for the somewhat tentative way in which I have put forward my views; my excuse is, that there are so many variables in considering battery working that it is not easy to find a starting-point from which to calculate. I have to thank Messrs. Elliott Brothers and the British Thomson-Houston Co. for lending me several instruments, and my assistants, Messrs. Hollingsworth, Eccles and Carter, for helping me with the experimental work.

The tramway system was very rapidly extended throughout the year, as is shown by the figures, the consequence is that the load factor over the whole year is lower than will be the case next year, when less new work will be done; the load factors for the quarters give a more true idea of the correct figures.

The boilers under steam at any time were two Babcock boilers fired with refuse burnt in a destructor, and two 30 ft. x 8 ft. Lancashire boilers, say the equivalent of three 30 ft. x 8 ft. Lancashire boilers.

## APPENDIX.

### COMPLETE FIGURES RELATING TO AN ELECTRIC POWER STATION DRIVING A TRAMWAY AND GENERAL SUPPLY LOAD.

The figures relate to the period from March 31st, 1900, to March 31st, 1901.

		April to June.	July to Sept.	Oct. to Dec.	Jan. to March.	Year's Total.
Units genr.	Lighting	53,938	64,350	122,924	124,907	371,119
	Traction	120,477	144,562	182,058	194,662	641,759
	Total	179,415	208,912	304,982	319,569	1,012,578
Units sold	Lighting	47,620	53,845	102,410	105,382	309,257
	Traction	118,407	132,041	168,003	183,229	601,680
	Total	166,027	185,886	270,418	288,611	910,942
Batteries (1)	Charge	27,110	31,640	30,920	32,493	122,163
	Discharge	19,680	24,120	22,270	24,810	90,880
	(2) Charge	—	—	Mar. 2nd to 31st only.	10,517	—
Booster motor units	Discharge	—	—	—	8,560	—
	From Aug. 2nd only.	2,660	6,194	5,720	14,574	—
Max. load on feeders	Lighting	KW. 180	KW. 216	KW. 278	KW. 250	KW. 278
	Traction	307	344	402	430	430
	Total	482	560	688	680	660
Max. load on plant	Lighting	194	195	292	220	292
	Traction	206	302	212	255	302
	Combined	390	470	504	475	504
Plant hours	Lighting	670	614	1,304	1,391	3,988
	Traction	1,455	1,418	1,410	1,451	5,734
	Combined	1,455	1,418	1,410	1,451	5,734
Load factors	Lighting	13.1	11.8	17	19.4	12.7
	Traction	17.5	17.8	19.0	19.6	16.2
	Combined	15.9	15.1	19.4	20	15.8
Plant load factors	Lighting	45	53	32	41	32
	Traction	41	33	60	52	37
	Combined	31	31	43	46	35
Percentages.	Sold Genr.	80.8	83.6	33.3	84.3	83.3
	Charge Genr.	46.0	49.1	25.1	26	33
	Disch. Sold	41.3	44.8	21.7	23.6	29.4
Lighting	Disch. Sold	72.6	76.2	72.0	76.3	74.4
	Charge Genr.	93.3	91.3	92.3	94.1	93.7
	Booster Genr.	—	—	3.40	2.94	3.30
Traction	Charge Genr.	—	—	—	16.02	—
	Disch. Sold	—	—	From Mar. 2nd to 31st only.	14.0	—
	Disch. Charge	—	—	—	81.4	—

TABLE II.—SHOWING CAPACITY OF BATTERY AND PLANT IN SOME DIRECT CURRENT STATIONS.

	Total capacity in kilowatts.		Ratio of battery to steam plant in kW.
	Plant.	Battery at 8-hour rate.	
Aberdeen	1,620	260	.16
Sunderland	1,880	60	.03
Norwich	1,664	120	.07
Notting Hill	680	100	.15
Oswestry	173	40	.23
Wolverhampton	1,440	220	.15
Manchester	7,250	240	.03
Lincoln	600	85	.14
Chester	1,000	30	.03
Charing Cross	4,900	800	.16
Chelsea	3,100	190	.06
Stockport	460	250	.54
Whitehaven	210	55	.26
Canterbury	300	150	.5
Leyton	1,260	200	.16
Hove	1,200	90	.07
Barrow	525	40	.07
Halifax	1,900	200	.1
Nelson	116	88	.75

TABLE II. - SHOWING CAPACITY OF BATTERY AND PLANT IN SOME DIRECT CURRENT STATIONS.—CONTINUED.

	Total Capacity in kilowatts.		Ratio of battery to steam plant in kw.
	Plant.	Battery at 3-hour rate.	
St. Helens ... ..	950	230	.24
Northwich ... ..	194	66	.34
Leith ... ..	640	116	.18
Llandudno ... ..	400	80	.15
Hull ... ..	3,900	300	.07
Bradford ... ..	3,569	270	.07
Burnley ... ..	822	120	.14
Shrewsbury ... ..	540	60	.11
Bury ... ..	760	70	.09
Kensington ... ..	1,000	157	.157
Edinburgh ... ..	9,697	460	.048
Dewsbury ... ..	485	85	.175
Southampton ... ..	730	250	.34
Belfast ... ..	2,200	200	.09
Harrow ... ..	350	70	.2
Stafford ... ..	198	140	.7
Nottingham ... ..	2,569	30	.01
Blackburn ... ..	2,127	75	.03
Glasgow ... ..	10,848	468	.04
Guildford ... ..	200	66	.33
Dundee ... ..	1,283	248	.19

### DIPPING AND BAKING ARMATURE COILS.

Considerable diversity of opinion exists among street railway master mechanics and shop superintendents regarding the amount of heat to which rewound armatures should be subjected in order to properly dry them out for service. The old idea that they must be baked for two or three days at a high temperature is fast disappearing and in fact many roads, especially those that make their own coils, have abandoned altogether the baking of the completed armature, and instead merely dry out thoroughly the coils before placing them on the core.

For the convenience of those companies that are making their own coils we give herewith a number of recommendations for dipping and drying that we believe will be of value. The recommendations are made by the Sterling Varnish Co., of Pittsburg, and embody the methods followed by the General Electric Co.'s winding department, the Westinghouse company, and a number of leading street railway companies. While these methods are particularly applicable where the Sterling insulating varnishes are used they will also be found applicable to varnishes of other makes.

For winding form-wound armatures or field coils it is advised that dry cotton tape instead of viscous tape be used, as the former absorbs the varnish more readily. The Westinghouse and General Electric companies place strips of paper fibre between the layers of tape in several of their forms of coils.

After taping and before dipping the coils should be placed in the heating oven and dried out for three or four hours at a temperature of 175° F. This will drive out all moisture from the tape itself and permit the varnish to penetrate more freely. After drying, the coils should immediately be taken to the varnish vat and wholly immersed in the varnish, remaining so until the air bubbles cease coming to the surface, which will indicate that the tape has absorbed all the varnish it will hold. The coils should then be taken out and suspended directly over the vat, allowing the excess of varnish to drip off. They are then to be carried to the baking oven and baked for 12 hours at a temperature of from 185° to 190° F. It is not necessary to leave them for a longer period than this, but care should be taken that the temperature does not fall below 185°, as a low heat will not penetrate the varnish and is apt to form a crust on the outside of the wrappings, leaving the interior wet and raw. Armatures made up of coils treated in this way are ready to be placed in motors without additional heating, for the heat generated in service will soon thoroughly dry them out.

Where the varnish is kept in a dipping vat, the vat should be closely covered when not in use to prevent evaporation of the solvent. If the varnish becomes too thick, it may be thinned with petroleum benzine or if necessary a hydrometer should be used. The specific gravity of the Sterling insulating varnish should be kept as nearly as possible at Sp. Gr. .880.

It is recommended that when making an oven for baking coils,

all the steam piping or electric heaters, whichever are used, be placed around the sides in the interior, and not at the bottom of the oven, for there is always more or less varnish dripping from the armature coils, and it is better to have this drip fall upon a smooth unbroken floor which can be readily cleaned.

### NEW PLANS OF THE EVERETT-MOORE SYNDICATE.

A company is about to be incorporated under the Illinois state laws for the object of ultimately connecting Chicago and St. Louis by an electric line. It will be known as the Central Illinois Traction Co. and will have an initial capital stock of \$1,000,000, and later the capital will be increased to \$6,000,000. A large proportion of the capital invested will come from Cleveland. Mr. Henry A. Everett, of the Everett-Moore syndicate, who recently visited Springfield, Ill., in regard to the proposed system, states that while he can give no idea of how soon the plan can be perfected there is no doubt but that St. Louis and Chicago will be connected sooner or later. The company has laid out for the present about 200 miles of road, which will be built at once. These lines will reach Springfield, Decatur, Bloomington, Jacksonville, Peoria and a number of other cities. Connection to Chicago will be made eventually by means of the Aurora, Wheaton & Chicago Ry.

The syndicate is also preparing to greatly enlarge the scope of its freight handling business in Ohio and Michigan. At present none of the suburban roads entering Cleveland, and but few of the electrical roads in Ohio do anything more than a package express business. Objections were raised to this business by some of the steam roads and the matter was carried into court. A decision in favor of the trolley lines resulted. Now the electric roads expect to be handling heavy freight within a short time, and coal trains on the suburban lines will probably be in operation in less than a year. Plans for increasing the scope of the express and freight business are being prepared for the entire line of the Lake Shore Co.

### REORGANIZATION OF THE WASHINGTON TRACTION & ELECTRIC CO.

The plan or reorganization of the Washington Traction & Electric Co. has been completed. The properties and franchise of this company are to be acquired by a corporation described in the plan of the reorganization as the new company, which will authorize the following new securities: \$17,500,000 50-year 4 per cent gold bonds, secured by mortgage covering all the property and franchises of the new company; \$8,500,000 5 per cent preferred stock cumulative after June 1, 1904, and \$6,500,000 common stock. The present security holders, according to the plan of reorganization, will be entitled to the new securities as follows: for each \$1,000 bond deposited with coupons attached there will be received in exchange \$550 new 4 per cent mortgage bonds; \$550 new 5 per cent preferred stock and \$200 new common stock. For each payment of \$9 per share of stock deposited by present stockholders there will be given in exchange \$9 new preferred stock and \$30 new common stock. Depositing bondholders are also accorded certain privileges in respect to purchasing additional bonds and stock of the new company. All deposits of bonds and stocks were called for before Oct. 12th, after which date no further deposits were received under the same conditions. New securities will be delivered when the reorganization is completed.

An order providing that street cars operated in Raleigh, N. C., shall be vestibuled in winter has been issued by the corporation commission.

A company comprising E. P. Shave, Henry Hine, C. M. MacNeill and C. E. Noble, of Colorado Springs, has been organized to build an electric railway from Clyde to the summit of Pike's Peak, a distance of 11 miles. Clyde is 26 miles from Colorado Springs, and its altitude is 10,000 ft. above the sea. The proposed road will make an ascent of 4,143 ft., and its steepest grade will be 25 per cent.



## TRANSFERS IN BOSTON.

The Boston Elevated Railway Co. has a system of free transfers between a large number of its intersecting lines, and in the case of lines between which free transfers are not issued an eight-cent transfer check is sold by conductors which is good for passage on a connecting line to any point where the fare is not over five cents.

With two exceptions, free transfer checks are issued to passengers applying for them at the transfer stations which are established at various points where the lines diverge, and are in charge of agents who issue the checks. Transfers are made from inward cars to other lines of inward cars and from outward cars to other lines of outward cars by general inward and outward checks.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
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## A SUCCESSFUL RESORT IN THE WEST.

The city of Butte, Mont., contains one of the most beautiful summer resorts in the West. It lies at the foot of the Rocky Mountains. The Columbia Gardens which were provided by the Butte Electric Ry., were described in the "Review" for August, 1900. The garden has now passed its third season which has proved a most successful one.

The citizens of Butte, and especially the young people, take great pride in the park, which is free to the public, no admission being charged to those coming to the park on the street cars.

The idea of the park was conceived by Mr. W. A. Clark, the owner of the railway system, and its successful management is due to Mr. J. R. Wharton, who is also manager of the railway company. The development of this resort has been at an expense of over \$100,000, which is in excess of the revenue derived by the company for transporting the visitors to and from the grounds.

Butte is probably one of the most barren cities in the country, but these grounds abound in beautiful flowers, plants and trees. This pleasure ground is provided with a large artificial lake, handsome buildings, a fine menagerie and an excellent collection of



SENATOR CLARK AND FRIENDS AT BUTTE GARDENS.

plants and flowers artistically distributed about the grounds. The garden also contains the usual amusement accessories of summer resorts.

The accompanying illustration shows Mr. Clark enjoying the grove in company with some friends.

One of the most interesting days of the year at Columbia Gardens is Arbor Day. This annual tree planting occasion is made a general holiday for all the school children of the city, and on that occasion the cars transport them free to and from the grounds.

The company contemplates extending the road on past the grounds to the top of a mountain which rises about 2,000 ft. above the valley. This branch when completed will attain one of the highest altitudes of any street railway in the country.

## ELECTRIC RAILWAY IN GUAYAQUIL.

The municipal council of Guayaquil has granted a charter to a local syndicate authorizing the construction of an electrical railway system in that city, which contains in the neighborhood of 50,000 inhabitants. This charter permits the use of any of the streets in the city and provides for the construction of a new race course in the suburbs, and also grants the use of electricity for lighting and power. The franchise runs for 35 years, after which time the property reverts to the city without compensation.

At present the city has a very poor horse car system despite which the dividends have been 25 per cent annually for a number of years past. The present horse car system will probably be bought out by the new company, which is now seeking capital in the United States.

## TIMBER FOR POLES AND TIES.

From the Yearbook of the Department of Agriculture for 1900.

The timbers most used for telegraph, telephone, and electric power and light poles, are tamarack, white cedar, and red juniper. Their value is fully known, and if the supply could hold out nothing would displace them. Their life in the ground is about ten years, so that every decade sees one generation of poles worn out and another cut to replace it. To the poles required for renewal is to be added the number required for new lines and systems. The total is very large. The telegraph lines of the country require nearly 600,000 poles annually, at a cost of not less than a million dollars, and the telephone and electric car lines and light systems use as many more. The price of poles for such uses varies immensely, ranging from \$1 to \$50 each. If an advance in the price of post timbers is to be expected in the next fifteen years, a much greater advance may be expected in timbers of this class. A post may be grown comparatively quickly, and in an exigency almost anything can be used; but a telegraph pole must be long, straight, and of good quality. Timbers that fulfill these conditions are few, and a number of years are required to grow them. When the natural supply runs low, high prices will prevail. The man will be fortunate, then, who has a plantation of salable red juniper or catalpa. Here again the catalpa shows its excellence.

The timbers most in use for railroad ties at the present time are white oak, post oak, burr oak, white cedar, red juniper, and chestnut, with white oak preferred. Prices range from 30 to 60 cents each for standard sizes; 620,000,000 cross-ties are in use in the railroads of the country, and 90,000,000 are required annually for renewals, taking the timber from an estimated area of 200,000 acres. Railroad officials realize that tie timber is becoming scarce, and assert that prices are rising rapidly. Street car and suburban lines are now using many million feet of lumber for cross-ties.

It is certain that timber can be grown for railroad ties at a profit. Two extensive plantations of catalpa at Farlington, Kan., established twenty years ago, have now some trees large enough for ties. The soil of the locality is not well suited to the catalpa and the management of the plantation has not been the best. Hardy catalpa and locust can be grown to the proper size for cross-ties in fifteen years under favorable conditions of soil and management. Only in certain localities of the West will the oaks be planted for this purpose. The white oak requires thirty or forty years to make the growth that the hardy catalpa makes in fifteen, whereas it is generally conceded that there is little difference in their value as tie timbers.

## INSULATION RESISTANCE OF RUBBER GLOVES.

The result of some experiments carried on by M. Janet, in Paris, is given in a paper read before the Société Internationale des Electriciens. The experiments were performed first with the gloves dry and then with them wet, the pressure being 105 volts in each case. In the dry test the gloves were filled with mercury and then suspended in a basin of mercury; fine sand moistened with acidulated water was used. The resistance in megohms ranged from zero to 52,500 dry and from zero to 420 wet. The author also made wet tests for determining the effective e.m.f. at which the gloves broke down under high pressure alternating currents. Three of the samples broke down at low voltage, while three others broke down at 1,000, 2,000 and 11,000 volts, respectively. In the discussion which followed the reading of the paper it was argued that insulating gloves cannot generally be regarded as an effective protection; and that wiremen with gloves should not touch the conductors directly, but only such parts as are already insulated.

Mr. George C. Smith, vice-president of the Westinghouse Construction Co., is quoted as stating that work will soon be commenced on the proposed electric road from Chestertown, Md., to Tolchester and Rock Hall. The county commissioners have granted a six months' extension of time to the operating company, and have required that the general offices of the road shall be located in Chestertown, and that one-third of the directors shall be appointed by the commissioners.



## PAINT SHOP ECONOMY.

BY LOUIS GRATON.

While economy in the paint shop may be attained in many ways, various practices there go under the name of economy that would more readily pass muster if labeled extravagance or wastefulness. A thoughtless and wasteful system is frequently inaugurated which is apparently successful when operated by a public service corporation while the same system would swamp a private firm in a few months or years. We sometimes attribute wisdom to corporations that operate public utilities, whereas such operations are often mismanaged in all their details, from the standpoint of economy. Those corporations or private employers are wise who summon to their aid men who are even selfishly interested in all that concerns the welfare of their employers; for as inapt as the word selfish may appear in this connection, it is nevertheless true that the workman who is most anxious to retain his job is the one that will render the most faithful service.

The American "make-shift" system still obtains to too great an extent in many places where the motto seems to be "It will last my time." Fortunately much of this feeling is disappearing and we are gradually passing into an era of more enduring workmanship. I believe that whatever of good may accrue from the great aggregations of capital which operate public utilities will largely in the direction of building upon more permanent foundations.

I also believe that today no really progressive man desires to go back to the childish competitive system of the past; that this wasteful system has disappeared with the evolution of modern methods. The desire to control large affairs and the benefits of such aggregations of capital which operate public utilities will be largely large corporations must concede the right on the part of the people to demand the economical administration of the affairs in which they are vitally concerned.

It is also my conviction that all reasonable men will concede to these corporations the right to a reasonable profit on their investments whenever these corporations settle down with the least amount of friction to render a fair equivalent for the remuneration received.

On the other hand it is unfortunately true that too many workmen are merely time servers. While many, I hope, walk firmly and bravely to their tasks with the thought ever present of giving 100 cents worth of work for every dollar received, too many drag themselves to their hated work with pay day as their only goal. Such men consider themselves very bright for drawing pay for services never rendered, failing to realize that their employers are fully as sharp as they, and that sooner or later they will pay for their brightness with the loss of their jobs.

Not long ago one of these interesting growlers came to our paint shop and, seating himself cross-legged and cross-purposed on a box, squirted tobacco juice all over the place and proceeded to berate everything and everybody, especially the men who were steadily employed. He wondered how it was that Tom or Dick always had work. "It beats everything how lucky some men are." He never dreamed that the men who hold their jobs are those who hustle, and who hold equitable views on the relations of employer and employee.

I know a man whom I see every day at the close of work who has suffered more from overwork than from the lack of it; who through the panics of '73 and '93 and all the intermediate periods of depression; through prosperity and through adversity, has kept brushing away without stopping to look for a better job. And this is called luck by the growlers.

A few days ago I received a letter from a young man who is scarcely twenty-one years of age but who has gained the confidence of his employers to the extent that they have entrusted him with the supervision of a gang of men. In his letter he expressed his gratification at this, and also his disgust at the lack of interest which the men displayed in their work. He said that these men seem to regard their employers as their common enemy and they act as if their only object was to get all they can and do as little work as possible. It is probably true that this unreasoning conduct is the result of greedy oppression for hundreds of years back, but injustice is as reprehensible on one side as it is on the other.

Men have grown to want the rewards without the sacrifices; they desire to attain without effort the benefits which are the outcome

of long years of toil and preparation. Men dissipate their energies in vicious practices, waste valuable time in repining, grudge to the industrious the rewards of industry, desire an unearned share in the benefits earned by those who have been faithful to perform every duty; in short they fail to realize that each can settle for himself the vexing labor problem.

As long as men believe that to pick up a brush or a chisel will make painters or carpenters of them, so long will there be malcontents and faultfinders. Ignorance ever looks with envy upon the achievements of the intelligent and the industrious.

Let a mechanic but show indications of self-respect, or pass his spare hours in the improvement of his intellect, in endeavoring to study the requirements of the ever changing conditions of his trade, and those whom he would be glad to help, at least by example, brand him as "tony" or "stuck up" or even call him a "sucker," thus making a reproach of his virtue. While the few aspire to a higher level the many seem to seek a lower level.

But someone asks: What has all this to do with paint shop economy? While I have not the time to answer this question satisfactorily I believe that the foregoing thoughts are inextricably connected with economy. I will, however, touch upon a few points that are surely connected with the economy of the paint shop. In the building of the shop, economy of space is often gained at the expense of valuable time wasted in moving articles back and forth to make room for others; or in going around obstructions that might have been avoided.

A good old-fashioned kind of economy has it that the best is none too good; yet if the company concerned desired to revarnish its cars every year, it might be wise to use a second instead of a first grade of varnish. Though as far as brushes are concerned I believe that the best are the cheapest. The same reasoning holds in regard to color, or white lead, or putty.

The painting department here, is fortunate in a management that spares neither pains nor expense in having its rolling stock kept in good repair. This management is also to be congratulated for its determination to keep the paint shop open the year around, instead of shutting it up for part of the year, and then rushing the work with not always efficient help, for experience dictates that poor help is poor economy.

It is sometimes deemed advisable, in a pinch, to send men to the paint shop from the other departments; men who make no claim to a knowledge of painting. Such help is always unsatisfactory and often necessitates doing the work over. If a roof or floor is painted by such helpers, enough paint is likely used for one coat, as would do for two or three. This is wasteful in a double sense, as such work is never durable.

It is sometimes thought that priming, sand-papering, or puttying, is not very essential, and that such work may be done by anyone. This is surely a mistake, for no detail of painting is insignificant. And then, the time lost by the painter in looking after these men, and often doing their work over, should be considered.

Occasionally, one or more of these incompetent men appear in the paint shop with the unwelcome word that they were sent there to help; and the painter is at his wit's end to know what to do with such men. For if there is a department of car work that should not be a catch-all for promiscuous help, the paint shop is surely that department. But it is somehow currently accepted that any kind of a brush, dipped into some kind of paint, by any kind of a man will bring about desirable results. If not, it is a mere matter of luck.

The painter of many years of experience, who is truly progressive, will not hesitate to confess his inability to understand certain conditions and results, while the painter (?) of a month will boldly tackle any job. And the result? Surely not economy

Mr. Charles T. Yerkes has purchased the stock of the projected Brompton-Piccadilly railroad, London, from the Brush Electrical Engineering Co., and from Walker & Co., the contractors, of London. It is announced that the road will be operated in connection with the Charing Cross-Hampstead line and the Metropolitan District Ry., and that Mr. Yerkes' American backers in his other London projects are associated with him in the present acquisition. Mr. R. T. Perks, it is understood, will be president of both the Metropolitan District and the Brompton-Piccadilly lines.



## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### PAYMENT OF WITNESSES IN EXCESS OF LEGAL FEES.

*Green v. Metropolitan Street Railway Co.* (N. Y. Sup.), 70 N. Y. Supp. 123. Apr. 29, 1901.

Whenever a witness has been paid money in excess of the legal fees, that fact, in and of itself, the first appellate division of the supreme court of New York holds, is always a proper subject to be considered by the jury as bearing upon his credibility; that is, whether the testimony of such witness is induced by the increased or additional payment.

### CABLE SLOT $1\frac{1}{2}$ TO 2 INCHES WIDE A NUISANCE.

*Brown v. Metropolitan Street Railway Co.* (N. Y. Sup.), 70 N. Y. Supp. 40. Apr. 29, 1901.

Where the usual width of the slot between the tracks of a cable railway is from five-eighths to three-fourths of an inch, which it may be inferred does not render the slot unsafe, the first appellate division of the supreme court of New York holds that where the slot at a particular place is from one and a half to two inches wide, and people riding bicycles have had the wheels go through it, a jury is warranted in finding the slot to be unnecessarily wide, and therefore that the authority granted to make this excavation in the highway has not been pursued with proper care, and that, consequently, as the authority has not been properly used, the company has created a nuisance.

### NO INJUNCTION BEFORE DECISION ON VALIDITY OF STATUTE GIVING SCHOOL CHILDREN HALF FARES.

*Ahern v. Newton & Boston Street Railway Co.* (U. S. C. C.), 105 Fed. Rep. 702. Dec. 13, 1900.

The United States circuit court, in Massachusetts, says of the state statute which requires street railway companies to transport scholars of the public schools to and from the school houses and their homes at one-half the regular fare charged other passengers that, upon its face, the statute seems open to the objection of unreasonably reducing the rates charged by railroad companies, and to the further objection of discriminating in favor of a particular class in the community. An act open to either of these objections has been held by the supreme court to be in violation of the fourteenth amendment to the constitution of the United States. But, notwithstanding that the circuit court has grave doubts of the constitutionality of the act referred to, it holds that a preliminary injunction should not be granted against the carrying out of the statute, an important constitutional question being raised, and the plaintiff not having shown that either the stockholders or the railway corporation would suffer irreparable injury before a final hearing could be had in the case.

### ABUTTERS CANNOT ENJOIN OPERATION OF ROAD FOR INCONVENIENCE OF LOCATION.

*Budd v. Camden Horse Railroad Co.* (N. J. Ch.), 48 Atl. Rep. 1028. April 27, 1901.

A municipal corporation which is empowered by its charter to regulate its streets, and to prescribe the manner of their use by any person or corporation, the court of chancery of New Jersey holds, has exclusive power to determine in the first instance how the space within the bounds of the highway shall be appropriated to the varied uses of the highway. But a general ordinance prescribing a certain width of the sidewalk in avenues of a certain width is modified by a subsequent special ordinance making a different disposition of a particularly named avenue. And the court holds that a trolley railway track, laid in accordance with the direction of the special ordinance, will not be enjoined from operation because its location works inconvenience and injury to the abutting owners. If the municipality has so unreasonably appropriated the divisions of the highway as to work injury to the abutting owners, their remedy is not in equity, but in the courts of law, which super-

vise the action of inferior jurisdictions. A mandatory injunction will not be decreed where the legal rights of the complainants are disputed and unsettled, and where the acts complained of are adequately remediable in the courts of law.

### JOLT COMMON KNOWLEDGE.

*Whitcomb v. Detroit Electric Railway Co.* (Mich.), 84 N. W. Rep. 1072. Jan. 29, 1901.

The evidence must be very clear, the supreme court of Michigan says, which would make a company responsible for such a dangerous method of operating a disabled electric car as having the conductor stand upon the top of it and attempt to hold the trolley pole against the wire. A rule requiring such conduct, it declared, would shock the common sense of the average man. If conductors are in the habit of so doing, a rule against it, the court adds, would be very proper for such companies to adopt.

The sudden jolt given a car when it reaches a curve, the court holds, is common knowledge.

### STREET CARS CLASSED WITH HACK AND OMNIBUSSES AS TO PRIVILEGES AT DEPOT.

*Ex parte Vance* (Tex. Cr. App.), 62 S. W. Rep. 568. Apr. 17, 1901.

A city ordinance intended to establish omnibus and hack stands, as well as stands or stopping places on passing street car lines, near a depot, and to regulate the right to solicit employment for vehicles, hotels, etc., at and about said depot, which makes it unlawful for any driver of any omnibus, hack, carriage or other vehicle engaged in carrying goods or passengers for hire in the city to leave his vehicle and go anywhere along the walks and thoroughfares adjacent to the depot to solicit patronage for his conveyance, but as to motormen and conductors of street cars contains no such provision, the court of appeals of Texas holds clearly discriminates against hackmen, omnibuses, etc., and in favor of street car men, in their right to solicit patronage, and is unreasonable and on that account invalid. True, it says, these represent different characters of vehicles, but they belong to the same general class—that is, of carriers of passengers for hire; and there is more or less competition between them, so their rights as to the solicitation of custom should be equal. But the street car lines being fixtures, the court does not think that it is, in the absence of clear proof to the contrary, an unreasonable discrimination in their favor that the designated stopping places on them are nearer the depot than the hacks, etc., are permitted to stand.

### RISKS ASSUMED BY WORKMEN IN REPLACING OLD STRUCTURE AT NIGHT BY ELECTRIC LIGHT.

*Robare v. Seattle Traction Co.* (Wash.), 64 Pac. Rep. 784. Apr. 13, 1901.

The work of repairing the track of a line of electric railway which was constructed upon piles where it crossed a lake, was carried on both by day and night, clusters of electric lights being used at night by the workmen to aid them in seeing the work. A common laborer on the night force, who knew of the general condition of the road and that the ties had been sawed off at stated intervals for the purpose of driving new piles, stepped upon a tie that had been more or less severed from the rest of the structure, which gave way, and precipitated him through the trestle. There was also testimony that the foreman had constantly warned the men of their danger, and notified them to look out, which it would seem that this man ought to have heard, although he testified that he did not hear it. The supreme court of Washington holds that a nonsuit should have granted at the close of his testimony, from which alone it says that it is forced to the conclusion that he did not exhibit that care and watchfulness which he should have done under the circumstances, that the danger was apparent, and that the company was, therefore, not responsible for the damages which

ensued. It says that he must necessarily have known that the tearing down and building up of an old structure of this kind was a dangerous occupation, and that it was his duty to be careful under such conditions, whether he had heard the warning to be careful or not.

#### EXTRAORDINARY DILIGENCE REQUIRED IN THE CONSTRUCTION AND MAINTENANCE OF TRACKS.

Macon Consolidated Street Railroad Co. v. Barnes (Ga.), 38 S. E. Rep. 756. Apr. 24, 1901.

Nothing can be more free from doubt or question, the supreme court of Georgia says, than the proposition that railway companies are bound to exercise extraordinary diligence in protecting their passengers from injury. It is not logical or sound to say that this requirement can be met by managing with such diligence cars upon a track built or kept up with diligence of a less degree. The track is just as essential a thing in the transportation of passengers by rail as is the car in which they ride. A railway car cannot be successfully or safely run except upon a track, and a railway company cannot lawfully, either as to car or track, be wanting in extraordinary diligence toward passengers without becoming responsible in law for the consequences. So the court holds that the rule of law requiring railway companies to exercise extraordinary diligence in protecting their passengers from injury applies as well to the construction and maintenance of tracks as to the operation of cars thereon. Continuing, it says that the rule of extraordinary diligence is fixed and unvarying. It requires the observance of that extreme degree of care and caution which very prudent and thoughtful persons exercise in and about any given matter. What does or does not amount to extraordinary diligence varies with circumstances. For instance, in larger towns, or in cities, or with more dangerous motive power, greater strength of materials and more care in construction would be necessary than in a town of 3,000 inhabitants where it was designed to operate cars by horse power at a correspondingly limited rate of speed. In any given instance, the test would be: Does this road, in view of all the circumstances and surroundings, come up to what very prudent and thoughtful persons would regard as essential to its safe operation?

#### RIGHTS ON TRACKS AT OTHER PLACES THAN STREET INTERSECTIONS.

North Chicago Electric Railway Co. v. Peuser (Ill.), 60 N. E. Rep. 78. Apr. 18, 1901.

The supreme court of Illinois holds that it was error to refuse to give the following instruction: "The jury are instructed that by reason of its convenience to the public as a carrier of passengers, and because of the inability of its cars to turn out, a street railway company is invested with the right of way over other vehicles over the portion of street occupied by its tracks, and it is the duty of the drivers of such vehicles to turn out and allow its cars to pass, and to use care not to obstruct and delay the same; and if the jury believe from the evidence that the plaintiff, while neglecting such duty and failing thereby to use ordinary care for his own safety, was injured, then he cannot recover in this case."

Street railway companies, the court says, are public carriers of passengers, and are given corporate existence to enable them to provide the means of rapid transportation for the convenience of the people and the promotion of the public welfare. The cars of such corporations cannot give and take the road,—turn to the right or to the left,—as can ordinary vehicles, but must move on and along the rails laid down in the street for that purpose. The grant to such corporation of the right to use the streets of a city must, by necessary implication, be held to confer the right of passage along its track superior to the right of a horseman or one driving a vehicle on that portion of the street occupied by the tracks of the railway company. Such companies do not, however, have an exclusive right to the use of that part of the streets occupied by their tracks. The public are not deprived of the right to use all parts of the street in the ordinary manner, but retain such right subject only to the superior right of passage, which, out of considerations of public convenience and the necessities of the case, must be yielded to the street cars on that portion of the street occupied by tracks of the railway. The citizen passing along

a street in a carriage, buggy, or other like vehicle, subject to the rule he must exercise ordinary care for his own safety and not obstruct the passage of the car, may drive on the track or rails laid in the street by a street car company, and drive along and upon such track or rails without being a trespasser, but it is his duty to leave the track whenever his presence there serves to impede the passage of the cars. On the other hand, a street railway company is charged with the knowledge that the public may lawfully use the entire street, and it must, in operating its cars on the streets, employ all reasonable means to avoid injuring those whom it knows may rightfully use that part of the street occupied by its tracks.

The foregoing, the court says, applies only to other portions of the streets than street intersections, and the principles announced it says are supported by the consensus of modern authority.

#### RIGHTS AND DUTIES OF PERSONS DRIVING UPON OR DIAGONALLY TOWARDS TRACKS.

Armstead v. Mendenhall (Minn.), 85 N. W. Rep. 929. May 3, 1901.

According to the supreme court of Minnesota, a street car company operating cars upon public streets and other persons lawfully occupying such streets have rights alike, in the main. The cars cannot turn out, as can persons driving or walking, so that in this respect it may be said that the company has a paramount right over its tracks. Beyond that, the duties of the parties are reciprocal, and so are their rights. Except as before indicated, they are charged with the same measure of care and the same duties.

Further, the court holds that, if, in this case, the horse in question proceeded along the street 50 or 60 feet, gradually approaching the track, and thus indicating the driver's purpose to cross, it was the duty of the motorman, who saw both horse and wagon, upon his own admission, from the time they were within 300 feet, to have his car under control, and thus avoid a collision. The driver's prior negligence would not relieve the motorman from exercising an ordinary degree of care, or excuse the defendant company from liability in case of accident. In the operation of its car, defendant was bound to take notice of and respect the rights of the driver of any vehicle in the street. If by the speed of its cars it increased the risk of accident to those lawfully upon the streets, it was bound to enlarge commensurably the vigilance and care necessary to avoid the infliction of injuries made more imminent by such speed or management. The rule applied when the crossing is at steam-car tracks to both look and listen does not apply, as a hard and fast rule, to street railways; and the car should have been run in an ordinary manner, with some regard to the fact that streets are open to travelers upon foot or in wagons who may desire to cross the track. Acting upon this fact, the driver of the horse had the right to assume that the defendant's cars would not be run in an unusual way or carelessly.

#### CONSTRUCTION AND VALIDITY OF ACT MAKING TAXATION OF PROPERTY OF STREET RAILROADS "IN CITIES" THE SAME AS THAT OF OTHER RAILROAD PROPERTY.

State v. Metropolitan Street Railway Co. (Mo.), 61 S. W. Rep. 603. Feb. 19, 1901.

The supreme court of Missouri holds that, notwithstanding "An act to provide a more uniform assessment and taxation of street railroads in cities of this state," approved March 11, 1897, uses the words "in cities" in the title and text of the act, its provisions apply to the assessment and taxation of the property of a street railway company, not only when its line is located on "the public streets and thoroughfares" of a single city, but also when located on the public streets and thoroughfares of any city, one or more, "through or in which it is located," and also when its line may be extended on its "right of way" through or into "a municipal township not within the limits of such cities." The words "in cities," in the title, and in section 3 of the act, it holds, were evidently used as words of description, and ought not to have the effect of limiting the terms of the text as a whole.

The act being applicable to all street railroads existent in the state, the court holds that it is not obnoxious to the constitutional inhibitions of class legislation.

Prior to this enactment, the whole property of a street railroad was subject to assessment for taxes by the local authorities. The effect of this act in that respect was simply to change the assessing authority from them to the state board of equalization, and the court says that it knows of no reason why this might not have been done. But, it was then contended that, the whole of the company's property being assessed under this act in the manner that the distributable property of steam railroads is required to be assessed, the school taxes ought to have been levied thereon at the rate prescribed by the statute for that class of property of such railroads,—that is, at the average rate of the several school districts throughout the state,—instead of, as they were, at the rate levied upon other property in each district. And the court admits that there would be much force in this contention if it were not for the provision in the act that, "the said property returned to the state auditor as by the first section of this act required, shall be subject to taxation for state, county, municipal and other purposes to the same extent as the real and personal property of private persons." The only way, however, the court holds, that the company's property could be subjected to taxation for school purposes to the same extent as the property of private persons was by levying the same rate thereon on its property in each district as was levied upon the property of private persons.

#### NO LIABILITY FOR INJURY OF PASSENGER IN ALIGHTING WHILE CAR IS STOPPED TO LET A HOSE CART PASS.

*Oddy v. West End Street Railway Co. (Mass.), 59 N. E. Rep. 1026. Mar. 29, 1901.*

After a car that stopped for passengers at designated points only had passed the last stopping place before that at which a passenger intended to leave, the conductor called out the name of the next stopping place, and the passenger signaled him. Presently, the car, the rear platform of which was furnished with gates, the one on the side next the other track only being closed, slowed up and stopped. The car had not arrived at the stopping place the name of which had been called, nor was it stopped in consequence of any order or signal given by the conductor, nor for the purpose of delivering or receiving passengers, but was stopped by the motorman because he saw approaching from the direction opposite to that in which the car was moving, a fire engine and a hose cart, which were being run to a fire. Yet as the car slowed up, the passenger, unconscious of what was taking place outside of the car, arose from her seat, and walked to the rear door, reaching the platform as the car came to a standstill, went down the steps, and either stepped into the wheel of the passing hose cart, or was struck by it as she was leaving the car. In the meantime, the conductor was on the rear platform, looking over the closed gate to ascertain when the hose cart should have passed, after having seen the fire engine pass on that side of the car. The time was 8 o'clock on an evening in January.

This stoppage was in accordance with what the supreme judicial court of Massachusetts holds was a reasonable practice. And it is of the opinion that it would not be competent to find the street railway company guilty of negligence upon the evidence. It was right, it says, for the motorman to stop the car where he did upon the approach of the fire apparatus. It is not customary or necessary to notify passengers of the cause of a stoppage occasioned by an obstruction in the street. The conductor, while bound to give the passenger an opportunity to leave at the stopping place which she had indicated to him as the point where she wished her journey to end, was not obliged to inform her that that place had not been reached, unless he knew that she was attempting to leave under a misapprehension, and it was his duty to attend to the very things to which he was attending, namely, to ascertain when the obstruction of the car should cease by the passing of the approaching fire apparatus. Street car companies, carrying passengers in ordinary public streets or highways, are not negligent in not providing means for warning passengers about to leave a car of the danger of colliding with, or being run over by, other vehicles in the street. The risk of being hurt by such vehicles is the risk of the passenger, and not that of the carrier. It is not a danger against which the carrier is bound to protect the passenger or to give him warning. The cases relied upon to show that there was

a cause of action, the court adds, were none of them cases in which the danger encountered by the passenger upon leaving a street car was merely that of collision with some vehicle not owned or controlled by the carrier and lawfully using the street.

#### CARE REQUIRED OF PASSENGER MEETING CONDUCTOR ON RUNNING BOARD.

*Third Avenue Railroad Co. v. Barton (U. S. C. C. A.), 107 Fed. Rep. 215. Jan. 4, 1901.*

A passenger got on the running board of open car somewhat back of the middle of the car, with a stanchion in each hand. The car started, and the conductor motioned him to come forward, calling out: "Seat in front, sir. Come forward here, and get the seat." The passenger moved forward along the running board, and the conductor at the same time moved toward the rear of the car on it. When they met, the passenger started to go around the conductor and came into violent contact with a pillar of an elevated railroad, of the location of the pillars of which he knew in a general way. He obtained a judgment for damages. This, however, the United States circuit court of appeals, second circuit, has reversed, ordering a new trial. There was an instruction given from which the jury might have inferred that, if the passenger were in a place of safety, and left it not voluntarily, or because of his own wish, but by reason of the invitation or summons of the conductor, in order to take a vacant seat, and while moving towards such vacant seat encountered the conductor, who insisted standing in such a position that he could only proceed by undertaking a manifestly perilous passage, it must find for him. But, in order to entitle him to recover under such circumstances, the court holds that it must be apparent upon the whole case that in undertaking such passage he acted as a man of ordinary prudence would have done. He was not physically thrust into peril. When he reached the conductor on the running board, he might fairly have insisted that the latter should step inside, or should retreat sufficiently far to uncover the entrance to the vacant seat, or should allow the passenger to pass inside of him. Certainly, he was under no obligation to proceed by passing on the outside of the conductor, and whether he acted with reasonable prudence in attempting to do so was a question which the company was entitled to have submitted to the jury, but which, under the charge, was practically withdrawn from its consideration. And the court thinks that it was error to refuse to give these instructions: "If you believe that the plaintiff, even though he were invited to do so by the conductor, committed a negligent act in passing around the conductor while on the step, then your verdict must be for the defendant. An invitation by a conductor does not relieve a passenger from the rule that the passenger must use care of an ordinarily prudent man for his own safety."

#### LIABILITY FOR EJECTION AND SUBSEQUENT ARREST OF HOLDER OF DEFECTIVE JOINT-CONTRACT TRANSFER.

*Jacobs v. Third Avenue Railroad Co. (N. Y. Sup.), 69 N. Y. Supp. 981. Apr. 16, 1901.*

The appellate term of the supreme court of New York reverses the judgment of the general term of the city court of New York in this case. It says that the action was for assault, founded upon the act of a conductor in the employ of the company sued in causing the plaintiff to be ejected from one of its cars. Damages were claimed, also, for an arrest alleged to have been incidental to the ejection, but the accepted theory of the case was that no unnecessary force was used; and, there being no ground for holding that the arrest was unlawful, the cause of action depended upon the question whether the plaintiff was or was not excused from paying his fare upon his tender of a transfer ticket which had been issued to him by an employee of another company. It appeared that the latter company and the company sued were parties to an agreement which provided simply that each should carry passengers transferred from the cars of the other, at intersecting points, without extra charge; this being the extent of the recital of the contract admitted by the pleadings, and nothing further being disclosed by the proof. A transfer slip was handed to the plaintiff shortly after his leaving the car of such other company, and he took passage without unnecessary delay upon the car of



the company sued, but, owing to a mistake made by the first conductor, the slip was not acceptable under the reasonable regulations of the company sued; hence the plaintiff's ejection upon his refusal to pay his fare.

The authorities, the court says, support a cause of action in tort, as it is called, where the obedience of the reasonable rules of the company by one employee in refusing to receive a defective transfer or stop-over ticket, issued through the mistake of another employee of the same company, results in the invasion of an innocent passenger's rights; but the liability of the common employer in such a case is traced directly to the mistake of the servant whereby the wrong was caused. In this case, the servant of the company sued was justified in the attitude assumed towards the plaintiff. There was no such community of enterprise upon the part of these two corporations as would suffice to charge the company sued with the consequences of the neglect upon the part of the other company's employees. The business of each was wholly independent of the other, and, so far as was shown, there was no common interest in the fares received, nor in identity of management, such as would be essential to the imposition of the liability sought to be asserted in this action. The plaintiff's contract was with the other company referred to, whose duty to him probably included the issuance of a valid transfer slip; but, as against the company sued, his rights were no stronger than they would have been if, instead of receiving a defective transfer slip, he had been refused one altogether by the other company, and had sought to justify the omission to pay his fare to the company sued by the assertion of the other company's default. Furthermore, if it be assumed that the plaintiff could treat the contract between the companies as made for his benefit, there was still no failure of performance upon the part of the company sued; for it was required only to transport passengers who had been duly transferred, and, through the error of the other company, the plaintiff was not thus qualified. Wherefore, the court holds that a recovery was without support upon the record, and reverses, as above stated, a judgment in his favor.

#### SITE FOR POWER HOUSE AND COAL POCKETS CAN NOT BE ACQUIRED UNDER AUTHORITY TO CONDEMN LAND NECESSARY FOR CORPORATE PURPOSES.

In re Rhode Island Suburban Railway Co. (R. I.), 48 Atl. Rep. 590, 591. Mar. 5, 1901.

A statute authorizing a company to condemn land for "corporate purposes," the supreme court of Rhode Island holds, must be construed to mean for a "public use" only, and is not unconstitutional on account of employing the former expression. Then, it being provided that a certain court shall determine whether the lands described are necessary to the company for its corporate purposes, the supreme court says that it does not mean to question that the term "necessary," as used in the statute, does not mean an absolute necessity, in the sense that the particular land is indispensable, but, rather, that the land, or other similarly situated, is reasonably required for a public purpose. It is also beyond question, it says, that everything which may be necessary for "corporate purposes" is not, by that reason, necessary for public purposes. A common carrier serves both the public and itself. It has its public and private functions. The public part is the exercise of its franchise for the accommodation of the parties; the private part is its incidental business, with which the public is not concerned, and which the company manages for its own interests. The company carries passengers over its road as a public duty, but the generation of the power to propel cars is the private business of the company. Whatever is necessary to the exercise of the franchise is for the benefit of the public, but that which pertains simply to means of supply is the private business of the company.

Here, it was sought to condemn a wharf lot for a power house and for coal pockets, which was selected because of the convenience of getting coal to it on tide water and because it adjoined the lot of a certain other railroad company. It was argued that power was absolutely essential to run the cars, and that this concluded the question of necessity for a power house; that there could be no power without coal, and hence the necessity of coal pockets. But, granting that these were things which the company must supply in order to run its road, the court says that it did not follow that

the company had the power to take private property for those purposes. The public, it declares, had no interest in the source of supply, whether the power was purchased, as some of it was, at the time, in this case, or whether each branch of the road had its own station, as was then the case with two branches of this road, or whether there was one central station, which was sought for in this proceeding. Neither was it of interest to the public whether the cars were run by trolley or by storage batteries. Furthermore, it points out that the company was not limited to a particular location for a power house, for coal pockets, or for a water supply, as was evident from the fact that the lot which it here sought for a power house was about five miles from the nearest point on its road. True, the location was claimed as a central point of the system, but this was a matter of convenience to the company, not a necessity. Besides, it involved the taking of land for the purposes of the company, in the city, when another company had the exclusive right to run cars in that city. It is evident, the court holds, that this proceeding was for the private benefit of the company, and not for the public use, and hence not necessary within the meaning of the statute. The simple fact that the company must have a power house did not convert this necessity into one for a public use. And there is a plain distinction, the court holds, between such a case and that of a steam road where the power must be generated in the locomotives on the tracks, and cannot be transmitted from another place.

#### NATURE OF INTEREST OF CITY TAKING CAPITAL STOCK IN COMPANY SECURED BY LIEN.

Guarantee Trust Co. v. Galveston City Railroad Co. (U. S. C. C. A.), 107 Fed. Rep. 311. Mar. 19, 1901.

The United States circuit court of appeals, fifth circuit, holds that where a city grants a street railway franchise to promoters, and at the same time agrees to accept a certain number of shares of paid-up capital stock of the company to be organized in lieu of a percentage on the net receipts of the street railway, and in lieu of a bonus for the contract, and such stock is issued to the city, and it is entered as a stockholder on the books of the company, and it is represented on the board of directors by its mayor, who is by agreement elected a director to represent its interest, the interest of the city is that of a stockholder, and not of a creditor. Nor does it think that there was anything in the contract of that character before the court which placed the city in the attitude of a creditor to the company, or clothed it with a single attribute of a creditor, further than in the "sense in which every shareholder is a creditor of a corporation to the extent of his contribution to the capital stock." And it is of this opinion notwithstanding that the contract in question between the city and the company provided that, in the event that the latter should allow itself to become incumbered by debt to the jeopardy of the city's interest therein, then the city should be regarded as having thereby a first lien on the franchise and the roads and fixtures and corporate property of the company, the same to be secured to the city, by proper process, immediately after the organization of the company, and notwithstanding that an instrument was executed which recited the terms of the contract, and, in consideration thereof, created and granted a lien on the corporate property of the company to secure the interest of the city in the company, in the manner and to the extent provided for in the contract. The court considers that the interest of the city in the company was one capable of being secured, and that the evident purpose of the company in providing security for that interest was to give the city a preference in the distribution of the capital stock or net assets of the company over other stockholders. It says that it would not be presumed that the purpose of the company was to make a contract by which the city was to receive the par value or any part of its stock before all the debts of the company were paid. It would require the clearest language to show that such was its purpose, which the court's interpretation of the contract in question fails to disclose was the purpose, while, if it existed, the contract, the court holds, would be contrary to public policy and void.

A collision between a switch train on the Big Four railroad and an electric car at Danville, Ill., September 12th, resulted in instant death to the motorman and serious injury to two passengers.

## Purchasing and Storeroom Accounting on the Brooklyn Rapid Transit System.

MR. W. J. O'CONNOR, general store-keeper of the Brooklyn Rapid Transit Co., has devoted years of study to the general subject of store room keeping and accounting and is an expert in this particular line. In conjunction with Mr. Lincoln Van Cott, purchasing agent for the Brooklyn Rapid Transit Co., Mr. O'Connor has originated a scheme of ordering, checking, keeping, distributing and charging stores, which we believe embodies a number of new and extremely commendable ideas. Through his courtesy we are able to present a review of his blanks and methods in this issue, which we think can not fail to be instructive to anyone interested in this important phase of street railway operation. Mr. O'Connor has had years of experience on both steam and street railways.

In devising a method for properly purchasing, checking, recording and distributing material and supplies, the officials of the Brooklyn Rapid Transit Co. have developed a system unique in many of its features and which has been more or less followed by a number of the large street railway systems throughout the country. As has been pointed out in the "Review" for September, the Brook-

supplies of goods are received and kept in order to facilitate to the greatest degree the distribution of materials to the points where they are needed.

At the present time the company is carrying about \$350,000 worth of stock, and the weekly distribution of supplies amount to nearly \$25,000. But by the system of records and accounts in use, it is

[illegible]

FIG. 1.

ly Rapid Transit Co. is now operating cable lines, steam elevated trains, electric elevated trains, and about 1500 motor cars of various styles and makes, this complexity of equipment necessitating the carrying of an enormous diversified stock and rendering the checking of supplies into and out of store a somewhat intricate problem.

When the large mileage, the different motive powers employed and the varied types of equipment are considered, together with the large amount of money it is necessary to expend annually for the purposes of additions to the rolling stock, tracks, superstructures and the like of the Brooklyn Rapid Transit system, and also the large quantities and diversified class of materials required to maintain the various features of the property on a scale in accordance with the progressive ideas of the new management, it will be seen that the supply accounting must of necessity be laid out on a most comprehensive plan as to detail, and yet combine with the method rapid facilities of reference which



W. J. O'CONNOR.

will quickly give the quantities and money values of the stock at the different points of the system where it is carried in store, a detail of the receipts and deliveries, and also the various construction, maintenance, suspense and operating accounts chargeable with the cost of materials issued in carrying on the business of the company.

possible to balance the stock-books at the end of every working day in the year and at any moment the store-keeper is prepared to state the quantity and value of every class of stock on hand at any one of the six distributing points, and the quantity and price of all undelivered stock that may have been ordered or is then in transit. For keeping these records there are but ten clerks employed: one on the ledger, two on stock, one on orders, and six on routine clerical work.

Through the courtesy of Mr. Lincoln VanCott, purchasing agent, and Mr. W. J. O'Connor, general storekeeper of the Brooklyn Rapid Transit Co., who have been chiefly instrumental in developing the present methods, the "Review" is able to present a complete description of the system of supply accounting, together with

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No. \_\_\_\_\_ BROOKLYN HEIGHTS R.R. CO. DATE \_\_\_\_\_ 1 \_\_\_\_\_

52D ST. REPAIR SHOP.

STOREKEEPER: DELIVER TO

CHARGE TO...

Foreman,

**Original.**

FIG. 3.

STOCK CARD										ORDERED									
										D.C.	P.O.N.	QUANTITY							
BIN NO.																			
PRICE										UNIT									
RECEIVED										ISSUED									
In	C	P	S	E	R	T	I	O	N	In	C	P	S	E	R	T	I	O	N

170. 2

There is one central receiving and distributing point located at 52d Street and Second Avenue, Brooklyn, where all materials are stored and where all store-room accounts are kept. There are also five other points of distribution throughout the city where limited

a number of blanks used in recording and checking the materials from the time they are ordered on requisition until they are dispersed and consumed.

To begin at the beginning, the ordinary run of supplies is ordered only after the foremen and division superintendents of the various departments and divisions have designated upon proper blanks just what material will be required for a designated period in advance. At present these preliminary requisitions are made every 30 days, the blank used being merely a form 8½ x 11 in. in size, stating that the following "Supplies are required at" (followed by the name of the station), "for the month of ———." These blanks are all forwarded to the general storekeeper who enters upon a sheet, Fig. 1 (original size 13 x 11 in.), the quantity and estimated price of each item and the distributing point to which it is to be delivered. By reference to his stock card, Fig. 2, he then determines just what quantity of each particular item he has on hand at his general store-room, and the other store-houses on the





The order is made in duplicate, the duplicate copy being one inch wider than the original to provide an edge for binding, and is kept in the office of the purchasing agent. This duplicate is merely a ruled sheet with a heading similar to the original. With

ordered, the price, order number, date and amount of bill. The bills, when so certified, are then forwarded to the auditor and in due course are paid.

To facilitate the work up to this point and reduce the amount

[illegible]

FIG. 8.

each order is sent the company's standard bill or invoice form, Fig. 7 (original size 8½ x 7 in.), which is sent in triplicate and all three copies must be returned properly made out when the goods are shipped or the company will refuse to accept the goods.

[illegible]

FIG. 9.

When these bills are returned with the shipment the original, which is on white paper and the triplicate, which is on pink paper, go to the auditor, while the duplicate, on yellow paper, is held at

of letter writing and clerical work incident to reporting and rectifying errors in requisition blanks, bills, non-deliveries of goods, damaged or unsatisfactory goods, etc., a number of small blanks covering each class of error have been devised. For instance, if a bill is found to be wrong, instead of sending a long letter describing the error, a blank form is pinned to the bill stating in concise form just what the trouble is. In the same manner delinquent deliveries are traced, and the shipper notified to hurry delivery, by a blank giving requisition number, order number, and a brief description of the goods. The companies with whom the street railway does business soon find that these printed blanks require immediate attention, and the forms are found to be as efficacious as long letters.

We have now traced the goods up the point of delivery to the store-room. When the goods arrive at the general storehouse they are immediately entered in the receiving or day book, a sheet of which is reproduced in Fig. 8 and the column headings of which are self explanatory. This book constitutes the debit side of the store-room accounts. The goods when received are also checked off on the stock cards, Fig. 2, the entry when the goods were ordered having previously been made as described.

Materials are issued only on requisitions signed by foremen or others duly authorized to make requisitions. A requisition from

[illegible]

FIG. 19.

the office of the purchasing agent, for record. They are checked against the original requisition, are signed by the purchasing agent and then go to the general storkeeper who checks them against the material actually received, and if quantity and quality are in

a foreman upon the general storekeeper at 52nd Street, is made on the blank, Fig. 3, and upon the storekeeper at any of the other distributing points on the blank, Fig. 4. These two sets of blanks are forwarded daily to the general storekeeper's office and consti-

[illegible]

FIG. 11.

accordance with the specifications on purchasing agent's order he attaches his certification to them, after which they are entered on the triplicate requisition order, which he has held in the office, in the remaining columns, that is, name of the firm from whom

tute the only record of outgoing goods. They are, of course, made in duplicate, the second copy being retained by the issuing storekeeper for his own protection.

When these requisitions or receipts arrive each day at the general

storekeeper's office, they are immediately entered upon the stock cards and also upon large sheets, which are known as the "supply blotters" and constitute the credit side of the storeroom accounts. A separate set of sheets is kept for everyone of the six distributing points. On the blotters are also entered the account to which the materials are to be charged, these being indicated by a reference number and letter, according to a regular established schedule, each item of maintenance and repairs of track, line, cars, etc., having its own reference letter. At the end of each day a summary of the blotters for all the distributing points is made, and the total distribution of supplies for the whole system entered upon a "daily distribution sheet" which has a line for each day of the month, and vertical columns for each one of the accounts designated by its reference letter.

There is also kept a "daily ledger sheet" with each class of material, Fig. 9. This sheet provides for the material charged to expense and also for the credit to the ledger account maintained with each class of stock on the general supply ledger.

The "general supply ledger," Fig. 10, is a monthly summary made up from the daily receiving and distribution sheets, and gives the quantity, unit, price, and total value of each class of material on hand and issued. A new balance is struck each month, and a new valuation price at which the goods for the coming month are to be charged to expense, determined by dividing the total quantity into the total price, this practice providing for fluctuations of market values.

Fig. 11 is the "ledger adjustment sheet" with stock inventories made semi-annually when all stock is adjusted and balanced and the semi-annual statements are made up.

### THE M'KENZIE TRAVELING GRATE STOKER.

At the present time a great deal of attention is being paid to the economies which are secured through automatic stoking devices for steam boilers and engineers are generally turning their attention to these devices which serve the purpose of attaining efficiency of the boilers by means of the proper mechanical feeding of the coal and as a sequence the absence of smoke from the stack. Among the types of automatic stokers which have within the last few years been placed upon the market the McKenzie traveling grate stoker occupies a prominent place. This device which is made by the McKenzie Furnace Co., of Chicago, was originated by Mr. Dougal J. McKenzie, and the manufacturers make the following claims for it, namely: high efficiency, smokelessness, mechanical durability, accessibility, large excess capacity, simplicity of construction and operation, ability to successfully burn cheap coal and adaptability to any boiler. One great advantage possessed by this type of stokers is the manner of disposal of clinkers, which is done automatically by having them travel over what is called a clinker apron. This fits snugly to the rear end of the traveling grate and is kept cool by means of cold water circulation. Proper ventilation is produced by having the whole stoker tightly bricked in and the receiver at the end, in which the ashes and clinkers are dumped, is made to close automatically after it is occasionally dumped, once every four or five hours. An improved brick coking arch with adjustable doors at the front end of the furnace facilitates the coking of fresh coal as it enters from the coal hopper. A marked advantage of this furnace is that a fire can be started or banked as in the hand fired furnace. The McKenzie stoker, which is adaptable to any type of boiler, is designed upon the principle that coal fired automatically can be so correctly distributed as to admit just the necessary amount of oxygen to every portion of coal over the entire grate surface, thus producing complete combustion.

The grate bars are of ample strength and are constructed with only 50 per cent of metal to the square foot of surface. The thickness of the bed of coal is automatically controlled according to the power required and the amount of coal to be consumed and at the same time no excess of air is admitted. This type of stoker is not what is called a chain grate stoker. With the McKenzie stoker the chains, although very important, are not subjected directly to the fire. When anything happens to them they can be repaired leisurely and without serious interruption to the running of the plant. The economy obtained by the use of this stoker is claimed by the manufacturers to amount to a

saving in the fuel from 15 to 25 per cent over the usual method of hand firing. Among the many prominent companies which are using the McKenzie stoker may be mentioned, Chicago Edison Co., Toledo Railways & Light Co., Aurora, Elgin & Chicago Electric Railway Co., the Department of Electricity of the City of Chicago and a number of other equally prominent concerns.

### RAPID TRANSIT RAILWAY CONTRACTS.

The site for a power house for the New York Rapid Transit Ry. has been purchased by Contractor John B. McDonald. The location is between Eleventh and Twelfth Aves. and 58th and 59th Sts. The price paid was in the neighborhood of \$1,000,000. Work on the power house will be commenced next spring, and the structure and machinery will cost about \$3,000,000. As has already been mentioned in the "Review," the contracts for the engines, of which there will be eight of 7,500 h. p. each, has been awarded to the Allis-Chalmers Co. An order has also been given for 48 water tube boilers to the Babcock & Wilcox Co. The electrical equipment of the power house has been awarded to the Westinghouse Electric & Manufacturing Co., which it is understood amounts to about \$1,500,000. The plant will consist of one main power house and eight sub-stations. The third rail system has been definitely decided upon as the method by which the cars will be operated.

A committee of the Rapid Transit Subway Construction Co. consisting of August Belmont, president, John B. McDonald, contractor, E. B. Bryan, general manager, L. F. Deyo, chief engineer, L. P. Stillwell, electrical director, and J. Van Vleck, mechanical engineer, have sailed for Europe to make a tour of inspection in the cities of London and on the Continent where subway systems are in operation. The committee will examine into the details of the different systems, the kinds of cars used, the equipment and methods of handling passengers. The committee will be joined in London by Mr. Wm. B. Parsons, chief engineer of the Rapid Transit Commission.

### SPRINGFIELD-PALMER INTERURBAN OPENED.

The new trolley road between Springfield and Palmer, Mass., was formally opened to the public on September 16th. At the invitation of the Springfield & Eastern Street Railway Co. a party of about 50, including city and town officials and representative business men of Springfield and Palmer and neighboring places, made a trip over the line. The party started from Springfield at 1 o'clock and arrived on the return trip at 7 o'clock in the evening.

A stop was made at Ware, the run of 26 miles from Springfield being made in a little less than two hours. A long stop was made also at Forest Lake, the summer resort near Palmer owned and operated by the railway company. Here the guests were entertained with trips around the lake in a naphtha launch and with a substantial luncheon.

### STRAIGHT VS. CURVED SIDE PANELS.

The Harrisburg (Pa.) Traction Co., as fast as arrangements can be made, is changing the exterior side paneling on all its closed cars from concave and convex panels to straight sides of ½-in. poplar strips, fitted tongue and groove, and running vertically from the window sills to the bottom of the main side sills, the strips being held by lag bolts to the lower sills. The strips bear against a wooden riser running the length of the car about midway between the window sill and the main side sill, and of proper height to compensate for the curve in the framing and to bring the new sides perfectly straight.

It has been determined that this innovation will appreciably reduce car repair expenses, as with the straight sides of narrow stripping a dent or mar, resulting from a side scrape or collision with an obstacle at the side of track, can be removed by merely replacing the damaged strips, whereas with the curved sides it is frequently necessary to replace an entire side panel as the result of one bad scratch or dent.



# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

## THE SELECTION OF A STEAM BOILER.

BY W. E. SNYDER, M. E.

This paper has been called "The Selection of a Steam Boiler" because that is the most important work in the entire development of the plant. More can be done in less time before the contract for the boiler is let than in any subsequent period, and it may be stated with emphasis that the successful operation of a boiler plant begins about three months before the contract for the boiler is let. Every engineer knows of firms that would quibble and haggle with a common laborer in the endeavor to reduce his small daily wage, while up their stacks goes fuel and heat and out from their ash pans goes fuel in abundance year after year. This is because they bought their boilers "grocery store plan" from a clerk across the counter. It is hardly possible for the unprofessional man to make himself sufficiently familiar with technical considerations so that he can be competent to select a boiler plant for himself, nor is the young mechanical engineer, of but limited experience, capable of giving very valuable advice on this subject. The writer would insist that since the boilers are the very heart of the plant so far as its operation is concerned, and since their proper or improper installation may make or lose a small fortune for the owners during the life time of the boilers, it is imperatively demanded that their selection, construction and erection shall be intrusted to a competent engineer of wide experience in that particular line. Several years of experience with boilers have been sufficient to demonstrate to the writer the many details and features, which are continual sources of annoyance, danger and expense, most of which could have been avoided had the engineer been familiar with particular conditions.

Another consideration is the relation of the boiler manufacturers to the prospective purchaser. The buyer often cannot see why he should engage the services of an engineer when he is dealing with a company which will do all his engineering free of charge. Of course, the boiler companies will foster this idea. Consider, then, for one instance, the methods by which some common types of boilers must be cleaned and repaired. The conditions are simply wretched. It would seem that if boiler companies cannot change their designs so that cleaning may be done easily and efficiently, they should invent special devices for cleaning. The real trouble is that there is very little good engineering talent connected with the manufacture of boilers, and this simply makes more emphatic the necessity of an engineer for the purchaser. The engineering talent of the seller is not usually of the kind competent to meet particular conditions. Additional proof of this is given by the fact that practically no improvements in many common types of boilers have been made during the past ten years notwithstanding the fact that their makers can scarcely fail to realize that there has been absolute need for such improvements.

We should consider the particular lines along which the relative merits of boilers should be investigated before selection is made. The whole list of detail specifications as to what a boiler should be cannot be given, but after a careful study of the matter the writer would give the following points for special investigation in the order of their relative importance:

(1) Safety, (2) convenience of manipulation, (3) steaming properties, (4) durability, (5) cost.

Of course the minor considerations such as the floor space, special kind of service, etc., may influence the decision or limit the selection, but in general the points enumerated should be considered in the order given.

### Safety.

No one will question the propriety of placing the consideration of safety first. There are two provisions made to guard against the ignorance or carelessness of the man in charge of the boilers from causing loss of life and waste of property by boiler inspections. These are inspections first by persons legally appointed in accordance with the statutory law, and second by inspectors in the employ of boiler insurance companies. In regard to the inspectors appointed in accordance with laws relating to such matters, if the inspectors are selected after a competent examination by a competent board, as are many government employees, the system is not a bad one, although the inspections are too few in number, being usually made about once a year. When such positions, however, are subject to political appointments the system is one of the most pernicious pieces of legislation ever perpetrated. When the boilers are insured and regularly inspected by insurance inspectors the conditions are somewhat better. In this case the insurance company is liable for damages caused by an explosion and efficient inspection is self protection for the company; but even here there are men holding positions who are neither qualified by experience nor training for their duties. Even the best inspection may not reveal defects of design and construction and none of the defects of the material used. This refers the matter to the time of the selection. It is then that the physical and chemical tests of the material can be made and it is then that the design and construction can be superintended. The series of physical and chemical tests proscribed by the United States government for marine boilers is a good guide as to the quality of material and strength of tubes. The kind of tubes and their proper expansion in the tube sheet or head, and the size and distribution of stay bolts and braces and the manner of their connection are also particular points pertaining to safety. The design of the joints demands special attention. One point that deserves particular mention is the thickness of the plate as specified compared with its actual thickness. The plates are sometimes rolled much thinner on the edges than the nominal thickness, owing to the wear and spring of the rolls. In water tube boilers the tube caps, bolts and nuts by which they are fastened deserve attention. The stripping of the threads or the breaking of the bolts has cost more than one man his life. Many of these things may seem unimportant details, but the writer has seen accidents and trouble due to these very details, even when the boilers were made by the large boiler companies.

### Convenient Manipulation.

This is a very important requirement and has been placed even before that of efficiency, because no matter how good its principles so far as generating steam is concerned if it is not capable of being completely and effectively cleaned and being kept in proper repair its efficiency as a steam generator will soon be reduced to that of the most common boiler. The boiler must be cleaned inside and outside. All kinds of matter held by feed water in solution or suspension will be deposited in the boiler and must be kept from accumulating. Unless the water can be purified before feeding it to the boilers the next best way to provide against this trouble is to select boilers that may be readily and thoroughly cleaned. The writer has seen water tube boilers in which the space between the tubes was simply choked solid with dirt because there was no way of removing it while the boiler was in operation.

Another important consideration in the case of water tube boilers is the baffling. This is put in to cause the hot gases to take such a path through the boiler that the heating surface will be continually in contact with the current of hot gases and thus be effective in evaporating water. In some boilers it is practically im-

\*Abstract of a paper read before the Engineers' Society of Western Pennsylvania.



possible to replace the baffling if it once burns out and the boiler must be run with the gases running straight through. In any boiler it ought to be possible to keep the baffling in first-class condition without having to tear down half of the setting to do so. This trouble with baffles is a very serious one. If the gases do not circulate properly heat is wasted and the heating surface rendered useless. It is a great convenience to have a boiler which can be cleaned or have the tubes renewed without going inside the setting of the boiler. At many plants the boiler capacity is very limited and one boiler on or off may determine whether the production of the day may be good or poor. In such a case a few hours lost in repairing or cleaning the boiler may mean a very considerable sum of money to the owners. If repairs can be begun or completed before the boiler or setting is cool enough to enter there is simply that much time saved.

#### Efficiency as a Steam Generator.

The third point in the selection of a boiler is its ability to make steam. The problem is really one of heat transference from the furnace to the boiler. For a definite quantity of fuel burned per unit of time the condition of maximum economy and capacity is when every element of heating surface is effective and doing its legitimate share of heat transference.

One question to be settled in looking at a boiler is whether it is of such design that all the heating surface is effective and can be kept effective in actual practice. The fancy boiler trials have their place and their use in the engineering world, but their use is not deceiving the purchaser into believing he has something which he has not. No report of boiler trials should be allowed to have any weight in influencing the decision in favor of some particular boiler, unless the trials were made by a competent engineer in the employ of the purchaser and the boilers were in regular service.

It is the opinion of the best engineers that no one type of boiler can be selected as superior to all others. There are many different types and each type has a particular advantage or disadvantage, the relative importance of which must be determined by the engineer with reference to the particular place and condition under which it is to operate. The evaporative performance of boilers is rated by horse-power, which in this case means the rate of heat transference from the furnace to the boiler, one boiler horse-power developed meaning that the boiler has absorbed 33,317 B. T. U. in our hour. Different manufacturers allow different areas of heating surface to effect this absorption varying from seven to twelve square feet per horse-power in the ordinary types. This, of course, means that the manufacturer of one boiler considers that seven square feet of heating surface in his boiler will transmit as much heat in an equal time and under similar conditions as twelve square feet in the other man's boiler. The deception comes from the fact that the boilers are usually bought or sold by horse-power, and in competitive bidding the builder of the boiler of high surface rating is evidently placed at an unfair disadvantage when bidding against the builder of a low surface rating boiler. In bidding on an equal number of horse-power the first man will furnish much larger boilers than the second and the latter has every show to underbid the former and still make a large profit on his contract. The best and fairest way is for the buyer to have each bidder state in his specifications the area of heating surface he has allowed for horse-power as well as the total efficient heating surface in the boiler and its distribution. The trouble is not so much that the heating surface in the one boiler is really less efficient than it is in the other, but that in the one case every element of surface is not doing its legitimate duty. We expect results proportionate to the amount of heating surface in the boiler, while the results obtained are proportionate to the amount of heating surface in effective operation. This may account for the apparently higher evaporation per square foot of heating surface in some boilers of low than in others of high surface rating.

When water is being evaporated very rapidly in the hottest part of the boiler other water must be continually flowing in to replace it and the steam produced should not pocket any place but quickly escape to the surface of the water. This implies that there must be circulation and that its rapidity will increase with the increase of rate of evaporation. In considering the importance of the circulation both for promoting evaporation and preserving the heating surface it would seem essential that this particular feature be one for the special investigation in choosing a boiler. The boiler

ought to be of such design that its circulation is thorough and unrestricted. Unfortunately this is a special defect in some common water tube boilers.

Another matter that merits discussion is that of moisture in steam. Conditions of operation and not features of design produce wet steam. In some 1,200 tests of the quality of steam made on different types of boilers the writer has found in nearly all cases steam commercially dry or containing less than 2 per cent of moisture. The writer has seen trials of boilers in which over 8 per cent moisture in the steam was reported and has then tested these boilers and found less than  $\frac{1}{2}$  of 1 per cent moisture present. This tends to verify the statement that excessive moisture is due rather to some condition of tracks than to the design of the boiler.

Engineers writing on this subject usually enumerate the requirements for producing dry steam to be ample liberating surface and steam space. Most of the common type boilers have this.

Another point which may be considered in the efficiency of a boiler is the place at which to deliver the feed. There are two precautions to be observed in feeding a boiler: first, the feed if possible should attain boiler temperature before it comes in contact with the hot sheets; and, second, it should be discharged in such a way that it will assist circulation. Probably the best method of feeding return tubular horizontal water tube or two flue boilers is in the steam space near the back end of the shell or drum. The method is certainly a rational one, as the circulation is not interfered with in any way, while the water being delivered in a sheet or cone attains boiler temperature before coming in contact with the plates. The water is heated by steam actually generated, but that steam is not taken from any place where its condensation will produce a disturbance in the circulation as is the case when feeding in the front end of the drum below the water line. The number and location of the blow-off pipes should also be considered. The boiler that is to be kept clean must be blown-off daily and if it is to be efficient the blow-off valves must not leak. The blow-off pipes should not be expected to be efficient in blowing out mud more than two or three feet on each side of the point where they enter the drum. This will determine their number and location. To be efficient they should never be less than  $2\frac{1}{2}$  inches in diameter.

#### Durability.

On this topic there is not a great deal to be said. The durability of a boiler is dependent very largely upon the conditions under which it operates and in particular on the type or design of the boiler. This statement is somewhat modified by the fact that tubular boilers using very bad water may require retubing in a few years, while the old style two-flue boiler could use the same water and be kept in very good condition owing to its better facilities for cleaning. The practice is now to rely wholly on examination to determine when the boiler has ceased to be safe. This, of course, places the entire responsibility upon the inspector and is an additional reason why competency should be required in this position.

The actual life of a boiler under fairly good conditions would be almost impossible to estimate. In general it may be stated of different types of boilers properly proportioned and having equally good material and workmanship that that type which is easiest to clean will not alone be the more economical but the more durable.

#### Cost.

To a superintendent or manager the question of cost is, of course, simply a business one and he sees simply first cost. To these men the plea may be made and urged that the engineering side of the question should be allowed predominance. Low price alone should never be an inducement for selecting a boiler. The lowest price in this line as in many others is apt to be the highest in the end.

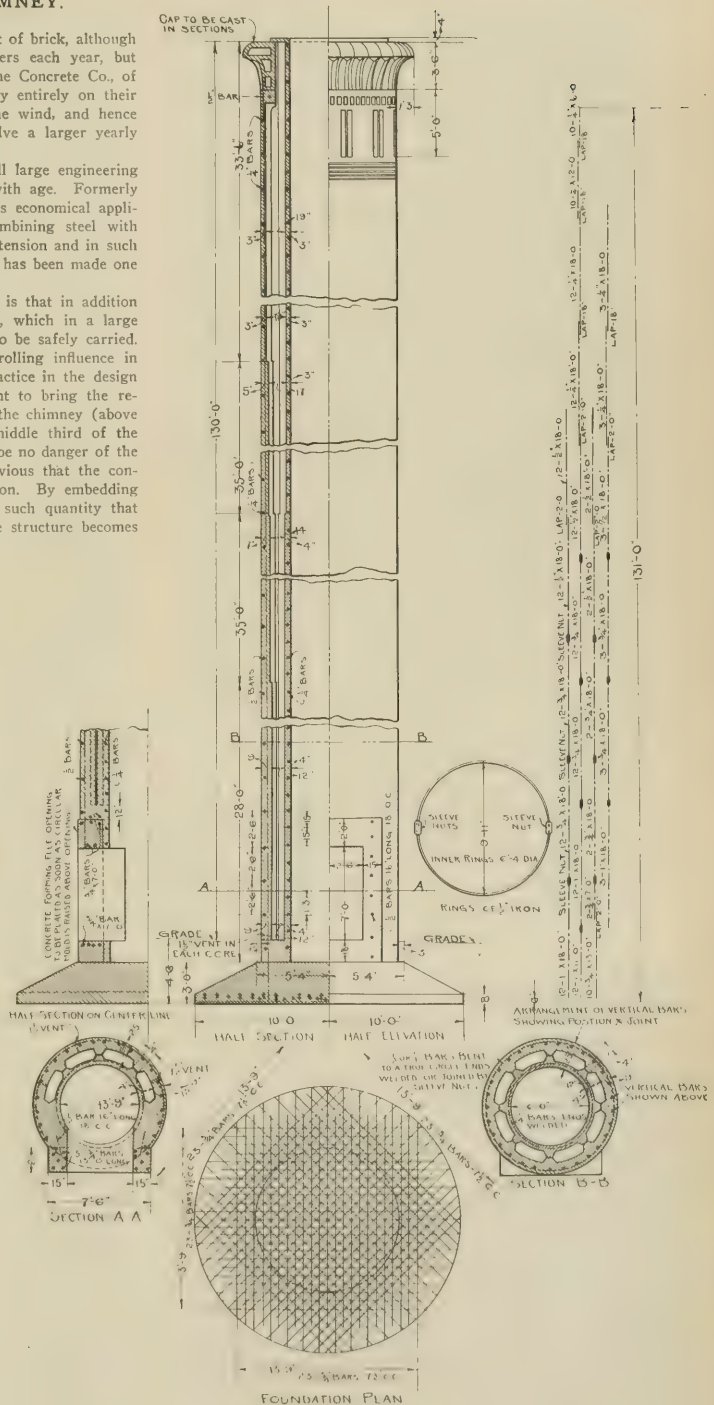
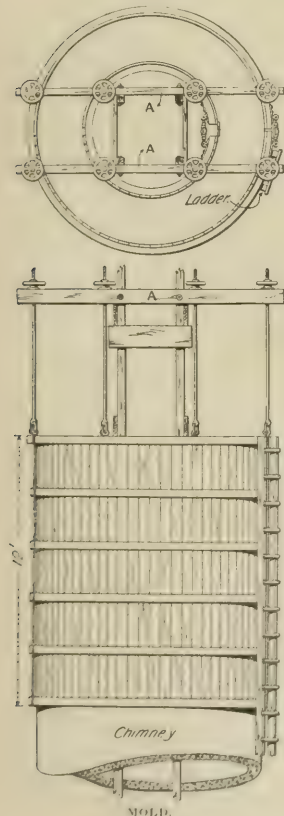
The main argument I have made clear through has been for competent engineering talent from the very inception of the idea of a plant to its completion. The boiler plant will then start under conditions which will insure its operation in complete harmony with the principles of modern economical engineering. The special advantages and disadvantages of each type of boiler as they are developed from actual practice would form an interesting continuation, but the limits of this paper prohibit their consideration.

# A CONCRETE-STEEL CHIMNEY.

Heretofore chimneys have generally been built of brick, although steel stacks are being erected in larger numbers each year, but a new departure has been made by the Ransome Concrete Co., of New York. Chimneys built of brick must rely entirely on their weight to resist the overturning moment of the wind, and hence require very large sections. Steel stacks involve a larger yearly maintenance charge.

Concrete is being very extensively used in all large engineering work, and has the great merit of improving with age. Formerly its lack of a high tensile strength prevented its economical application to all classes of structures, but by combining steel with concrete so as to supply the needed strength in tension and in such a manner that the two act in harmony, concrete has been made one of the foremost of building materials.

The peculiar characteristic in chimney design is that in addition to vertical loads, the horizontal wind pressure, which in a large chimney amounts to a considerable force, has to be safely carried. In fact it is this force which exerts the controlling influence in the design of the cross sections. The usual practice in the design of brick chimneys is to supply sufficient weight to bring the resultant of the wind pressure and the weight of the chimney (above the section under consideration) within the middle third of the base. This is essential in order that there may be no danger of the joints opening on the windward side. It is obvious that the concrete steel stack is not subject to this limitation. By embedding steel in the concrete shell in such form and such quantity that the concrete and steel will act in harmony, the structure becomes



an elastic body capable of resisting the tension which may result from wind pressure.

Therefore with a properly constructed foundation the concrete steel chimney can be designed on the principal of flexure, the sections being determined by the tension which can safely be taken by the steel and concrete on the windward side, or the safe compressive strength of the concrete on the leeward side.

No one questions the ability of good stone concrete to resist very high temperatures without injury, and hence this design results in a most economical use of materials that give permanent structure requiring no outlay for maintenance. The design, however, brings a large overturning moment at the base, requiring great care in the construction of the foundation.

The foundation should have such a base area that there shall be no tendency to rise on the windward side, and also that the maximum edge pressure on the leeward side shall be within the safe bearing power of the soil. In circular foundations the first condition is satisfied by keeping the resultant within the middle fourth of the base. The second should be based on actual tests of the soil.

The illustration shows a chimney designed on these principles for the Singer Manufacturing Co., and two of them are now being erected at the company's new factory at South Bend, Ind. The chimneys are 130 ft. high above grade, 6 ft. internal diameter and 10 ft. 2 in. external diameter, and consist of two distinct shells. The inner shell can hence contract or expand with the temperature changes without producing any strain in the outer shell. The inner shell has a thickness of 4 in. for about half its height and 3 in. for the rest. The outer shell has a thickness of 9 in. at grade and decreases by offsets to 3 in. The distance between the shells is 12 in. at the base and increase with the offsets in the shells.

The embedded steel consists of square bars twisted cold. The twisting increases considerably the tensile strength. Tests made recently at Columbia University showed an average increase in the elastic limit of 89 per cent and in the ultimate tensile strength of 47 per cent. The cold twisting also reduces the ductility of the steel and gives a key between the steel and the concrete. The vertical bars start at the bottom of the foundation and extend continuously to the top of the chimney, decreasing in number and size in accordance with the decrease in the tensile stress from grade upwards. Horizontal rings of twisted steel are also embedded in both shells at intervals as shown. Additional bars are placed around the flue opening as required.

The foundation is the regular Ransome spread foundation, consisting of a monolith of concrete with twisted steel bars embedded near the bottom to take up the tensile stress produced by the cantilever action of the projecting portion. The concrete specified consists of one part "Atlas" portland cement to six parts of clean crushed stone in size from  $\frac{3}{4}$  in. diameter to dust as it comes from the crusher, with sufficient clean sand added to fill all the voids not filled by the cement. The concrete is mixed by a Ransome mixer.

The concrete is placed and thoroughly tamped between circular molds built up of dressed white pine. These molds are 12 ft. high with a joint down one side covered with sheet iron and controlled by turnbuckles. The molds are supported by iron rods passing through cross pieces bolted to the scaffolding which is built up inside of the chimney. The iron rods are threaded and have hand wheels on the ends. To raise the molds the turnbuckles are loosened until the molds are free from the hardened concrete and then raised by screwing down the hand wheels on the threaded rods. They are raised 5 ft. at a time, thus leaving a 7-ft. lap on the portion of the concrete already set. The molds are adjusted to line by the turnbuckles and the placing of the concrete is then continued.

The concrete is delivered to the workmen by a bucket hoist attached to the center scaffolding.

The ornamental top is either erected between special molds set up on top of the regular molds or cast on the ground in sections, and then bedded in place.

To form lightning conductors two or more of the twisted steel bars are carefully grounded below the foundation, and extend through the ornamental top and are tipped with copper.

Among the chimneys designed and built by the Ransome Concrete Co. may be mentioned the one at the factory of the Pacific Coast Borax Co., Bayonne, N. J., which is 150 ft. high, and one

at Elizabethport, N. J., 125 ft. high; and one in course of erection for the Central Lard Co., Jersey City, N. J., which is to be 100 ft. high.

## COAL AND ASH CONVEYING GEAR.\*

BY R. A. SHATTOCK.

The question of dealing with coal used in electric generating stations is one of the most important that presents itself to the electrical engineer, and of almost as much importance is the question of disposing of the ashes that are produced by the boilers. Taking the average of a number of works, the cost of the coal works out at 0.71d. per unit, and this represents 46.6 per cent of the average works cost per unit. In a station producing 5,000,000 units per annum this means an expenditure of £14,791 per annum, or, at an average rate of 12s. per ton, a consumption of 24,652 tons per annum. The cost of conveying and handling this coal varies between very wide limits, according to the distance it has to be taken, the height to which it has to be raised, and the means at disposal. As a rule coal contracts are drawn up to include the cost of cartage into the generating station, and it is consequently somewhat difficult to give an exact figure for this item. A charge of 6d. per ton for cartage from an ordinary railway siding for a distance of half a mile is, however, a fair estimate. This represents an annual cost of about £616 on the above quantity of coal.

If it is possible to put in a conveying apparatus that will take the coal direct from a railway or water siding and deliver it to the generating station, and if the annual charge on this, represented by, say, 10 per cent on the prime cost of the apparatus, does not exceed the above amount, it is certainly worth while to adopt this principle. If, however, the distance is great between the siding and the station, and the cost of the apparatus excessive, it is better to have the coal carted to the generating station and distributed in the coal bunkers by means of a local conveying apparatus. Horse traction for cartage purposes is a very unreliable means, especially in winter time when the frost is on the ground, and when it is very important that there should be no interference with deliveries, and on this account, and also that the cartage may be under the direct control of the station engineer, a more reliable means should be provided. This may be effected by means of motor-driven trolleys, each capable of holding about 5 tons, so constructed that they can be backed under the coal drops of a railway siding or under the cranes used to unload a barge, and arranged so that they can be tipped into convenient hoppers in the generating station. Such vehicles can travel at a speed of 8 miles an hour, and when not used for coaling purposes they can be utilized for conveying cable drums or other heavy gear about the town. They should be, preferably, steam-driven, and can be purchased for £500 or £600 each.

Once the coal has reached the station the question of the most convenient means of storage presents itself to the engineer. The minimum amount which should be stored in a station is 100 tons for every 1,000 i. h. p. installed, and this amount can be conveniently contained in overhead bunkers placed above the boilers. It is, however, desirable to store four or five times this amount if possible, and to effect this an auxiliary coal store is necessary. This must obviously be placed outside the boiler house. It should be near the ground level, and connected to the overhead store by means of conveying and elevating machinery. The coal store or bunkers, whether overhead or on the ground level, may be constructed of brick or iron work. The flooring should be sloped at an angle of 45 deg. to points in the center, from which distributing shoots can be taken either to supply the boilers or the conveying apparatus. The maximum depth of the coal stored in such bunkers should not exceed 10 feet. If this is exceeded the coal is liable to become overheated and to catch fire. The construction of the bunkers, including the roof-work, should be entirely of non-combustible material, and fire hydrants should be placed in accessible positions. In an auxiliary coal store it is usual to have a conveyor running over the top of the store and returning underneath it. By means of this the coal can be collected from the points where it is discharged from the carts, and

\* Paper read before the Incorporated Municipal Electrical Association at Glasgow.



can be distributed in the store. If it is desired to draw coal from this store the return half of the conveyor, which runs beneath it, can then be fed by shoots, and arranged so that it will deliver to an elevating apparatus. The elevating apparatus should take the coal to the level of the coal bunkers over the boilers, and it should be possible to feed this either from the auxiliary coal store or direct from the carts. After the coal has been elevated to the desired height, it can then be distributed in the overhead bunkers by means of another conveying apparatus, and from these bunkers it should be fed to the boilers through chutes, which should be fitted with controlling valves. There are many forms of conveying apparatus, and I will endeavor to describe those most in use, and point out their advantages and defects.

The worm type of conveyor consists of a worm or screw which revolves in a semi-circular trough. The coal is fed into one end of this trough and is gradually pushed along by means of the worm; it is allowed to fall through doors in the bottom of the trough, which can be opened when necessary. This apparatus can only deal with small coal, and it is very liable to get out of order owing to lumps of coal becoming jammed between the worm and the trough. The power taken by this apparatus is also excessive owing to the friction between the worm and the coal, and between the coal and the sides of the trough.

The chain type of conveyor consists of a chain formed of links of bar-iron riveted together; this is dragged along a flat-bottomed trough having doors on the underside; the chain passes over a sprocket wheel which is driven by gearing, and is dragged along the trough pulling the coal with it. This conveyor is less liable to get out of order than the worm conveyor, but the friction between the chain and the trough, and the coal and trough is excessive. Another objection to this conveyor has is the fact that the rivets in the chain, which form the pins on which the links turn, are buried in the coal, and in time these and the holes in the links become worn and cut away; the centers of the links consequently become elongated and the chain does not gear properly with the sprocket wheel. The life of such a chain is not more than from three to four years.

The push-plate type of conveyor was devised with the idea of keeping the chain itself out of the coal. The chain of this conveyor runs on rollers above the trough, and attached to it are a series of rectangular plates which dip down into the trough and push the coal along as the chain is dragged forward. This is a better form of conveyor than the last, but it has the same objection owing to the excessive power absorbed in the friction of the coal when being dragged along the trough.

The band type of conveyor consists of a broad endless india-rubber or fiber belt, from 18 in. to 24 in. in width, running over pulleys at either end, and supported by rollers throughout its length. These rollers are shaped or inclined so as to cause the belt to sag in the center, and so prevent the coal from falling off. In order to discharge the coal from the belt, the latter can be tipped on one side at any desired point, and the coal will fall off the other side, or the coal may be scraped off by an inclined scraper placed at any point. This form of conveyor takes less power to drive, and there is no power absorbed in friction as described in the previous types. This type of conveyor has the advantage of being about the cheapest in first cost, and rubber belts such as these have been known to last from 10 to 12 years, and even then to be in a very fair condition. The working parts of the apparatus can be lubricated, preferably by means of grease.

The steel trough conveyor is composed of a number of steel plates, which are usually turned up at the edges, and which are fixed to the links of an endless chain. The chain may be run on rollers or may be fitted with small flanged wheels which run on a tramway. The plates are so arranged that when the chain is approximately in a straight line they form a continuous trough, which travels along. The coal, which may be of any size, is fed on to this trough and carried along by it to any desired point, where it can be discharged. It has the advantage that the working parts of the chain are kept away from the coal dust, and there is no power absorbed in friction, the coal being carried along bodily. The conveyor is not, however, adapted for the convenient discharge of the coal at any point along its route. The return chain also is useless. All the above types of conveyors can only be used for conveying coal approximately horizontally, and if

used for elevating they should not be run at a greater angle than 30 deg. with the horizontal.

Another type of conveyor that is being extensively adopted now is one in which the coal is conveyed by means of buckets which are hung on an endless chain. These buckets always hang vertically, and in this way the conveyor can be used either for conveying horizontally or elevating vertically, or at any desired angle. The chain itself is fitted with small flanged wheels, which run on an ordinary tramway composed of T section rails. Where it is necessary to change the direction of the motion from conveying horizontally to elevating vertically, curved rails are fitted to effect this. The chain is a double-link chain on each side of the buckets, and the driving is effected by means of toothed wheels or pawls, which engage with distance blocks fixed between the double links. This conveyor can only run in a straight line when moving horizontally, but the direction of the motion may be changed to one at right angles if desired, where the chain is ascending or descending vertically, by allowing the chain to twist where it is hanging free. The buckets are filled by means of funnel shaped spouts which fit into them as they pass along, and each spout allows just sufficient coal to enter in order to fill the bucket. This conveyor takes very little power to drive it, as there is only the friction in the wheels to overcome and the dead weight of the coal to be raised. It is so free that the weight of the coal in the ascending buckets is enough to cause the chain to run backwards if the driving power is taken off, and means have to be taken to prevent this by using some form of ratchet and pawl. The working parts are protected from contact with the coal or ash dust, and, in consequence, have a maximum life. The buckets can be tipped at any desired point by means of a lever engaging with a pin on the side of the bucket. This conveyor can be used both for coal and ashes if it is arranged to travel over the coal bunkers and under the ash pits of the boilers, and in this way the cost of installing two conveyors and special elevating gear is obviated.

Another type of conveyor and elevator that may be employed is as follows: A long girder of H section is supported at any desired height by means of lattice framework and tie rods. On this is fitted a trolley which can be pulled backwards and forwards by a wire rope; on this rope is a pulley with a hook attached, and at certain points this hook can be lowered to the ground level, where a skip, holding about a ton of coal, can be attached to it. The skip is then raised, and when the hook is brought to a level of the girder it is gripped by the trolley, and the whole is traveled along; the skip can then be tipped at any desired point. The motion is then reversed, the skip brought back again, lowered, unhooked, and a fresh skip attached. In this method it is necessary to fill the skips by hand; they can, however, be emptied at any desired point. The working parts are kept free from coal and ash dust, and the apparatus does not take an excessive amount of power to drive.

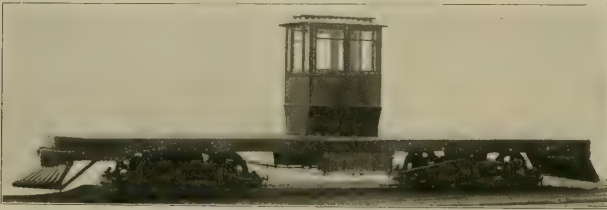
Turning now to elevators as distinct from conveyors. The most usual type adopted is that having an endless chain, which passes over pulleys at the higher and lower level, and has buckets fixed to it. These buckets dig into the coal at the bottom end, in what is called the boot of the elevator; they carry the coal to the top, and as they turn over the top pulley they discharge the coal down a chute, which, as a rule, feeds on to a conveyor. This form of elevator takes a considerable amount of power to drive it, and it has the disadvantage that the working parts of the chain come into contact with the coal or ash dust, and in consequence wear takes place. For unloading coal from a barge the best form of elevator is an automatic grab which can be attached to a crane. This, while open, can be dropped into the coal, and, as soon as the lifting chain begins to pull, the grab closes, digs into the coal and fills itself. It can then be lifted to any desired height and discharged into a hopper, from which the coal can be taken by the conveyor. If desired, each grab can be weighed and an automatic register kept of the weight. Conveying and elevating apparatus is peculiarly liable to breakdown, owing to the rough nature of the work it has to do, and in order to guard against the serious results which a breakdown may entail during the heavy winter loads, some duplicate means should be provided for getting coal into the station and for getting the ashes away from it. Owing to the high initial cost of good conveying plant it is not advisable to install this in duplicate, unless the station be very large and the outlay be warranted. It would appear best to use some simple

and effective means, such as system of light tipping trucks, which can be run on a tramway in the boiler house and which can be filled by hand. Such an arrangement, of course, entails a considerable amount of labor; but, being only a stand-by and to be used only in an emergency, this item cannot amount to very much. In some cases means may be provided for taking the coal carts themselves into the boiler house and dumping the coal on to the floor.

With reference to ash conveying, the same type of apparatus can be used as is employed for coal conveying. The ashes should not be allowed to interfere with the handling of the coal in any way, and should, if possible, be dealt with in a cellar below the boiler house flooring. In a boiler house containing a large number of boilers, if the ashes are allowed to accumulate even for a couple of days, the whole place becomes so choked that it is impossible to work the boilers properly, and if there is a large space available below the floor the ashes can be allowed to accumulate here for several days if it is impossible to get rid of them. The ashes should be taken to an overhead bunker, preferably at the end of the boiler house furthest from that which the coal enters, and from this bunker they may be fed into carts or trucks by means of chutes. It is most essential that they should not be allowed to accumulate, and it is quite as important to provide duplicate means for getting rid of them as it is for getting the coal into the station.

### SPECIAL CONSTRUCTION CAR.

The Mahoning Valley Ry., Youngstown, O., has just purchased from the J. G. Brill Co., a construction car shown in the accompanying engraving, which is so unusual in most of its features as to be of interest to railway men. It consists of a platform car 36 ft. long by 8 ft. wide over the sills; the sills are heavily plated with iron and are strengthened by truss rods. The trucks are the Brill No. 27 G with four Westinghouse 12 A motors. Each end



WORK CAR AND LOCOMOTIVE, MAHONING VALLEY RY.

of the car has a Brill angle iron buffer, and a pilot of a type very similar to that used on steam railroads. In the center of the car there is a small cab having a door upon one side. This cab is 5 ft. long by 4 ft. wide, and at the bottom is finished with a concave iron panel, the object being to allow long rails to be loaded. The car is mounted as low as possible, has the usual trap doors in the floor. Under the center of each sill and between the needle beams are two storage boxes 48 in. long, 20 in. wide and 16 in. deep. From the top of the platform over the trolley board is 7 ft. 4½ in. The car is fitted for use not only as a construction car for rail carrying and the like, but has ample power so it may be used as a locomotive. The pilots are arranged so as to be easily removed for repairs or other purposes. The whole machine is arranged so that it will perform a great variety of services, and will undoubtedly be exceedingly convenient.

The Meriden (Conn.) Electric Railroad Co. projects an extension of its Wallingford line for the distance of one mile through the principal streets of that city.

A representative of Thomas L. Childs, who is promoting an electric line from Canton, O., to Akron, has filed with the canal commission an application for the lease of the outer slope of the towing path and the bank of the Ohio canal from Cleveland to Portsmouth, for electric railway purposes.

### GRAND RAPIDS, GRAND HAVEN & MUSKEGON INTERURBAN.

The work on the construction of this line and the erection of power houses and other buildings is progressing rapidly, and the new road promises to be one of the finest and best equipped trolley systems in the state.

The power house is located at Fruitport, and is now well toward completion, as are also the car barns and repair shops near the same site. The construction of the main line of the road is also nearly completed and it is expected that cars will be operating between Grand Rapids and Muskegon within a few weeks. The car barns and shops occupy an area of 128x166 ft. and are constructed of brick and steel. The roof is supported by steel trusses and a fire wall separates the car barns into two sections, in which there are six tracks, with a capacity for storing 24 cars. The repair shops occupy a large portion of one side of this building and are divided into a number of departments by partition walls. The departments consist of a machine shop, blacksmith shop, armature winding room, stock room and tool room. The main shop is equipped with machinery and tools for doing all classes of repair work and an overhead crane operates over its entire length. The power house is 105 ft. in length and 94 ft. in width. It is of brick and steel construction with Ludowici tile roof and concrete foundation. No wood is used in its construction and the floors are of cement.

The power house is provided with coal bunkers which adjoin the boiler room. These have a capacity of 300 tons of coal, and the coal cars are arranged to run directly over the bunkers into which they discharge. The generators are five in number, of 300 kw. capacity. Two of these are three-phase alternators and three are known as the A. C. D. C. generators, which are wound so that alternating current can be taken off one side of the machine and a direct current off the other side. This arrangement precludes

the necessity of rotaries at the power station to feed into the trolley at that point, as direct current is taken from the main generators. The voltage of the direct current is 650 volts. All the generators are direct connected to Westinghouse condensing engines. The boiler plant consists of four Babcock & Wilcox boilers of 300 h. p. nominal capacity, equipped with mechanical stokers and the draft is procured by means of vertical tandem fans. The boiler plant is equipped with fuel economizers and feed water heaters and a Worthington jet condenser is used. After passing through step-up transformers the alternating current is led to two sub-stations, one at Coopersville and the other between Grand Rapids and Berlin. Both of the sub-stations are constructed of brick and, in addition to the power room, they are each provided with a passenger room, express room and office. Here the current passes through step-down transformers and rotary converters from which the direct current connects with the third rail and trolley. The third rail system is employed in all parts of the line where right of way is enclosed with fences. In cities and villages through which the road passes the overhead trolley will be used.

The passenger cars are designed to be 58 ft. 9 in. in length and will be of handsome appearance and beautifully upholstered throughout. Each car is to be equipped with two 50-h. p. motors and with Westinghouse air brakes.

The Lorain (O.) Street Railway Co. has reduced the fare over its lines between Elyria and Lorain from 9 to 6 2-3 cents.

A man named Wrenn, accused of stealing 1,500 lb. of copper wire from the lines of the Milwaukee Electric Railway & Light Co., has pleaded guilty to the charge, in the municipal court, and received a sentence of nine months in the house of correction.

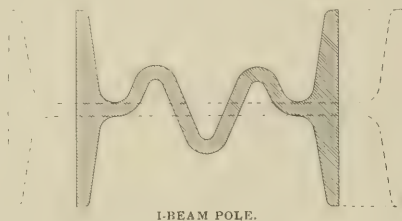
The Schenectady (N. Y.), Railway Co. has completed its extension to Albany, which is double-tracked for the entire distance and operated from a power and transformer station at Karner. The installation includes two large rotary converters of 300-kw. capacity, six transformers, and a 50-h. p. motor to run the air compressors and its necessary pumps to furnish water.

## COMPOSITE METAL SPAN-WIRE POLES.

The use of steel and iron poles for span wire works has grown to a great extent within the last few years, and if we consider the comparative life of wood and metal poles the latter will be found eventually to be considerably cheaper on account of their greater durability. The average life of wooden poles may be taken at about 11 years, while metal poles will usually last 33 years. On this basis a mile of wooden poles would cost for 33 years about \$3,500, while a mile of pipe poles for the same period would cost about \$3,500, making a difference in favor of the metal poles of about \$1,000. The rigidity of a pole line is of great importance in keeping the trolley taut and in good alignment and it was largely for these advantages that iron poles were first brought into use. There have been a number of makes of metal poles put on the market since the demand has arisen for iron poles among which the pipe pole has been the most conspicuous, and it is to be noticed that on many of the early overhead trolley lines which have been reconstructed the wooden poles as well as light metal poles have been displaced by heavy pipe poles. A system of composite iron poles has been devised by Mr. John Lanz, of Pittsburgh, Pa., which includes tubular poles built up of plates and also of channels, and triangular poles built up in the same way. These poles are the subjects of a number of patents granted to Mr. Lanz, and cross sections of some of the more important details of these poles are shown in the following illustrations. The object of composite poles of the types illustrated is to secure a maximum strength and rigidity with the minimum amount of metal and another point to be considered is the cost of labor in their manufacture. There is no condition that these tubular or triangular poles will not meet as well as the ordinary style of pipe pole and they are considerably less expensive to install.

In the pole line system devised by Mr. Lanz which is well adapted for suburban lines, where plain poles are suitable, the plan is to make every third or every sixth pole latticed and between these to use a 9-inch I-beam pole of 21 lb. per foot weight, loaded in the direction of the web. Such a pole is equal in strength to an 8-in. pipe, and such an I-beam pole and pipe pole, each 30 ft. long, will weigh respectively 630 and 1,220 lb. Of

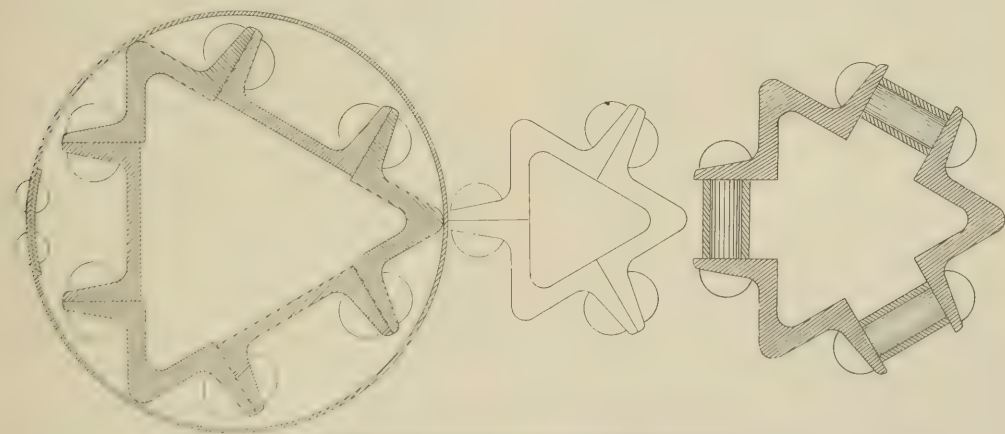
ticed the total weight of material per mile would amount to 69,150 lb. A great saving is also shown in the difference of cost of labor in the manufacture of these two styles of poles. As given by Mr. Lanz, the expenses of making pipe poles for one mile of track amounts to \$1,657, while the cost of making a composite pole would be but \$456. The steps in the manufacture of pipe poles and the composite poles are of interest as they show the great difference in the amount of labor required in either case. In the manufacture of pipe there is an expense of considerable importance in the heating and waste of material by oxidation. The entire skelp plate must be heated twice, once for the bending of the skelp to form and again for welding the same into pipe. This heating



I-BEAM POLE.

is done in expensive furnaces using considerable fuel. Then a third time the pipe is heated so as to swage and shrink the pipe sections for the pole one on another. In the making of composite poles there is no heating by the process devised by Mr. Lanz except for the rivets.

The first step in the process of making lap-welded pipe is to scarf the longitudinal edges of the plate, second, the plates are bent up ready for the welding, third, the bent plates are properly heated and welded, fourth, the welded pipe is rolled true and round, fifth, the pipe when cool is straightened in a hydraulic press, sixth, it is cut to length, and the waste of the crop ends should be considered, and seventh, two sections of pipe are heated



SECTIONS AND TOP VIEW OF HEAVY CHANNEL IRON POLE.

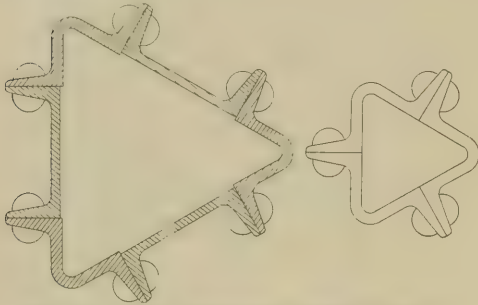
course, the less the number of latticed poles in this system the greater the economy of the material, and at the same time the fewer the latticed poles the further the I-beams in them must be spaced apart at the base in order to make them as strong as the several intermediate single poles. A cross section of the I-beam pole is shown in one figure, and these poles may be tapered either by corrugating the web or cutting a wedge out of the web and pressing the sides of the beam so as to close up the opening cut out. The weight of a mile of 8-in. pipe poles is about 100,000 lb., while with the system of I-beam poles with every sixth lat-

at the ends swagged or forced and shrunk on the other cold pipe section suitable for these poles.

In the manufacture of these composite poles the work is all done cold which is a considerable advantage in handling the material, and there are four steps in the process. The segments for these pipe are rolled with a suitable angle and require no further shaping. The first process is punching all the holes in the segments, second, cutting the pieces for pipe rivets to length, third, bolting or assembling the pole ready for riveting, and fourth, driving about 120 rivets, which practically finishes the pole. Channel or

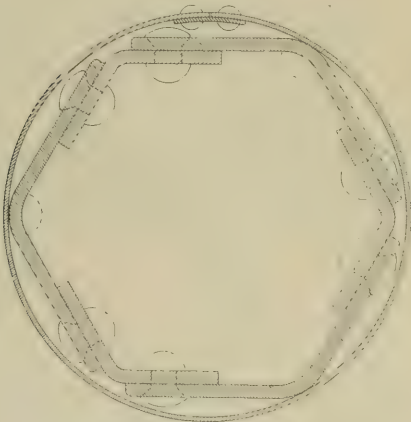


plate girder poles weighing 720 lb. have been bought for \$12.20, which equals 1.71 cents per pound; deducting the price of steel angles and plates at 1.05 cents per pound, leaves .66 cents per pound for manufacturing. At the same time the above price for composite poles was quoted 8-in. pipe poles weighing 1,220 lb. each cost \$30, or 2.46 cents per pound. Deducting the price of skelp at .95 cents per pound leaves 1.51 cents per pound for the



SECTION AND TOP VIEW OF LIGHT CHANNEL IRON POLE.

manufacturing pipe poles. These prices were taken from actual quotations and are consistent with the relative expenses estimated by Mr. Lanz as necessary for pipe making and riveted work for trolley poles. The triangular pole illustrated herewith is a very simple and strong construction. It is also apparent that a pole composed of segments arranged in a triangle will give the greatest strength with the least steel. The design and the firm union of the segments of the triangular pole is such that it will not collapse as a thin pipe pole will when overloaded, nor can the



TUBULAR POLE OF PLATE IRON SURROUNDED WITH CASING FILLED WITH CONCRETE.

segments move relatively to each other when the pole is strained. A device for making these poles more durable is the method shown herewith of surrounding the lower part of the pole with concrete, which is contained in an outer casing. This assures considerable added durability and permanent strength. It is to be noted that rust on pipe poles is the greatest at or near the ground level, as at this point it is practically impossible to apply any coating for protecting the metal. With the casing filled with concrete extending somewhat above the ground the moisture at this point is avoided and paint may be applied to all exposed surfaces when desired.

The Amherst (Mass.) & Sunderland Railway Co. is preparing to extend its line for four miles in the direction of South Hadley. The extension will afford connections with the lines to Holyoke.

## TROLLEY FROM MAUCH CHUNK TO PHILADELPHIA.

The Mauch Chunk, Lehigh & Slatington Street Railway Co. was opened over part of its route in the latter part of September and has met with gratifying patronage since the start. This road when completed will extend from Mauch Chunk to Slatington, a distance of 20 miles, and will connect quite a number of important Lehigh Valley towns. The company owns 425 acres on the top of Flag Staff mountain, which is a level plateau fully 2,000 ft. above sea level. It is proposed to establish a pleasure park at this site. At Slatington connections will be made with the Ellentown & Slatington Street Railway Co., connecting with the Philadelphia & Lehigh Valley Traction Co., thus making a practically through line from Mauch Chunk to Philadelphia.

The officers of the new company are: I. A. Sweigard, president; John H. Pascoe, vice-president; Thomas F. Durham, secretary, and W. H. Bartlett, treasurer.

## MELBOURNE TRAMWAY & OMNIBUS CO.

The 28th annual report of the directors of the Melbourne Tramway & Omnibus Co., of Australia, for the year ending June 30th, showed the company had passed an unusually prosperous year. There was a very considerable increase in the company's receipts over the previous year, which in a large measure was due to the opening of the Federal Parliament and the royal visit. As these instances will not recur it was decided to take the opportunity to add £20,000 to the company's reserve fund, making it, with interest earned, £30,375. There was also added £2,574 to the dividend reserve, bringing this fund to £12,000. The directors of the company voted a bonus of 2½ per cent extra dividends out of last year's earnings, which was payable to the stockholders after Aug. 14, 1901.

## A STREET RAILWAY MANAGERS ASSOCIATION.

A rather unique organization has been formed recently among the officials of the Everett-Moore syndicate. The managers of the several properties controlled by this syndicate have organized themselves into what will be known as the Managers' Association. The object of the organization is to bring the several managers more closely in touch with the different properties of the syndicate, and it is expected that much good will result from an exchange of views on the management of the different systems. Meetings will be held by the association once a month and the next meeting will probably be held in Toledo. At the first meeting of the association the following nine general managers were present: J. C. Hutchins, of the Detroit United Railway; Ira A. McCormack, of the Cleveland Electric Railway; Chas. Currie, of the Northern Ohio Traction Co.; L. E. Beilstein, of the Toledo Railway & Light Co.; Allan F. Edwards, of the Detroit and Toledo Shore Line; R. L. Andrews, of the Cleveland and Chagrin Falls Railway; C. E. A. Carr, of the London (Ont.) Electric Railway; Joseph Jordan, of the Cleveland, Painesville & Eastern Railway, and R. E. Danforth, of the Lake Shore Electric Railway Co.

## GAS FOR THE IOLA POWER HOUSE.

A gas well which was drilled by the street railway company of Iola, Kan., for its power house was completed early in September, and yields an amount of gas which is equivalent in heating capacity to 350 tons of good coal per day. The building of the power house was immediately commenced upon the site of the well, and it is expected to have the line in operation with the new fuel during the present month.

A series of lectures will be delivered before the Augusta (Ga.) Railway Athletic & Benefit Association, which comprises some 115 employees of the Augusta Railway & Electric Co., by Mr. N. L. Willet, and Mr. W. E. Moore, manager, superintendent and chief electrician of the company. An effort is being made to furnish the association with an industrial library.

## DANGER OF OVERHEAD ELECTRIC WIRES TO FIREMEN.

At the Indianapolis meeting of the Association of Fire Chiefs a paper was read on the above subject by Morris W. Mead, superintendent of the Bureau of Electricity, Pittsburg, Pa., in which he makes a number of suggestions in regard to the arrangement of overhead line construction.

The author thinks that all electric circuits should be run in parallel lines and at regular intervals be lead off switches the location of which should be kept on file at the headquarters of the fire department. Blue prints of the circuits and switches should be carefully studied by the firemen, with the assistance of an expert of the local company or of a competent city electrician. The firemen should be carefully trained and instructed in handling the switches as well as in general electrical principles, so as to understand the safest manner of handling the wires in case of an emergency. He suggests that each circuit should be labeled at regular intervals with the voltage carried. Trolley wires should also be arranged so that sections could be cut out at every 1,000 or 2,000 feet in the crowded cities. In the large cities one or two electricians should be attached to the fire department to assist and instruct the members of the department in self-protection from high potential circuits. One of the best remedies for danger from electrical wire is obviously to place them underground, especially in the business portion of the city, but all cities are not so situated as to make the underground system possible. In all cases, however, trolley feed wires can be placed underground and feeding points arranged at stated intervals, thus doing away with much of the obstruction and danger.

The author also suggests that an important step toward doing away with electrical danger would be a complete city control over all electrical circuits. An ordinance should be passed placing the supervision of overhead wires in the hands of a competent city electrician. Another safety arrangement suggested for the protection of firemen from electricity is that all electrical light and railway companies should have thoroughly equipped wagons located at certain intervals along their lines, with competent men in charge, to respond in every case of fire. This, it is thought, would be a good thing for the companies themselves from the standpoint of economy, in addition to the protection it would afford to the firemen. Another precaution which should be observed is to have on hand rubber boots and rubber gloves to be furnished firemen as well as insulated pliers in case of necessity.

## SCANDINAVIAN STREET CAR HEATERS.

A new method of street car heating has been adopted in some of the larger cities of Norway and Sweden. The heater consists of long perforated boxes, one of which is placed under each row of seats. The boxes are filled with red hot briquettes of compressed coal, which are prepared in such a manner that no smoke or odor results from their consumption. Iron sheeting is arranged under the seats, which allows the fumes to escape into the open air. The air is supplied to the fuel through a ventilator placed under the coal boxes at the bottom of the car and the speed of the car develops sufficient draft to completely consume the briquettes. The system is stated to be very satisfactory, both as to its efficiency and economy.

## BALTIMORE STREET RAILWAY TO HANDLE HIGHWAY REFUSE.

The United Railways & Electric Co., of Baltimore, is about to submit figures to the Board of Estimate for a contract price for removing street dirt. The street cleaning commissioner has furnished the officials of the railway with an estimate of the probable amount of dirt to be removed yearly, which will aggregate about 260,000 cubic yards. According to the plan of the railway company the dirt is to be delivered at one of the company's buildings situated near the center of the city and within easy access of the several city districts. From this building it will be loaded on cars and transported to the ends of the car lines, from which it will be distributed.

## STRIKES OF THE MONTH.

A strike of the motormen, conductors, switchmen and guards employed by the South Side Elevated Railroad Co., Chicago, went into effect September 28th, the men demanding an increase of wages of 25 cents per day. At the time of the strike, motormen were receiving \$2; conductors, \$1.75; and switchmen and guards, \$1.50 per day. In addition to the raise, which would average 15 per cent, the employees demanded that the cabooses in which the motormen stand be heated in winter, and that salaries be paid every two weeks instead of every month as has been the custom. President Carter expressed a willingness to consider the employees' demands, and to grant an increase of wages averaging 10 per cent; he was not willing, however, to submit to the coercion attempted by the men in sending a committee to his house at 3 o'clock in the morning to inform him that unless their demands were granted unconditionally, not a car on the South Side Elevated system would be permitted to run that day. On Mr. Carter's refusal to meet their demands, 200 of the 250 trainmen in the company's employ went out on strike at 5 a. m., September 28th. The company, however, was equal to the emergency. Shop-men, extra ticket agents and other substitutes were pressed into the service and a fair schedule was maintained throughout the day. Passengers and ticket sellers were threatened, and during the following night six guards were assaulted and beaten. After an all-day session the strikers decided that they would return to work at any price if the union were recognized by the company. The officials answered that an increase in wages would be granted, but that the union would not be considered. Many of the strike leaders admitted defeat and a number of the men returned to work. Trains were operated on regular schedule without inconvenience to patrons, and no appreciable effect on the business of the road resulted. September 30th, the road carried 64,638 passengers, the number carried on the corresponding day of the previous week being 67,084. The gain for the month was reported at 4 per cent.

A strike on the lines of the Scranton (Pa.) Railway Co., covering the entire Lackawanna Valley from Pittston to Forest City, 30 miles, was called at 5 a. m., October 1st, and some 600 employees of the company stopped work. The direct cause was the refusal of the general manager to reinstate two conductors who had been discharged. The reinstatement of the two conductors, and a uniform wage scale of 20 cents per hour, was arbitrarily demanded. These terms the company would not consider, and a general strike resulted. The entire street railway system was tied up until substitutes could be procured.

A strike on the lines of the Pensacola (Fla.) Electric Terminal Railway Co. went into effect September 29th, and was caused by the discharge of a union motorman for refusing to instruct a non-union recruit in the management of an electric car. For two days the entire line was tied up, the striking motorman and conductors numbering about 50.

## HALF FARES IN SWITZERLAND.

Hereafter there will be no possibility of passing off eight year old children as under five years of age in Switzerland. The railway authorities have decided that the sin of fibbing about a child's age to escape paying its car fare must be met in some other way than by means of moral instructions. The railway men claim that the loss of children's fares on the railroads every year reaches an enormous amount, and in order to avoid the chances of any dispute as to the age of the child the rule has been laid down that in case of doubt the child must be measured. Those under two feet in height are to be allowed free passage while those between two feet and four feet in height must pay half fare. If this method is not ideal it at least puts the question of age beyond dispute.

The Hartford (Conn.) Street Railway Co. is having made in its shops two miniature cars, which will be exact models of its standard open and closed cars and complete in every detail.

The Lowell & Boston company's new branch from Woburn, Mass., to Billerica Center has been opened for regular traffic. The initial trip was made September 5th by a party comprising the officials of the road and their guests.

## PERMANENT WAY FOR ELECTRIC TRAMWAYS.

Extracts from a paper read before the Incorporated Association of Municipal and County Engineers (England) by W. Howard Smith.

To successfully design tramway permanent way necessitates the most careful consideration of a multiplicity of small details, many of which may, to the inexperienced, appear of insignificant import, but a closer analysis will show how greatly they may affect the stability, ease of running, cost of maintenance, or life of track. A well-designed track which is the outcome of practical experience will probably have a life double or treble that of one badly conceived. Each year added to the life means not only a saving of the proportion of capital cost and interest thereon, but also the postponement of the inevitable loss of revenue during reconstruction; every possible means should therefore be taken, at reasonable expense, to ensure that the permanent way shall be perfect in design and construction, and its standard of stability of the highest. Though the experience in this country of the wearing effect of electric traction on tramways has been comparatively short, it has been sufficient to conclusively demonstrate that it is much more exacting in its demands for perfection of permanent way than was found necessary under horse, cable, or steam traction. This is primarily due to heavier cars being run at much faster speeds and with much greater frequency. A loaded electric car weighs from 10 to 12 tons as against 3 to 4 tons for a horse or cable car, while the maximum speed is generally fixed at 8 miles per hour on urban and suburban, and 15 miles per hour on interurban lines, these speeds being subject to further restrictions where there is a density of vehicular or pedestrian traffic. When entering or leaving passing-places, cars are supposed to slow down to four miles per hour, but it not unfrequently happens that in actual working these speeds are somewhat exceeded. Electric cars are equipped with more powerful brakes, which are more frequently put into requisition, with attendant use of sand, causing wear. On some steep-grade lines no less than four brakes are provided to the cars, and the Board of Trade has required that, in addition to the usual electric and hand-wheel brakes, wood slipper-brakes, about 18 in. long, shall be constantly applied to each rail on the downhill journey, and in one case a special brake or pilot-car with similar brakes is run in front of the passenger car. Perhaps the most powerful brake is the "scotch," applied to both wheels and rail. The better the permanent way the more use is made of it by vehicular traffic, especially of the heavier kind, quick to take advantage of the lessened tractive effort necessary when cart-wheels are run on the smooth rail surface. This is particularly the case when track is of 4 ft. 8½ in. gage, which nearly approximates to the usual width apart of wheels on vehicles. So obstructive and detrimental to the wear of the track has vehicular traffic been found at some place that the authorities are endeavoring to obtain powers to relegate it to the sides of the carriageway, but a frequent car service generally results in practically sweeping other vehicles off the track.

### Rails.

An ideal tramway track would be one in which, in addition to providing perfectly smooth running for the cars and being unobjectionable to ordinary street traffic, each part would have a similar period of life; this, however, is unfortunately far from realizable. Assuming the work to be well executed, the concrete is practically for all time, and the paving, if of granite or other hard stone, may last thirty or more years, whereas the life of the rails will be much more limited, and as their renewal entails relaying the paving and other work, it behoves the engineer to give earnest consideration to every detail tending to obtain longer life in the rails, which, with their accessories, it is not too much to say form the most important part of the track. The main duties of a rail are: mechanically, to carry the car and vehicular traffic passing over it; and, electrically, to act as a medium for conveying the return or negative current back to the power-house. For this latter purpose it is immaterial in what form the metal is disposed, so long as a certain minimum sectional area is provided. The Board of Trade has recently made a pronouncement that this minimum shall be such as to be equivalent to a rail weighing 90 lb. per yd.—i. e., one having a sectional area of about 9 sq. in. for a hard-steel rail having a conductivity of about 1-12th to 1-14th that of copper. The general practice now is

to go even beyond this: perhaps about 95 lb. per yd. may be considered the weight most desirable. Mere weight alone is, however, of little value as affording a criterion of the strength, stability, ease of running, or wearing qualities of a rail; it depends how this weight is disposed—i. e., upon the section or profile, and also upon the chemical constituents. While the section should be such as to provide great vertical and lateral stiffness, the profile of the head of the street surface, must be such as not to interfere with the general traffic, and its total width should be as narrow as possible. Until very recently by the Board of Trade Regulations the groove was limited to 1 in. in width and depth, being varied only in one or two exceptional instances where railway rolling-stock also passed along the tramway rails. Of late this has been relaxed and grooves of 1½ in. in width and depth have been approved. Undoubtedly a wide groove is an advantage by admitting a thicker and, therefore, stronger wheel-flange to be used; and it is particularly desirable at curves to allow free passage of flange without friction against sides, and straining of underbody of cars when of long rigid wheel base. But with a wide groove on the straight, more side-play is allowed to wheel-flange, and, therefore, the greater the force of impact and vibration, through flange striking sides of groove; again, larger stones, pieces of metal, etc., and more dirt can enter, and there is a greater reservoir capacity for surface water, to be splashed up by a passing car into the bearings and motor-gearing, with the possibility of damage resulting. With a wheel-flange ¾-in. thick, a width of groove of 1½ in. should be ample on the straight and for curves with larger radius than 75 ft. For curves of from 75 ft. to 50 ft. radius, 1¼ in. width will usually be found sufficient, while those of less radius should never be used; if they are, there will be grinding and great wear, but much depends upon the profile of groove apart from width and depth. It should not be forgotten that the effect of wear is to widen the groove, and that a wide groove is an element of danger to cyclists, tradesmen's tricycles, and other narrow-tired vehicles. While the purpose of the guard or lip is to form a guide for the wheel-flange, it must be strong enough to sustain vehicular traffic coming upon it. It is desirable that the top of guard be made slightly lower than tread as latter wears away the quicker; dirt can be also easier cleaned from groove. For curves, where the guard is subject to be ground away by friction from wheel-flanges, it should be made thicker and slightly higher. The web should be so placed that its centre is as nearly as practicable below the tread, so that the resultant of the forces from rolling load of car and lateral pressure of flange shall fall well within the base, otherwise there is a tendency for the rail to tilt under the forces coming upon it. It should, of course, be perfectly vertical; in badly rolled rails the web is often at an angle, and much crippled. The base should be sufficiently wide to spread the superincumbent weight on the concrete underbed and to resist the side-tilting motion referred to.

### Standard Rail Section.

The general adoption in this country of a "standard" rail section is much to be desired. It is difficult to enumerate the many advantages that would follow therefrom. Certain it is that it would assist to great economy, simplification of detail, and more perfect rolling, and manufacturers would gladly welcome it. The cost of a set of finishing rolls alone is about £200, which is of course eventually borne by the consumer, and they will only suffice to roll a limited quantity of rails, so that it does not pay manufacturers to specially prepare them unless for a large quantity. With the present multitude of sections, which are being constantly added to, it becomes impracticable for rail makers to stock rails, but with a "standard" section rails would be kept in stock of various lengths, including those for joining up to points and crossings, which have now to be cut on the ground in a somewhat rough-and-ready manner, and at much trouble and expense. Were the disadvantages that arise from the great variety of sections at present employed, and the great advantages that would ensue from the use of a "standard" section, all detailed, but little room would remain for dealing with other matters within the limit of this paper. Disadvantages are not so apparent in the first laying of a track when large quantities of rails are required, but should small lots be hereafter wanted for extensions or renewals it will probably be found impracticable to obtain them of the same section without fresh rolls being made, or, should rolls exist, at an enhanced price, as it costs a considerable sum to put in a set of rolls, and these difficulties will be still



more emphasized with foreign sections. Imagine the result when a track becomes a patchwork of various rail sections, as has been the case on many old tramways, and is even the case in more than one instance on tracks recently constructed. Endless trouble, delay, and cost will thereby be entailed. Joints cannot be properly made but cranking, joggling, packing, or other unworkmanlike methods have to be resorted to, with the natural consequence that trouble at the joints is quickly experienced and rails have a very short life. A "standard" section would also lead to a "standard" wheel tire profile, giving much less trouble from broken or worn flanges and longer life—no small advantages. The considerations before mentioned particularly apply to points, crossings, and special work. Take the case of cast crossings, which are made of various angles and which are often wanted at short notice to replace those worn or damaged; obviously it is impracticable to stock these of patterns to conform to the many sections, and if they have to be made it may mean a delay of some months, whereas with a "standard" rail they would be stocked. Much greater opportunity would also be given for improvement; the present design and manufacture of points and crossings can hardly be said to have reached perfection. The conditions to be complied with in a "standard" rail are so limited that there should be little difficulty in arriving at the best way of meeting them. We have first a rail of a minimum weight of 90 lb. per yd., with a head as narrow as practicable consistent with the duty it has to perform; experience shows that this should be about  $3\frac{1}{2}$  in., made up say of a  $1\frac{1}{4}$  in. tread,  $1\frac{1}{4}$  in. groove, and  $\frac{3}{4}$  in. guard. For curves less than 75 ft. radius, the groove should be widened to  $1\frac{1}{4}$  in. and guard made  $\frac{7}{8}$  in. thick. With a "standard" rail, all accessories, fish-plates, joint-plates, tie-bars, bolts, nuts, etc., could also be standardized. Similarly, tools—such as benders, jim-crows, spanners, saws, drills, etc.—could be largely of one pattern, instead of the present multitude, some good and some bad. A standard specification of chemical constituents and tests is also desirable. The author suggests:

Carbon	....	....	....	....	.45 to .55 per cent.
Silicon	....	....	....	max.	.08 to .55 per cent.
Sulphur	....	....	....	max.	.06 to .55 per cent.
Phosphorus	....	....	....	max.	.08 to .55 per cent.
Manganese	....	....	....	max.	.7 to 1.0 .55 per cent.

Tensile, 42 to 48 tons per sq. in.; elongation, 15 per cent on a length of 8 in.; tup test, 1 ton falling 20 ft. on 5 ft. piece on 3 ft. supports, without causing fracture.

The author believes that the best and cheapest track is to be made with rails 45 ft. long rather than 60 ft.

#### Tie-Bars.

Tie-bars should be of wrought iron not thicker than  $\frac{3}{4}$  in., or will cause very wide joints in paving; they should not be less than  $2\frac{1}{2}$  in. deep, when sufficient metal is provided for swaging down to form  $\frac{7}{8}$  in. threaded end, otherwise end is bent over and a very weak place results. Tie-bars having one end slotted are preferable to those with both ends threaded, as it is advisable to have as few screw-nuts as possible—they invariably work loose. The usual distance apart for tie-bars is 8 ft. on the straight, and 6 ft. on curves less than 75 ft. radius, but at joints they are placed about 2 ft. from rail end. Tie-bars are useful in keeping rails in position, but sole reliance should not be placed in them to hold rails to proper gage under stress of working.

#### Concrete Foundation.

Concrete for underbed is usually made of 1 part of cement (lime can seldom be used to advantage) to 6 of aggregate, though occasionally 8 or 9 parts of aggregate are used. The author's practice is to use 6 to 1 under rails, with further slight addition of cement at each joint, while 8 to 1 is used under paving; when paving is of wood, this is floated over with a layer 1 in. thick of 3 to 1. The depth is usually 6 in. below the rail and from 4 to 6 in. below paving. Old macadam is often utilized for the purpose of aggregate, to which there is no objection if it is thoroughly screened and all dirt removed; but in wet weather this is difficult, as mud adheres to the stones. In laying concrete one of two methods is usually employed.

The first is: After the excavation has been made, to lay in concrete to a height sufficient to bring the surface to approximate to a level as near as practicable about 1 in. below the base of the rail, pegs being previously driven to indicate this. After the concrete is

set the plate-laying gang lay the rails to their proper positions and levels, supporting them at intervals with thin packings. When this work is approved, then part of the concreting gang pack in the inch space under base of rail with fine granite or stone chippings and cement, 2 to 1, mixed dry, forcing same into space by means of beater picks. The webs of rails are then parged, the sand bed spread, and paving proceeded with. The second method is: After the excavating gang have completed their work, for the platelaying gang to lay in the rails to their proper alignment and levels, temporarily supporting them at intervals on concrete bolsters, bricks or wood blocks. When the platelaying has been approved, the concreting gang throw in the concrete to the requisite level, men being told off with strong spades to make solid the concrete under the rail base; the parging and paving are then proceeded with as before. This, termed the "pudding" method, has several practical advantages over that first described; better work results, because the platelayers, in walking over the concrete underbed while laying the rails, in manner first described, are apt to deposit thereon particles or even a layer of dirt or clay, which prevents the dry cement packing adhering to the concrete surface. Less cost, inasmuch as one operation suffices to complete the whole of the concreting; and a more perfect bed for rail base is obtained. Further, it is not practicable under first method to lay the concrete so that its surface shall always be 1 in., neither more nor less, below base of rail. With the best work this will vary longitudinally from say 2 in. to perhaps a quarter of an inch or even less, when it is difficult, if not impossible, to force in the dry packing, and if this is too thin there is a danger of it being disintegrated and crushed to powder under the effect of heavy rolling loads. A further contingency is that, through careless workmanship, the packing may be done at the outer edge, and not extend through full width of rail base, thus leaving rail with a hollow bed, probably to be afterwards filled with surface water. By the first method, the concrete surface being finished off 1 in. below rail means, with, say, a  $6\frac{1}{2}$  in. rail, a depth from rail surface of  $7\frac{1}{2}$  in., which necessitates either laying a second layer of concrete, a very thick sand bed, or unusually deep sets. By the "pudding" method the surface of concrete can be brought at one operation to whatever level may be desired; having given extended trial to both, there is no question in the author's view as to which is the better method.

The hollow on each side of the rail web should be filled with a "parging," composed of one part of cement to four of sand, laid to present a sound vertical surface to pave against. Sometimes special shaped creosoted wood boards are used instead of this cement plaster.

#### Paving.

The materials used for tramway paving should be as imperishable as possible. Judged by the periods usually allowed by the Local Government Board for repayment of loans, the life of soft wood on busy roads is estimated at six years, hardwood at ten years, and granite and similar stones at about thirty years. Granite or other stone sets are most frequently used, of a depth of 5 in. or 6 in., laid about  $\frac{1}{4}$  in. above rail surface, on a sand cushion  $\frac{3}{4}$  in. deep before ramming; with this it is usual to mix dry a proportion of cement, say 1 to 4, which quickly solidifies. By this practice a firmer bed is obtained and the sets are not so liable to sink under wear, but it makes the paving somewhat more noisy. Wood paving, on account of its noiseless character, is frequently required to be used in the business parts of a town and opposite places of worship, schools, etc., but there are so many attendant disadvantages, especially with soft wood, that a tramway engineer seldom lays it from choice. It should not in any case be laid on gradients steeper than 1 in 18. If wood is used, English beech and Australian Jarrah are probably the best kinds. The principal objections against wood are its liability to expansion and contraction, its tendency to rot, its greasiness at times, necessitating sanding, and its unreliability; blocks vary very much in character, one sample will expand considerably, while another will contract to a like extent; apparently little care is exercised in selecting trees at maturity, or in seasoning planks, and again blocks may be from heart wood or from outer or sap wood. Great care should be exercised to exclude sappy or shaky blocks. Wood paving contracts greatly under the effects of extreme cold as well as of excessive dryness. Expansion and contraction are particularly objectionable on tramways: the first tends to spread the gage, while the latter, by opening the joints, allows surface water to penetrate to

underbed. Within the author's experience the expansion of wood paving proved so great on a tramway, only 3 ft. 6 in. gage, that cars could not be run, the tie-bars were found burst, and the gage spread over an inch for long lengths of track, which had to be relaid, and he has learnt of several similar cases. He has also seen soft wood blocks risen 1-1.5 in. above rail surface, and men working with adzes trying to dress off the protuberances, though not very successfully, on account of the grit embedded in the fibres of the wood. The construction of a tramway makes it peculiarly liable to cause expansion in wood paving. When the whole of a carriage-way is paved with wood, the cement screeding or floating, on which the blocks are laid, usually forms a continuous curve in cross section, thus conducting the surface water to the channels, where any trouble from expansion is made manifest; but in a tramway a series of practically water-tight troughs are formed for surface water if admitted to accumulate, soaking the bottom of the wood, the top surface being perhaps at same time subject to great sun heat—conditions which not only cause expansion, but are detrimental to the life of the material. All possible means should be taken to prevent water penetrating to the underbed, therefore a clause such as the following from a recent specification is not to be advised:—"At the rail joints the paving blocks next the outer fishplate shall not be pitch grouted until after the lines have been opened and at work for two months, after which the loose part of the paving shall be lifted, the fishbolts finally tightened, and the paving replaced and grouted up." With these loose joints, open probably for a long period before completion of track, and then for two months after, there would be opportunities for any quantity of water to find admittance to underbed. Again, rail grooves are systematically watered to liquefy the grit; with open joints much of this water is likely to percolate. In one or two instances wood blocks have been laid on tramways with expansion joints, but it is questionable whether this is advisable, as such joints allow surface water to pass even easier to underbed. Wood paving is not permissible with the conduit system, as it has been found that its expansion closes the slot; for this reason its use has been prohibited on the proposed London County Council tramways. A method which has been tried on some tramways is to lay creosoted soft-wood blocks with a serrated or "hit-and-miss" course of hard wood next abutting on each side of rails. This, however, has not proved an unqualified success. At the present time, on a South London tramway, relaid on this method some three years since, there may be seen humps over an inch in height on each side of the rails, and in wet weather the wood between tracks rises and forms an arch, giving forth a hollow sound under horse traffic. Where the whole width of carriageway is wood paved, much less trouble is experienced from expansion between the rails, the haunches forming counteracting buttresses. Tramways usually have paved margins 18 in. in width. When these adjoin macadam it is best to lay the sets with a straight edge, as, with a serrated edge, the macadam cannot be properly rolled into the serrations—these become filled with mud, which, when dry, leaves hollows between the sets, and later become rounded, making a noisy road. Where a wood paved margin abuts upon macadam, it is desirable to lay a single course of stone sets between the wood and macadam. Whether grouting should be of bitumen or cement depends upon local circumstances and upon the particular paving material used. In either case it should be carefully run so as to solidify the paving and exclude all water soaking through. Trouble is frequently experienced by cement or bitumen grout getting into rail grooves and adhering to the metal, from which it is difficult to detach, but this may be avoided if the rail head be previously whitewashed. Tar macadam has, to a limited extent, been used for paving tramways. Examples may be seen at Sheffield, East Ham, and Poole; the last named has a length of about 4 miles constructed under the author's direction. He is of opinion that it forms a suitable material for suburban or inter-urban tracks on which vehicular traffic is light. Very great care is however necessary in the selection and laying of the materials. It is not desirable to use less than 1 in. stone for top coating, and much depends upon thorough consolidation; to ensure this the author devised, for use on tracks constructed under his direction, a special form of roller. When this material is used for tramway paving on a road where there is vehicular traffic, it is requisite to use sets next the rail on each side, as the macadam is of too soft a nature to withstand the "rutting." Ordinary macadam has been used on a few inter-urban lines with little vehicular traffic, sets being laid next rails. It is not a desira-

ble material, as it has little permanency of wear, and the dust caused through disintegration in dry weather, besides being objectionable to the passengers, is apt to get into the mechanism of car; loose stones, grit and mud also get into rail grooves. Very great care is necessary in rolling; if surface is left too flat, hollows form for the accumulation of surface water, while if laid with a full barrel, experience has shown that there is a likelihood of the life-saving guard, or fender, catching against loose stones and forcing them into the surface, which may be plowed up to a serious extent and much damage caused before car is stopped. The fenders or guards are usually only some 2 or 3 in. from surface, and project beyond extreme end of overhang of car; when car has only a single truck, the rocking brings the guard almost touching road surface. Asphalt has not been found suitable for tramway paving; it quickly wears into ruts, and the tremor of rails causes disintegration, which in turn allows moisture to penetrate to concrete bed, and in frosty weather the asphalt is lifted therefrom. Several other forms of paving have been tried on tramways; among these are Staffordshire-blue bricks, "McDougall's blocks," which are made by oak-studs being let into blue bricks, "sanitary blocks," made from a mixture of broken stone and bituminous asphalt compressed, and basalt lava sets. The latter—a non-slippery and noiseless stone—are coming much into favor, and they appear to possess in a high degree most of the qualifications necessary for a good tramway paving. The effect of much wheel traffic passing along rails is to cause "guttering" or "rutting" in the adjoining paving, especially when of wood. As a preventive, chilled cast-iron chequer blocks or short pieces of thin-rolled joists are sometimes used, but both are costly, and become noisy when the alternate wood blocks wear down; it will be found preferable to insert narrow steel strips, which are cheaper and have proved of equal efficacy. At Dublin recently it has been held that the usual obligation upon a tramway authority to keep its track in good order includes sanding the surface—the tramway company being mulcted in heavy damages for accidents caused through horses slipping on the set paving. So far as the working of an electrically-propelled system of tramways is concerned, sanding is the reverse of desirable, as much of the grit works into the rail grooves, where its presence, as previously pointed out, is most inimical to the proper working of the line. It is, therefore, important that a paving material should be employed which will, without the use of sand, afford a safe foothold under all atmospheric conditions. Whinstones and basalts, or so-called granites, are quite inadmissible, and most of the Norwegian and some of the Scotch, Leicestershire and other granites become exceedingly slippery under wear.

#### Life of Rails.

From the limited experience in this country of the effects of wear, etc., from electric traction, it is difficult to determine with any degree of definiteness what may be generally calculated upon as a fair average period for rails to last before requiring renewal. Many factors enter into the question. As much depends upon the suitability of profile and of the chemical constituents of the rails and their accessories, and the manner in which they are laid, as upon the amount of traffic they have to carry; it particularly centers itself round the life of the joints, these forming the weak link in the whole chain. The author has for some years given attention to this matter, and he has taken a number of measurements and rubbings of worn-out rails. Space does not permit this question being dealt with at length, but, in his opinion, the rails laid on tramways under electric traction in this country will probably be found to have an average life as follows:

Where frequency of car service is five minutes or less, and vehicular traffic heavy: 8 to 12 years on straight track with grades less than 1 in 40; 6 to 10 years on straight track with grades steeper than 1 in 40; 2 to 6 years on curves less than 66 ft. radius.

Local and special circumstances may either lessen or prolong life beyond these periods. The use of a thoroughly efficient joint will probably add at least 50 per cent, and much additional life may be gained by careful attention to engineering details. Herr K. Berger, engineer of the Essen tramways, at the recent Paris Congress of the International Tramways Association, showed a 90-lb. rail, having a half lap or raised fishplate joint, which he stated was worn out and had to be renewed after three years' wear under ordinary traffic and circumstances. On some tramways the wear on curves of small radii is found so excessive that renewal of rails becomes necessary about every twelve months.



## NOTES FROM BIRMINGHAM.

The consolidated companies at Birmingham are having fitted up for use for their General Offices a large four story building which, when completed, will be most conveniently arranged. On the ground floor, gas stoves will be exhibited at the front and in the rear will be the accounting department. On the second floor will be the offices of the president, the general manager, the manager of the railway department, the superintendent of electric lighting, and the superintendent of the gas department together with the directors' room. On the third floor will be the offices of the engineers and the record room, and on the fourth floor the store room. An electric elevator will be installed to obviate the laborious climbing of stairs.

Under the experienced direction of Mr. W. B. Brockway, secretary of the Street Railway Accountants' Association, the accounting system has been standardized, the books of the several companies consolidated and all modern forms introduced so that the system of the Birmingham Railway Light & Power Co. is now strictly up-to-date.

The splendid work of the Knell Air Brakes has so pleased the management that it has ordered 30 equipments to be placed on the interurban cars. These brakes have proved themselves to be

live in the small suburban towns and carry on their business in Birmingham, and naturally in the morning the traffic is very heavy on these lines and trains of three cars are run. A view of one of these trains is shown herewith.

## PROVIDENCE &amp; FALL RIVER STREET RY.

Messrs. James F. Shaw & Co. have sent us the following information concerning the Providence & Fall River Street Ry., which has just been built by this firm. The road has 12.57 miles of track, including sidings. Cars leave Market Sq., Providence, and run to the Massachusetts state line over the tracks of the Union Railroad Co., under a traffic agreement with that company. From the state line to Somerset town line, 10¼ miles, the company has its own line running via Seekonk, Rehoboth and Swansea. Thence through Somerset, via Slade's Ferry Bridge to the city hall, Fall River, the route is over the tracks of the Old Colony Street Railway Co. The running time between the centers of the two cities is 1¼ hours and the fare 25 cents. About one-third of the main line is over a private right of way.

There is a branch from Swansea Center to Warren, R. I., where connections are made with the Providence & Suburban lines for Crescent Park, Riverside and other Providence River resorts.



▲ BIRMINGHAM (ALA.) SUBURBAN TRAIN.

thoroughly reliable and with the time saved in making quick stops a much faster schedule can be maintained.

The coal stoves formerly used in the cars have been supplanted by electric heaters made by the Consolidated Car Heating Co., which are found to be much cleaner and less expensive in the long run than the stoves; all the cars on the system have been provided with this type of heater.

An attractive little pamphlet is published each week under the name of the "Birmingham Railway, Light & Power Co. Weekly" in which items of interest in all three departments are briefly discussed, the different places of amusements and the attractions offered, some witty little sayings, and reasons why people should provide themselves with gas stoves, are embodied in the little weekly and it is placed in small brackets in the cars for the edification of the passengers.

A locomotive is being built in the company's shops for use in switching cars and making short freight runs. The skeleton of a Porter locomotive is being remodeled and overhauled and a short cab put on it. It promises, when finished, to be a very satisfactory little engine for the use designed for it and reflects credit on the master mechanic who is directing the work.

With the acquiring of the gas plant the utilizing of coke on the steam line now in use will greatly reduce the expenses of fuel. There is naturally quite a great deal of coke produced at the gas plant and by using it on the locomotives it is found that it is quite as serviceable and satisfactory as coal.

Owing to the good street car service quite a great many people

The track is laid with 60-lb. T-rails on 6x6-in. by 7-ft. ties spaced 24 in. c. to c.; Weber joints are used. The overhead work is flexible bracket construction with No. 0000 grooved trolley wire.

The equipment includes ten 12-bench open cars and six vestibuled closed cars, which are all mounted on Peckham special double trucks and equipped with four G. E. 67 motors per car; the cars all have Christensen air brakes. The company also has three Taunton snow plows.

The road was opened for operation in June last and has enjoyed a very gratifying business which was to be expected in view of the fact that it gives a direct trolley line between Providence and Fall River without change of cars. The officers of the company are: President, John J. Whipple; secretary and treasurer, George A. Butman; general manager, James J. Shaw; purchasing agent, B. D. Sumner; superintendent, George P. Dole, Swansea, Mass.

The comparative statement of the Consolidated Traction Co., of Pittsburg, for the months of July, 1900 and 1901, has been issued as follows: Gross earnings from operation, \$276,053, last years, \$254,972; operating expenses, \$135,088, last year, \$122,873; net earnings from operation, \$140,964, last year, \$132,099; net earnings and other income, \$169,298, last year, \$160,112; taxes, rents, etc., \$63,371, last year, \$59,023; total income, \$105,927, last year, \$101,089; fixed charges, \$86,393, last year, \$86,501; net income, \$19,533, last year, \$14,588.



### HALF-FARES.

The Cleveland City Railway Co. recently received 25 new cars of modern type for urban service.

The Springfield (Mass.) Street Railway Co. is preparing to put all its heavy feed wires under ground.

A successful engineer recently said that scale in the boiler was as often due to the engineer as to the feed water.

A project for an electric line to connect East St. Louis and Cahokia is being promoted by the citizens of East St. Louis.

The Savannah, Thunderbolt & Isle of Hope Railway Co. recently increased the wages of employees who had been in the service longest.

The Jersey City, Hoboken & Paterson Street Railway Co. has acquired a controlling interest in the Hudson & Bergen Traction Co.

A new street railway line in Athens, Ga., extending from the center of the city to the several railroad depots has recently been opened.

The Woronoco Street Railway Co. of Westfield, Mass., will extend its system within the city limits. About 1½ miles of track will be laid.

The Pittsfield (Mass.) Electric Street Railroad Co. has received a number of new cars from J. G. Brill & Co. for service on its Lanesboro line.

The Dayton (O.) & Northern Traction Co. ran the first car over its newly completed line between Dayton and Greenville, September 30th.

The Indianapolis Street Railway Co. has given a series of band concerts through the season, occurring every Wednesday evening at Fairview Park.

The Chattanooga (Tenn.) Electric Railway Co. is working night and day on its St. Elmo line, which it is expected will shortly be opened for traffic.

Work is progressing rapidly on the Canton-Akron Electric Ry. The first rails for this line were laid within the city limits of Canton, August 1st.

The Exeter (N. H.), Hampton & Amesbury Street Railway Co. has furnished band concerts every Sunday evening throughout the season at its beach resort.

October 5th, the Cleveland Electric Railway Co. paid a quarterly dividend of 1 per cent, and the Cleveland City Railway Co., a dividend of 1¼ per cent.

The Milwaukee Electric Railway & Light Co. is an applicant for a franchise to extend its lines through several of the principal streets not now included in its system.

The Lansing (Mich.), St. Johns & St. Louis Electric Railroad Co. has arranged to run its interurban cars into Lansing over the tracks of the Lansing City Electric Railway Co.

The Hoosac Valley Street Railway Co., North Adams, Mass., has awarded contracts for the construction of bridges and culverts along the line of its proposed Cheshire extension.

The earnings of the elevated railroads in Chicago showed gains for the month of September. The Northwestern Elevated R. R. carried an average of 54,065 passengers per day, the increase over the number carried for the corresponding period last year being 14.8 per cent. The Metropolitan West Side Elevated Ry. gained

6,226 passengers a day, or 7.6 per cent; and the South Side Elevated R. R., 2,565 passengers a day, or 3.9 per cent.

The Boston & Maine R. R., which now controls the Concord (N. H.) Street Ry., has under construction a 35-mile extension of that line, which will afford connections with Nashua.

This paper strongly endorses the action of Gen. Charles H. Grosvenor in requiring a certain share of the proceeds from the sale of his book to be set aside for a McKinley monument fund.

The new 15-mile electric railway from Palmer, Mass., to Springfield, which was built under the supervision of James Scanlan for F. T. Ley & Co., of Springfield, is ready to be opened for regular traffic.

The directors of the Youngstown (O.) Park & Falls Ry., which is now a part of the system of the Youngstown-Sharon (Pa.) Railway & Light Co., have declared a semiannual dividend of 2½ per cent.

The Winnebago Traction Co., Oshkosh, Wis., has placed mirrors in the vestibules of all its cars for the convenience of the motormen in watching to see that passengers put their fares into the box.

The Northampton (Mass.) Street Railway Co. has completed an addition to its power station and is installing a 600-h. p. Hamilton-corliss compound engine, which doubles the capacity of the plant.

The St. Louis Transit Co. has issued a general order reserving the last three rows of seats in each car for smokers. During the winter months smoking will be permitted only on the rear platforms of cars.

The Indianapolis & Vincennes Railroad Co. has begun injunction proceedings against the Indianapolis & Martinsville Traction Co. to prevent it from occupying the former company's station grounds in Friendswood.

The Tri-City Railway Co., of Davenport, Ia., is preparing to erect a new car house, 300 x 150 ft., with a capacity for storing 70 cars, at Rock Island, Ill. A number of new cars will be added to the company's rolling stock.

The Keene (N. H.) Electric Street Railway Co. is about to begin the construction of a 7½-mile extension of its line to West Swanzy. Later, the line will be extended from that city to Brattleboro, a distance of 20 miles.

Home-made malleable iron controller handles with removable brass bushings are standard with the Union Traction Co., of Philadelphia. When the bushing becomes worn a new one is put in and the handle is as good as new.

Stone & Webster, of Boston, who project an electric railway in El Paso, Tex., have obtained a franchise in that city, and have purchased the El Paso electric lighting plant. The proposed street railway will be extended to Juarez, Mex.

The Seattle & Tacoma Interurban Railway Co. has closed a contract with Hale & Smith, of Portland, for the grading of its proposed line. The grading is to be completed by November 1st, and the road in operation early in January.

The Newburgh (N. Y.) Electric Ry., including lines to Orange Lake and Walden has been advertised for sale by order of the Supreme Court. The sale will take place September 20th, and will be conducted by O. P. Howell, of Newburgh.

The Metropolitan West Side Elevated Railway Co., Chicago, is preparing to erect five new stations on the new section of its road. The buildings will be of brick and stone, one story high, 27 x 34 ft. in dimensions, and will cost about \$25,000.

The report of the Cohoes (N. Y.) City Railway Co. for the quarter ending June 30th, shows gross earnings of \$5,974 as against \$6,993 for the corresponding quarter of 1900; operating expenses of \$7,107, as against \$5,857, and a net deficit of \$3,517.

The Pennsylvania company's electric line between Springfield, O., and Xenia, will be equipped with the third-rail system. If this experimental line proves successful, the company contemplates building other electric lines for its suburban service.

The St. Louis Transit Co. reports earnings for July, 1901, at \$505,723, an amount nearly double the earnings for July, 1900. The earnings for the current year to August 1st, amount to \$3,292,361, as compared to \$2,306,945 for the corresponding period last year.

In Rochester the gongs are now carried on the front of the dash instead of under the platform, thus increasing by 50 per cent the distance at which the gong can be heard. A foot-pin working through a hole in the platform is used to ring the gong as formerly.

The Union Traction Co., of Philadelphia, saves the wages of several men by having two power-driven sewing machines at its shops for sewing sheets of insulating material and canvas and storm curtains for open cars. Then, too, the work is done better and more quickly.

The Grand Rapids (Mich.), Kalamazoo & South Haven Traction Co. which has secured rights of way for its projected 104-mile interurban electric railway, has awarded contracts for the construction of the line for a distance of 18 miles between Grand Rapids and Allegan.

The Quincy (Ill.) Horse Railway & Carrying Co. handled the traffic on its electric lines Labor Day without a mishap, though the traffic that day exceeded any other in the history of the company. Manager Chubbuck's accomplishment in handling the crowds was commended by the local press.

The Buffalo, Hamburg & Aurora, and the Buffalo, Gardenville & Ebenezer Street Railway Cos. have each been granted a franchise for an electric line through East Aurora, N. Y., and it is announced that the two interurban roads between that city and Buffalo will be in operation within a year.

The Everett-Moore syndicate has opened depots in Detroit and Toledo for the accommodation of freight and express matter conveyed over its electric railways. The freight houses are of the same description as those of steam roads and are connected with the main line by side tracks on which cars may be loaded or unloaded.

The Rutland (Vt.) Street Railway Co. has nearly completed the construction of the largest dam in New England, at Chittenden, near Rutland. The dam will cost \$500,000 and will furnish from 4,000 to 5,000 h. p. to be supplied to all the industries within a radius of 50 miles, and for the operation of the local street railway system.

The Plattsburg (N. Y.) Traction Co. managed a baseball team this season as a park attraction, with highly satisfactory results. Admission to the game was included in a round trip fare of 35 cents, the regular fare to the park being 10 cents for a single trip. The company's team played successfully against the best teams in the state.

September 16th, bids for \$3,000,000 3½ per cent corporate stock of the city of New York were opened by Comptroller Coler, the proceeds to be used in the construction of the Rapid Transit Ry. There were eight bids, the highest being 104.52 for \$500,000 worth of the stock. The prices were several points lower than those of the last sale of bonds.

A device known as the Detroit platform is being introduced for the purpose of dividing the rear platform of cars into two compartments, in one of which passengers who prefer standing outside may be accommodated, while the other provides an unobstructed exit or entrance. The device consists in a pipe railing running

horizontally across the platform, with a curve or bow in which the conductor stands.

The Terre Haute (Ind.) Electric Co. has opened club rooms at its power house for the use of the men. One is equipped for cards and games of all kinds, another will be used as a reading room, and adjoining are bath rooms equipped with tubs and shower baths. The books and magazines in the reading room will be furnished by the company.

The Union Traction Co., of Philadelphia, enjoys the distinction of having the lowest percentage of operating expenses (excluding fixed charges) to gross receipts of any road in the country. It also has the highest paving expenses of any road as it is required to pave and maintain every street from curb to curb through which its 450 miles of tracks run.

Mr. John P. Martin, of Xenia, O., has not disposed of his interest in the Little Miami Traction line, which he, in connection with the Pomeroy-Mandelbaum syndicate, projects, and is quoted as emphatically denying that the line will be abandoned. Rapid progress is being made in the work of grading, and contracts for equipment were recently closed.

The Worcester (Mass.) Consolidated Street Railway Co. was recently petitioned to extend the same half-fare privileges enjoyed by children attending the public schools to pupils of parochial schools, but has declined to grant the request on the grounds that after the establishment of such a precedent the pupils of private schools would have to be carried for half fare.

The Pueblo (Col.) Traction & Electric Co. increased the wages of its conductors and motormen, September 1st, the new wage-scale which went into effect on that day being as follows: for the first year of service, 19 cents per hour; for the second year, 20 cents; for the third year, 22 cents; for the fourth and fifth years, 23 cents, and after five years of continuous service, 25 cents per hour.

All cars on the Sharon (Pa.) & Sharpsville, the Sharon & Wheatland, and the Sharon & State Line traction lines were tied up for a day because of the bursting of a large flywheel at the power house, October 4th. The wheel was making 250 revolutions per minute when a piece 3 ft. long flew out, narrowly missing the engineer of the power house and temporarily incapacitating both engines.

The construction of the proposed electric railway from Oshkosh, Wis., to Fond du Lac, which the Falk Co., of Milwaukee, is promoting, will be commenced early next year, and finished, it is expected, by July 1, 1902. The length of the track to be laid is 11.85 miles, the balance of the distance, 7.4 miles, being included in the system of the Winnebago Traction Co. and the Fond du Lac Street Railway Co.

The promoters of the proposed new electric street railway system in Natchez, Miss., have employed a man to count the pedestrians who pass a certain point on the proposed route, and the daily average is estimated at 1,541. Bonds to the amount of \$25,000 will be placed with local capitalists and the proceeds used for the construction of the road. James W. Lambert, of Natchez, is said to be interested.

General Manager McCormack, of the Cleveland Electric Railway Co., is considering the construction of a special observation car to be operated for the sole benefit of sight-seers. Traffic arrangements may be made with the Cleveland City company to run the observation car over the latter's tracks to all parts of the city. A regular route of 25 miles is contemplated, and a fare of 25 cents may be charged.

The Atlantic City Passenger Railroad Co., incorporated in 1860, is preparing to build a system of underground railways in Atlantic City, for which franchises were obtained some 30 years ago. If the consent of abutting property owners can be obtained, a part of the proposed system will be constructed in Pacific Ave., though as this thoroughfare is the only boulevard in Atlantic City

the plan has encountered objections from residents of the avenue. W. H. Bartlett is president, and E. H. Chandler, treasurer and secretary of the company. Among the directors is I. A. Sweigard, president of the four syndicates promoting extensive interurban electric lines in southern Pennsylvania and Maryland.

The Seabrook (N. H.) & Hampton Beach Street Ry. was opened for regular traffic, October 2d, the first trip being made by President Lovell with a party of guests. Later in the day the school children of the town were given a free ride over the line in celebration of the event. The road connects at Seabrook with the Exeter, Hampton & Amesbury, and the New Haven, Plais-tow & Newton Street Rys.

The revenue of the Peoria (Ill.) & Pekin Terminal Ry. for the fiscal year ending April 1, 1902, will approximate, according to conservative estimates, \$175,000. Earnings from April to July, 1901, inclusive, were \$32,187, as against \$23,437 for the corresponding months last year, an increase of over 37 per cent. The company has entered into freight contracts with local industries, which are expected to yield an income of \$60,000 a year.

The refusal of the German emperor to permit the construction of an electric railway across Under den Linden is regarded as a great hardship by the municipal authorities of Berlin. The council of that city, having the assurance of the minister and president of police that the emperor would sanction their purpose, recently purchased two street railways in Berlin with a view to connecting them with a line across the famous thoroughfare, thus giving the city a much improved street railway system.

The People's Electric Light & Power Co., Chattanooga, Tenn., has applied for a charter, the incorporators being J. H. Warner, D. P. Montague, W. A. Sadd and Frank Spurlock, of Chattanooga, and Edwin Warner, of Nashville. The capital stock of the company is \$200,000, and its purpose that of furnishing electricity for the operation of the Chattanooga Electric Ry., and for lighting and heating. J. H. Warner, manager of the People's company, is president of the Chattanooga Electric Railway Co.

Pursuant to the terms of the lease of the Brooklyn Union Elevated R. R. to the Brooklyn Heights Railroad Co. for 999 years from July 1, 1901, notice has been given that the guaranty will be printed on all Brooklyn Union Elevated and Kings County Elevated bonds that are presented at the general offices of the Brooklyn Heights Railroad Co., No. 168 Montague St., Brooklyn, between the hours of 9 a. m. and 12 noon on Tuesday, Wednesday and Thursday of each week during August and September.

In the matter of the president's approval of a franchise granting the Compania de les Ferrocassiles de Porto Rico the right to extend its lines between certain points on the island, advices have been received in Washington from Attorney General Knox recommending that the franchise be not approved. The executive council of Porto Rico is alleged to have undertaken to exempt the company and its property from all taxation for a period of 25 years, an action which the Attorney General holds is not within its powers as conferred by Congress.

Negotiations for the acquisition of the Atlanta, Ga., street railway systems have been successfully concluded by the Mercantile Trust & Deposit Co.; the Old Colony Trust Co., of Boston, and the New York Security & Trust Co., of New York, the transfer involving about \$1,100,000. No intention of consolidating the Atlanta Railway & Power Co. and the Atlanta Rapid Transit Co. has been announced, but the two roads will be operated in harmony as the same interests control both corporations. Mr. Joel Hurt and his associates will retire from the management.

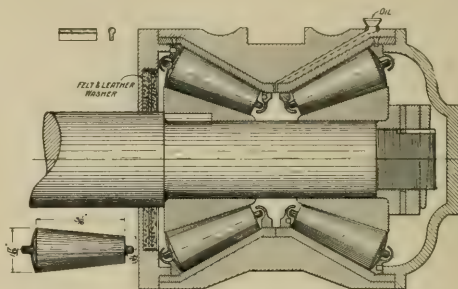
September 10th, the Appellate Division of the Supreme Court appointed three commissioners to report on the application of the Rapid Transit Commission for an extension of the rapid transit system to Brooklyn. A similar application will be made Septem-

ber 30th before the Appellate Division in the Second Department for the appointment of a commission to report on the portion of the road which lies in Kings County. The route of the proposed extension is from the Post Office down Broadway and Whitehall St., under the East River, along Jorolemon St., Brooklyn, and thence to Atlantic Ave.

### TESTS OF ROLLER BEARINGS.

By courtesy of Mr. M. Medlen, of Montreal, we have received the following details concerning tests of the Wright taper rolling bearing which was illustrated in the "Review" for June, 1901, page 366.

In street railway service the Montreal Street Railway Co. found a standard car to require 15,200 watt-hours and a car fitted with roller bearings to require 10,120 watt-hours. In Ireland a test



WRIGHT TAPER ROLLER BEARING.

showed 57 2-3 per cent saving, and another test in England, 58 per cent saving in power.

The bearing is used on vehicles of the General Omnibus Co. and the Road Car Co., of London, and it is reported that the pull at starting is 112 lb. for the ordinary vehicle and 40 lb. where roller bearings are used. Reports of a test at Bordeaux, France, with omnibuses give the figures 72.6 lb. and 38.4 lb.

In steam railroad service, the North Staffordshire Ry. found cars fitted with roller bearings to require a starting force of 40 lb. as against 107 lb. for the ordinary bearings. On heavy vans Sutton & Co. reported the figures 112 and 216 lb.

The sectional view herewith shows the construction of the bearing. The outer end is closed tight and a felt and leather dust guard provided at the inner end.

### CONSOLIDATION AT PITTSBURG, PA.

Negotiations for the consolidation of all the traction lines in Allegheny County have been under way for some time, which will in all probability result in the consolidation of all the street railway properties in Pittsburg and connecting cities. The plan of the project is to have the Philadelphia Co. take over the consolidated Birmingham, Monongahela, Southern and Suburban systems and operate them in conjunction with the United Traction Co., which it now owns. The total capitalization of all the companies in the deal is \$117,300,000. Mr. James H. Reed, president of the Philadelphia Co., states that while negotiations for the consolidation are well advanced they are not yet concluded, and until they are no details will be made public. The mileage of the lines which it is proposed to consolidate is in the neighborhood of 350 miles.

The Widener and Elkins syndicate, it is understood, will turn over its holdings in the various companies, but will continue as a large stockholder of the Philadelphia Co. The latter company in addition to its holdings and street railway properties now controls the electrical, gas lighting and gas heating business in Pittsburg. The properties of the Mellon syndicate in this district will not be sold to the Philadelphia Co., but will probably be controlled by lease. The Mellon properties including those now building represent a capitalization of \$28,000,000.



### MR. PECKHAM'S ARTICLE ON PACKING JOURNAL BOXES APPRECIATED.

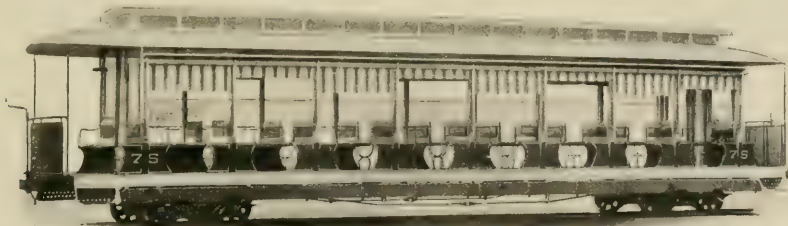
Editor "Review": Mr. Peckham's article on "The Proper Treatment of Journal Boxes" in your issue for August is valuable for car house men, and the street railway manager who does not place the "Review" and kindred publications in the hands of such men misses a chance to make a good money investment.

Yours truly,

MYRON ROUNDS.

### A LONG OPEN CAR.

The accompanying engraving shows what is known as an 18-seat vis-a-vis car built by the J. G. Brill Co. for a Mexican railway. In many respects, notably its great length, 45 ft. 6.3-8 in. over the crown pieces, it resembles steam car practice. The seats are all stationary and arranged back to back. The width over the sill plates is 7 ft. 8 1/2 in. and at the posts 8 ft. 2 1/2 in. At each end there are the usual bulkheads of the open car, but as there is a central aisle, they are fitted with curtains which come all the way to the floor. The reason for the substitution of curtains for doors is that a door in this position would necessitate either a solid sash on each side or else drop sash as well as a drop sash in the door, an arrangement both inconvenient and expensive. All the openings



A MEXICAN OPEN CAR.

between the posts are closed on one side, not only by an entrance guard but by wire nettings fixed in position. The length of the car makes it necessary to cut the step, or running board, in two at the center; the grab handles are of ash in bronze sockets. With the ordinary allowance for space this car should be able to seat 72 passengers. The openings between the posts are all fitted with spring roller curtains and, as the seats have round end seat panels, the curtains come to the floor without difficulty, making a perfectly protected car in inclement weather. The interior is fitted with electric lights. The car is used as a trailer, not being fitted with motors.

### ANNUAL REPORT, UNION TRACTION COMPANY.

The annual stockholders' meeting of the Union Traction Co., of Philadelphia, was held September 18th, at which the annual report of the company was presented. The old board of directors and officers of the previous year were re-elected. President Parsons' report shows the total receipts of the company for the fiscal year ending June 30th, 1901, to have been \$13,431,680, which, after deducting the cost of operation, licenses, taxes, and fixed charges, amounting to \$12,570,414, leaves net earnings of \$861,266, which is a decrease of \$76,754 over those for 1900.

There was expended for construction work, including improvements and extensions and new equipment for power house, \$1,212,716, which added to the amounts previously spent brings the total amount of money used in capital payments up to \$3,111,402. The operating expenses, including taxes, etc., equal 51.74 per cent of the gross receipts. The number of passengers carried for the year was 302,225,286.

### AMERICAN CAPITAL FOR RUSSIAN TROLLEYS.

A memorial has been presented to the Municipal Council of St. Petersburg, Russia, by Wm. A. Heidecker representing Murray A. Verner, of Pittsburg, Pa., offering to take over the entire surface traction in the city of St. Petersburg and to form a company under the Russian law with a capital of \$50,000,000. The project includes extending the street railway lines very large and equipping them for electric propulsion. There are at present 85 miles of horse car lines in St. Petersburg, and Mr. Verner and Mr. H. Sellers McKee, of Pittsburg, propose to increase the trackage of the city to about 300 miles.

Both of these gentlemen are well known in the electric railway field, having been connected with the electrical conversion of the roads in Rochester, N. Y., Buffalo, N. Y., Newark, N. J., Norfolk, Va., Pittsburg, Pa., and a number of other prominent systems.

### A TROLLEY HOSPITAL.

A new municipal hospital is to be built in Baltimore, Md., and a novel feature in connection with it will be a trolley annex. The site of the new hospital is adjacent to the lines of the United Railways and Electric Co., and a short switch will carry the car to the hospital entrance.

The plan is to have the hospital car always in readiness for a

call, and it is desired that it be given the right of way and its passage over the railway lines be facilitated in every way by other traffic. As all the lines of the United Railways Co. are connected the car could reach every part of the city and it would be an improvement in every way over the present ambulance system. It is proposed to furnish the car with cots and other hospital necessities, also to have on board physicians and nurses and every comfort and attention could be given to the sick en route, and they could be transported with more ease to themselves and safety to others than in a wagon.

### TROLLEY LINES HELP STEAM ROAD.

Five years ago it was said the increase in street railway mileage in Massachusetts and Connecticut would soon have a disastrous effect upon the passenger earnings of the New York, New Haven & Hartford R. R., whose lines were being paralleled in every direction. To those who made the prophesy then, the recent annual report of the N. Y., N. H. & H. property will come somewhat as a surprise, for despite an increase of over 50 per cent in street railway mileage in the same territory, the steam road shows gross passenger earnings for the past financial year of \$19,764,755, as against \$4,225,698, five years previously. The "Review" has always contended that much of the opposition to new electric roads on the part of the steam railroad companies, is wholly unjustifiable and in a majority of cases is ill-advised. The electric railway does for local sections just what the steam roads years ago did for the West and middle western parts of the United States. The trolley builds up territory, attracts population, increases trade manifold, and among the chief beneficiaries of this greater prosperity are the steam roads themselves.

## CANADIAN NOTES.

The Belleville (Ont.) Electric Ry. was sold at public auction on September 25th. It is believed that the property was bought in for Toronto capitalists.

It is said that the Standard Car Lighting Co., of Chicago, is making inquiries regarding the Central Ontario Electric Ry. with a view of financing the enterprise.

It is stated that the Toronto Street Ry. directorate has decided to increase the capital stock of that company by \$1,000,000, which sum will be utilized for the acquisition of suburban lines.

The bondholders of the Montreal Park & Island Ry. Co., have elected Hon. L. J. Forget and Mr. F. L. Wanklyn as bondholders trustees, in place of Messrs. David Morrice and Alfred Thibadeau resigned.

The legal representatives of Toronto, the Metropolitan Railway Co., and the Toronto Railway Co., are still discussing the agreement whereby the Metropolitan company is to obtain access to the city centers.

Mr. A. N. Green, a consulting engineer of Montreal, is inspecting the route of the proposed electric belt lines in Huron County, and is also making a survey of the Maitland River for the purpose of making a report of the available power.

A meeting of the shareholders of the Petrolea & Corunna Electric Ry. was held here recently, and it was decided to push construction. The contracts for the work will be let at once, and the line will be built through to Sarnia early in the spring.

The plan to run Montreal cars across the river to the villages of St. Lamberts, Longueil & Laprairie is now being seriously considered. Mr. Kennedy, superintendent of the street railway, has looked over the ground and has reported favorably upon the project.

Mr. P. Lane engineer of the American Bridge Co., the Hon. C. C. Colby, of Stanstead, Que., and E. C. Crosby, of Brattleboro, Vt., are interested in the electric railway to be built at Lewis, Que. They have been over the proposed routes, and have had surveys made of two alternative lines.

The Huntington Manufacturing Milling & Power Co., Ltd., with headquarters at Montreal, has made application to the Provincial Government for numerous powers, among which are permission to develop water power, generate electricity for heating, lighting and power and to construct and operate electric tramways.

J. J. Franklin, formerly manager of the Montreal Street Ry., died at St. Michael's Hospital, Toronto, after a brief illness. Mr. Franklin left the service of the Montreal company to manage an omnibus line for an American syndicate, in Paris, France, but returned to Canada some time ago. He was 64 years of age.

The by-law to grant a bonus to the Berlin (Ont.), Preston & Hamilton Electric Railway Co., was defeated in the Berlin Council by some 14 votes. The road has been partially constructed, and while this set back will delay completion to some extent, it will not prevent the ultimate construction of the road as originally proposed.

Two cars on the Hull (Ont.) Electric Ry. met in a head on collision, near Graham's Corners, on the evening of September 11th. Both coaches were wrecked, but fortunately only one passenger was seriously injured. The line at this point is single track and one of the cars, in an endeavor to make up time, ran past the meeting point.

Mr. A. J. Nelles, for many years manager of the Hamilton, Grimsby & Beamsville Electric Ry., has resigned his position. It is understood that Mr. Nelles has been offered, and accepted a position with a syndicate which has been formed for the purpose

of building and acquiring a considerable stretch of road in the vicinity of Hamilton. Mr. Nelles is succeeded by Mr. Geo. Waller.

The Winnipeg Street Ry. Co. has entered into an agreement with the Ogilvie Milling Co. whereby the two concerns will join in bringing in electric power from the nearest point on the Winnipeg River, some sixty miles distant, the rights to which have been secured for some time. It is announced that development will be proceeded with at once.

Mr. Alfred Baker, general manager, and Mr. J. H. Rider, chief electrical engineer of the County Councils Tramways, of London, England, have just spent a short time in Montreal studying the electric railway system, with a view to improvements in their own system. They intend visiting other points in Canada, as well as the leading cities in the United States, with the same object in view.

Mr. Horn Payne, of London, England, president of the British Columbia Electric Ry. Co., now on a visit of inspection to Vancouver, has announced that the company is about to expend \$600,000 in installing an electric plant at Coquitlam Lake, 15 miles from Vancouver, capable of generating 5,000 h. p. The company's annual report, just presented, shows that the gross receipts for the year were \$496,796, an increase of \$46,174 over the preceeding year.

The improvements and extensions to the Chamblay generating station are rapidly nearing completion. New turbines, developing 5,000 h. p. each, have been put in under the 31-ft. head. Current will be generated at a much lower voltage than heretofore and will be raised to 25,000 volts by step-up transformers, for transmission to the power station at Montreal, where rotary transformers are now being installed. The city power station is being considerably enlarged to meet the requirements.

The first general meeting of the Reid Newfoundland Co. was held in the office of Mr. R. G. Reid, St. John, Newfoundland, last week. This new company is capitalized at \$25,000,000 and will take over and carry out the contracts entered into by Mr. R. G. Reid, and will assume the management and control of the enterprises hitherto vested in the name of R. G. Reid in this colony. This will include the 50-year lease of the street railway privileges, the electric light system, the Newfoundland Ry., steamers, dry dock and some 2,650,000 acres of land.

The long expected report on street railway fenders was given out at the Parliament Buildings early this month. By the terms of the statute, street railway companies in Ontario must adopt one of three fenders acceptable to the Government engineer, or render themselves liable to a fine of ten dollars per day for each car unprovided with one of the designated fenders. An act to compel street railways to use certain designated fenders was passed in 1900, but was rendered inoperative by the omission of a penalty clause, which clause is a prominent feature of the present act.

The assessment on the property of the Montreal Street Ry. Co., has been increased to the extent of \$1,156,969, of which \$700,000 represents rolling stock, now assessed for the first time. The assessment commissioners are said to have made this increase because of the decision handed down in the now famous Cornwall Street Railway decision, which was rendered by the Court of Appeals. In handing down this decision the court held that cars were integral and inseparable parts of its plant, and were therefore assessable. As a result of this decision, many millions have been added to the assessment of electric roads throughout the Dominion.

In the case of Morrison vs. the St. John Street Railway Co., in the Circuit Court, in which Dr. Morrison is suing for \$60,000 damages for injuries received, Attorney-General Pugsley, for the defense, said he had become aware of a flagrant attempt to defeat the ends of justice. That James Crawford, acting for Morrison, had sought to induce Conductor Whittaker, a witness for the defense, to go to New York, and that Fred. Morrison, the plain-

tiff's brother, had tried to get Miss Brownell, bookkeeper for plaintiff and a subpoenaed witness for the defense, to leave the province. She was given a sum of money. The court has ordered that Crawford appear before it on the resumption of proceedings in this case.

The Toronto Council has instructed the city engineer to make a report on the cost of extending the street railway to Queen's Wharf. This extension will largely increase the mileage of the street railway, and if built, will require a considerable expenditure. The council has also ordered: "That the engineer be instructed to report on the cost of extending a line of the Toronto Railway from Bathurst St. to the break-water, crossing to the Island by means of a swing bridge (or if he can suggest, a better mode) along the Island, keeping to road allowances in the most convenient places, to the eastern channel, crossing this by a swing bridge, thence along the main land and connecting with the city lines at Woodbine Ave."

### DETROIT & TOLEDO SHORE LINE.

The work of completing a line of electric railway between Toledo and Detroit has been pushed rapidly during the summer. The Toledo & Monroe Ry., which was described in our issue for July, 1901, page 403, began operating a single track line between Toledo and Monroe, 18 miles, in May. This company is controlled by the Everett-Moore interests and the Toledo & Monroe Shore Line Railroad Co., another Everett-Moore company, has now practically completed a second track between Toledo and Monroe and a double track from Monroe to Trenton, 20 miles, where connection will be made with the Wyandotte River branch of the Detroit United Ry., giving a double track through line between Detroit and Toledo, a distance of 50 miles. The overhead work will be completed about December 1st.

The power house at Monroe will be enlarged, a second 400-kw. unit and a 1,000-kw. unit, Westinghouse alternators and Hamilton-Corliss cross-compound engines, being installed, and a sub-station built at Rockwood, 12 miles north of Monroe.

The officers of the Detroit & Toledo Shore Line R. R. are: President E. W. Moore; vice-president, J. C. Hutchins; treasurer, C. H. Stewart; secretary, George S. Stewart; general manager, Allen F. Edwards; chief engineer, J. T. Ross.

### CONTRACT LET.

We learn that Mr. George E. Fisher, president and treasurer of the Chase Construction Co., has just secured for his company a contract for the entire exterior construction of the Muncie, Hartford & Ft. Wayne Ry. upon which construction work is to be started within the next few weeks. This contract includes the grading, drainage, timber bridging, masonry, tracklaying, ballasting, bonding and drilling and the entire overhead construction. The work is to be of very substantial character and the road built for high speed, the private right of way practically paralleling the Lake Erie & Western Ry.

The contract covers that section of the line between Muncie and Montpelier, a distance approximately 30 miles, to be operated on a high tension, multi-phase system, the power house being located at Montpelier, Ind. It is proposed to extend the line, when this section is completed, to Ft. Wayne, a total distance of approximately 60 miles.

E. P. Roberts & Co., of Cleveland, O., are the engineers for the Muncie, Hartford & Ft. Wayne Ry.

The Chase company has just completed the 40-mile road of the Dayton & Northern Traction Co., between Dayton and Greenville, O., and expects to complete the Dayton & Troy Ry. during the next 60 days, part of this line being in operation at this time.

A new trolley wheel and harp has been invented by Mr. O. P. Martin, of Akron, O., which has been tested on the street railway of this city and is found to work successfully. The essential features are two separate and independent flanges combined with a central depressible pulley, the pressure of the wire upon which tends to converge the flanges at the top, making contact on each side as well as on the bottom of the trolley wire.

### PERSONAL.

MR. GRANT S. WHISTLAR has been appointed general passenger and freight agent of the Youngstown (O.) & Sharon Electric Ry.

PROF. EDWIN HAVILAND, JR., B. S., (Swarthmore) M. A., (Cornell) has been appointed to the chair of civil engineering in the Thomas S. Clarkson Memorial School of Technology, at Potsdam, N. Y.

MR. E. O. REED was on October 7th appointed auditor of the Toledo Railways & Light Co., the order taking effect October 15th. Mr. Reed was for 17 years auditor of the Toledo, St. Louis & Western Railroad Co.

MR. W. S. GRAFFAM, B. S., (Worcester Polytechnic Institute) has also been appointed superintendent of shops in the Clarkson School of Technology.

MR. DANIEL W. GROSS, formerly with the Buffalo Railway Co., has been appointed chief engineer of the Lake Shore Electric Railway Co., Cleveland.

MR. C. N. WILCOXON, superintendent of the Decatur (Ill.) Traction Co., resigned on October 1st to accept a similar position in Lima, O. On leaving Decatur his old employees presented him with a gold-headed cane.

MR. G. H. LUCKS has resigned as superintendent of the Oakland (Cal.) San Leandro & Haywards Electric Ry., which position he has held for five years.

MR. W. O. HANDS, who was manager of the East Side Electric Railway Co. (the Heim line), Kansas City, has, since the acquisition of that line by the Metropolitan Street Railway Co., been engaged in the engineering department of the latter road.

MR. J. H. GLOVER, who was the superintendent of the Connellsville, Pa., division of the Baltimore & Ohio railroad, has resigned his position to become secretary and treasurer of the Jewett Car Co., Newark. This company is increasing its facilities for conducting its business, which has expanded very materially in the past year.

MR. DAVID BRUCE has been appointed superintendent of the Haverhill Division of the Boston & Northern, the northern portion of the Massachusetts Electric Companies' system. Mr. Bruce has been with the Seattle (Wash.) street railways for the last nine years as superintendent and later, general superintendent of the freight department.

PROF. R. A. SMART has resigned his position in the department of experimental engineering of Purdue University at LaFayette, Ind., and connected himself with the B. F. Sturtevant Co., of Boston, Mass., with whom he will become the head of a department of experimental engineering which is being established for the purpose of investigating all problems relating to blower practice and of developing new and more efficient applications of the fan blower in all lines of industry.

The Southern Ohio Traction Co.'s statement of operation for the calendar year to August 1st, shows gross receipts for July, 1901, of \$35,805 as against \$31,214 for July, 1900; operating expenses of \$17,012 as against \$13,060; and net receipts of \$18,855 as against \$18,153. From January 1st to August 1, 1901, gross receipts were \$178,821; operating expenses, \$104,030, and net receipts, \$74,792.

The Harrisburg (Pa.) Traction Co. has voted to increase its capital stock from \$2,000,000 to \$2,500,000, the proceeds to be used in effecting improvements of the system in the city and suburbs. The gross receipts of the company for the year are reported at \$357,709; the operating expenses at \$163,124; and the earnings at \$194,585. The surplus earnings amounted to \$130,542, of which \$100,000 was paid in two dividends of 2 1/2 per cent each, and \$30,542 was spent on improvements.



# ECHOES FROM THE TRADE

THE PECKHAM TRUCK CO., has removed its western office from Chicago to 312 Electric Building, Cleveland, O.

THE LUDLOW SUPPLY CO., No. 313 Electric Bldg., Cleveland, has been appointed agent for the Morris Electric Co. for the sale of rail-bonds fare registers, and other lines of that company's manufacture.

THE SPRAGUE ELECTRIC CO. recently held its annual meeting and re-elected the following officers for the ensuing year: John Markle, president; Edward C. Platt, first vice-president; Allan C. Bakewell, second vice-president; Harry R. Swartz, secretary and treasurer.

WORK IS NOW UNDER WAY upon the foundations for the immense new plant of the B. F. Sturtevant Co., at Hyde Park, Mass. That the buildings can be completed none to soon for the urgent needs of the company is shown by the fact that the present plant at Jamaica Plain, Mass., is now taxed to the limit and that it has been necessary to run overtime, particularly in the engine and electrical departments.

THE MANHATTAN RAILWAY CO. of New York City, has awarded a contract to the Siegrist Lubricator Co., of St. Louis, to install the Siegrist system of automatic lubrication for the entire power plant of 96,000 h. p. The Siegrist system is also being installed by the DeBeers Consolidated Diamond Mines Co., of Kimberly, South Africa, and the Glasgow Tramways Co., of Glasgow, Scotland the largest plant in Great Britain.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, is doing some unique advertising on reply postal cards, on one side of which is a reproduction of a blue print showing the effect of chloride accumulator batteries in railway power stations. The example given shows the fluctuation of a line load without a battery, which amount to 500 amperes, by means of a curve, while with a battery the capacity of the station is increased 300 amperes and a second curve shows the fluctuation reduced to 200 amperes.

THE HOMER COMMUTATOR CO., Cleveland, O., which makes a complete line of new, assembled and refitted generator and motor commutators, has just issued its first catalog and price list since the incorporation of F. L. Homer & Co. under the present title of the concern. Principal among the products included in the price list are all kinds of commutator supplies, gears and steel pinions, high-grade rawhide pinions for street railway motors, solid motor bearings, babbitted motor bearings, and pure Lake copper commutator bars. The catalog is illustrated with cuts of the company's numerous products.

CRANE CO., New York, a branch of Crane Co., Chicago, manufacturer of valves, fittings, pipe, etc., has completed an additional plant for pipe cutting, threading and flanging of large and small pipe and for pipe bending. The new auxiliary works are located at 497-505 Cherry St. directly on the East River. The building is 125x100 ft., the main shop being 110x63 ft. and devoted to the cutting, threading and flanging of large pipe. The rear shop is devoted to the handling of small pipe and to pipe bending. The main shop is equipped with 13 pipe machines, apparatus for screwing up flanges of all sizes, and lathes for refacing flanges after they are screwed on.

THE JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J., has issued its automobile circular No. 4, relating to Dixon's graphite preparations for steam, gas and electric automobiles. The circular contains a description of the several varieties of lubricant applied to automobiles, and a complement of letters attesting the

satisfaction of patrons of the Dixon products. "Graphite," the monthly paper issued by the Joseph Dixon Crucible Co., in the interest of its products, contains, for October, readable articles on increased friction of machinery, inkless printing, graphite for typewriters, lubrication of gas engine cylinders and graphite paint as a protective coating for metal surfaces.

"AJAX PLASTIC BRONZE" is very highly recommended by a railroad company having some 14,000 of these brasses in use on large capacity cars; the company says: "There has never been a train delayed on account of hot brasses since adopting 'Ajax Plastic Bronze.'" This may properly be called a wonderful report, and independent of this, the brasses are reported to have shown nearly 100 per cent more mileage than former specifications. The Ajax Metal Co. has no hesitation in saying that "Ajax Plastic Bronze" will show a saving of 50 to 100 per cent (with an additional 100 per cent in reserve) covering hot bearings, oil, waste, attention, etc., and will furnish those interested with the name of the road giving it the recommendation quoted.

THE ERICSSON TELEPHONE COMPANY, 296 Broadway, New York City, has published a leaflet containing a great deal of information in regard to its different telephone systems. It also shows diagrams of wiring which is used in interior intercommunicating systems in which any station may call up a person at any other station without requiring the services of a central switch board operator. This system is very satisfactory up to 15 or 20 stations, beyond which the number of wires running to all the stations increases the cost of the system to too great a figure. For a large number of stations especially where they are a long distance apart a simple switch board system is preferable. The company uses two systems of house telephones one of which is equipped with a battery call and the other a magnetic call.

THE DUFF MANUFACTURING CO., of Pittsburg, Pa., has issued its catalog "B" for October, 1901, in regard to Barrett's patent automatic jacks, which are made exclusively by this company. These jacks are made in different styles to meet different requirements, among which may be mentioned track jacks, automatic lowering jacks, car box and oil well jacks, differential screw jacks, etc. This company confines its business exclusively to making jacks and it has had nearly 20 years experience in that line. The fact that nearly 150,000 Barrett jacks have been placed with American steam roads and street railways is substantial evidence of their worth.

THE SPRAGUE ELECTRIC CO. is receiving many orders for its apparatus from all parts of the country and abroad. Among recent orders are the following: 90-kw. split-pole generator, shipped to Bailey Walker & Co., Buenos Ayres; 125-kw. split-pole generator, Steelton (Pa.) Light & Power Co.; 37½-kw. split generator, Fort Wadsworth, Staten Island; 37½-kw. engine type generator, Fort Hancock, N. J.; 80-h. p. motor, American Linseed Co., Staten Island; 100-kw. engine type split-pole generator, Geuder & Paeschke Manufacturing Co., Milwaukee; 50-kw. generator and 15-h. p. motor, Roe & Conover, Newark, N. J.; 85-h. p. motor, John Stephenson, Elizabeth, N. J.; 75-kw. split-pole generator, Chase Rolling Mill Co., Waterbury, Conn.; 75-kw. split-pole generator, Fred Miller Brewing Co., Milwaukee; 100-kw. 550-volt split-pole belted type generator, Plymouth Mills, Plymouth, Mass.; 100-kw. belted type split-pole generator, C. S. Ashley, Toledo, O.; 100-kw. 550-volt, belted type split-pole generator, and various motors up to 50-h. p., T. C. Keller, Chicago; a quantity of motors for the mines and refining plant of the Arlington Copper Co., Arlington, N. J.; 100-h. p. motor, American Locomotive Co., Cooke works, Paterson, N. J.; 60-kw. split-pole generator, Fahy's Watch Case Co., Sag Harbor, L. I.; two 25-kw. engine type split-pole generators for Madison Square Garden, New York, and 100-kw. split-pole engine type generator, Leland Hotel, Chicago.

THE BURT MANUFACTURING CO., Akron, O., recently made a large shipment of its Cross oil filters to parties in Stockholm, Sweden. The Cross oil filters are now used extensively in 28 different countries.

### STUART-HOWLAND CO., AT THE CONVENTION.

The accompanying illustration, which unfortunately we were unable to secure in time for our issue of October 12th, shows a view of the exhibit which the Stuart-Howland Co., of New York and Boston, made at the street railway convention. The arrangement of materials is quite novel.

The exhibit was fenced in by tops of poles fitted with cross arms, brasses, pins, and glass insulators showing a full assortment of all



EXHIBIT OF STUART-HOWLAND CO.

the styles of insulators. Three posts were erected, also, for the display of samples of the different styles of bracket arms. At the back of the booth was an attractive exhibit of the "Peerless" lamps, with vari-colored globes, and the "Helios-Upton" arc lamps were also shown.

There was an extensive line of overhead material in different types, carbon brushes, fare registers, trolley catchers, gears and pinions, and a trolley wheel that is guaranteed to make 5,000 miles. An excellent souvenir in the shape of a bronze paper weight was given to friends of the company and it was so good that the demand exceeded the supply. The exhibit was in charge of Mr. Herbert W. Smith, manager of the railroad department, assisted by Mr. William Wampler, Middle States representative, and Mr. T. C. White, manager of the factory.

The company was not able to make as fine a display as had been intended, as much of its line and other material was lost in transit.

### OHIO NOTES.

Messrs. Comstock Bros., of Detroit, have bought the Cincinnati, Georgetown & Portsmouth Ry. (a steam road), of which Ralph Peters, general superintendent of the Pennsylvania at Cincinnati, is principal owner and president. The road is about 45 miles long, passes through a thickly settled community and Georgetown is the eastern terminus at present. It has a 3-ft. gage and was built in the early 80's. It is the intention of the new owners to change the road to standard gage and operate it by electricity. The new directors are: A. W. Comstock, W. B. Comstock and H. A. Haigh, Detroit; C. C. Tennis, Pittsburg; R. E. Field, W. R. Todd, Jos. S. Trevor, Judson Harmon, Samuel Tappin, N. S. Keith and F. F. Dinsmore, all of Cincinnati. The board organized by electing A. W. Comstock, president; C. C. Tennis, vice president, and R. E. Field, secretary and treasurer. Mr. Comstock, the new president, built the Toledo, Fremont & Norwalk line. He will move to Cincinnati and take personal charge of the property at once. The capital stock of the old company was

\$500,000, but the terms of the recent sale have not yet been made public. The line is parallel to the proposed Suburban Traction Co.'s line but really over different routes. It is the intention of the new company to ultimately extend the line to Portsmouth, about 40 miles farther up the river.

Efforts have been put forth for some few weeks to effect a settlement of the bitter controversy that has arisen between representatives of the two roads that are building from Columbus north. The lines referred to are the Columbus, Delaware & Marion, and the Columbus, Delaware & Northern. It has been quietly rumored for several days that one of the companies would permit itself to be "swallowed" by the other, and that in all probability the Simons line would be absorbed by the representatives of the Columbus, London & Springfield, which is a part of a system that is seeking entrance into Cleveland.

The commissioners of Franklin County have granted an extension of time to the Columbus Street Railway Co., for the completion of its line to Arlington suburb, because of the company's inability to get ties and the delays due to the recent steel strike. The line was to have been completed by the first of October under the terms of the original franchise, but the time has now been extended to December. About 2½ miles of road is now in operation.

During the recent fall festival at Cincinnati, a long string of floats were placed on flat trolley cars and were borne through the main thoroughfares, producing a very brilliant effect and forming a spectacle that was both interesting and attractive.

The statement of the Brooklyn Rapid Transit Co. for August, 1901, shows gross receipts, \$1,139,611; expense including taxes, \$760,083; net receipts, \$379,528. The number of miles of road (counted as single track) operated is 489.3.

### CLARK'S SAND DRIER.

The accompanying illustration shows one of the types of the Clark "Perfect" sand driers, which are manufactured by the Parkhurst & Wilkinson Co., of Chicago. This sand drier received the premium as the best sand drier at the National Exposition of Railway Appliances and it is in extensive use not only throughout the United States but in Canada, Europe and South America. These driers are built in the fashion of an hour glass, the wet



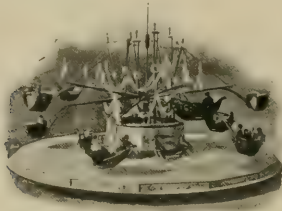
"PERFECT" SAND DRIER.

sand being shoveled against the stove and as it dries it is allowed to run out through apertures in the perforated ring which surrounds the bottom of the hopper. The amount of sand that will pass through this machine in a given time is variable and depends largely upon the conditions under which it is used; that is to say, how wet the sand is when it is put in the hopper and also the intensity of the fire maintained in the stove. The furnace is arranged to use any kind of solid fuel such as hard or soft coal or wood. These driers are for use with clear sand only, as earth or clay will merely bake and will not discharge itself from the machine. These driers are claimed to be the best ever put upon the market for preparing sand for use on locomotives and street cars.



## THE HERSCHELL-SPILLMAN OCEAN WAVE.

Herschell, Spillman & Co., North Tonawanda, N. Y., are introducing a new park attraction, in the line of an improved riding gallery known as the "ocean wave," the design and equipment of which may be seen in the accompanying cut. The ocean wave is a novelty which appears well worth the consideration of the managers of street railway parks, since it may be installed and operated at comparatively small expense, and combines many of the attractive features that have made the merry-go-round a standard



"OCEAN WAVE."

and profitable amusement feature. The ocean wave is designed to accommodate the traveler with all the sensations of an actual sea voyage since he progresses with a rocking motion as when a ship rises on the billows and dips into the trough of the sea.

## THE OHMER CAR REGISTER.

The Ohmer Car Register Co., of Dayton, O., has published a catalog explaining the merits of its system of indicating and recording fares. The register is designed to protect companies from loss through the carelessness or dishonesty of conductors and to save the time and trouble involved in the usual system of accounting for fares by conductors' trip and daily report sheets, and inspectors' reports. The Ohmer car register indicates and records separately each fare received, whether it be in the shape of a transfer, ticket, or cash fare for any amount from 3 cents to 50 cents. A receipt is shown for each fare received, not only by the tablets seen through the sight-opening of the register, but at other points in the car on dials bearing figures to represent the different classes of fare. Each car is provided with four or more such dials which are attached to an iron rod running through the car from end to end, each of which indicates simultaneously the same amount, so that passengers, wherever seated in the cars, can see the registration. In addition to displaying upon the register the amount of fare paid, together with the number of passengers served, the Ohmer car register prints the amount of fare paid separately and collectively on a sheet of paper in plain, unmistakable figures. This printed report is inside the register, and

cannot be tampered with or changed, nor taken away except by the person whose duty it is to remove it for the purpose of checking up the day's receipts.

The Ohmer car register No. 3, while practically the same as the one described, has in addition a device known as the identification key by which the work of each conductor is determined from his individual number printed upon the statement by the operation of his key. With this system no trip cards are necessary and no receipts of any kind are punched or passed from one conductor to another.

## ALLSTON FOUNDRY CO. EXHIBIT.

Our engraving shows a view of the exhibit of the Allston Foundry Co., of Boston, which was located in the annex at Madison Square Garden. The principal features of this exhibit were the "Compo" pulleys, brake shoes and friction clutches, in all of which high frictional qualities are secured by means of cork insets in the bearing surface. The pulley has been the subject of test at Worcester Polytechnic Institute with most satisfactory results which it expected will soon be made public in an official report. The "Compo" brake shoes first became widely known after the M. C. B. brake shoe tests in 1896 when they attracted a great deal of attention because of the high coefficient of friction shown. Tests of



later designs which have cork insets were made at Purdue University with favorable results. The company was represented at the convention by Mr. W. W. Whitcomb, president, and Mr. William S. Sanborn.

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STOPS A RACING ENGINE. Gives absolute protection from DRIVE WHEEL BREAKS. CLOSSES THE THROTTLE—NO CONNECTION WITH THE GOVERNOR. Perfectly Automatic—an Engineer always at the Throttle. The Engineer's FRIEND, and Most Reliable Assistant. Easily attached to any Engine or Combination of Engines. Any part or all of the plant can be put in Electric Contact or connection with the Throttle. Equip your Engines with the MONARCH SYSTEM and avoid that fatal "TOO LATE." Write for 1901 Illustrated Catalogue. Visit our exhibit at Pan-American, Power Court, Mechanic's Hall.

MONARCH MANUFACTURING CO., WATERBURY, CONN.



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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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On another page will be found an interesting description of the New Bedford & Fairhaven Bridge, which will carry street railway tracks. The design of the structure itself embodies no particularly novel ideas in bridge building, but the manner of moving the draw is, we believe, an unusual one. Interest in this connection will center chiefly in the fact that street railway motors, taking current from the usual 550-volt trolley circuit, are employed for moving the gates at either end of the draw; for operating the compressing pumps forming part of the hydraulic system with which the bridge is fitted; and for turning the draw. Although the New Bedford bridge will cost over a million dollars, the principles of operation, as described here by Mr. Williams, are equally applicable to street railway draw bridges built on a smaller scale.

One of the English municipal enterprises concerning which considerable has been published in the American daily papers, with a view to showing the advantages of municipal ownership, is the Shoreditch electricity works and refuse destroying plant. About three years ago a garbled statement as to the operation of this plant was widely circulated; it was said that the net profit for the year was some \$16,000, whereas there was, in fact, a loss of some \$7,000, even after the department was credited with 50 cents per ton for all refuse burned (which was charged to the scavenging department), while other parishes similarly situated were able to dispose of their refuse at about 25 cents per ton. Accounts for the last fiscal year show a deficit of about \$16,000 on the operation of this plant.

The review of the past and forecast of the future of street railways, presented by Captain McCulloch, at the New York convention, in an entertaining paper, contains in addition to numerous reminiscences of early horse car days a very just estimate of the advantages accruing to communities in which the modern electric railway has been established. It may be pointed out that of all the applications of electricity to innumerable purposes its adoption

by railways affects a larger proportion of the public than other uses to which it has been put. The expansion of a city is due to the electric street railway extension instead of the extension of the railway being a result of the growth of the city, as might be supposed. In nearly every city where a progressive street railway management exists lines of railway have been pushed far into the suburbs where but small traffic could be expected for several years. The street railway has been the pioneer in the settlement of new districts and almost every city railway company owns one or more lines which are run at a loss and depend upon the future growth of the city to pay their operating expenses. In referring to the popular clamor for municipal ownership, which is heard in many localities, the author points out that in no line of business have the changes and improvements been so rapid, necessitating the discarding of old plant and equipment and the substitution of new. It is hardly probable that any municipality would have been bold enough to have ventured upon the costly changes which have resulted in the present success, as the expectation of financial reward which has nerved private corporations to make vast expenditures for improvements is an incentive which would be lacking in the case of a municipality. The continued progress and improvement of our street railways depend for the future as they have in the past upon the progressiveness of the companies which own and operate the roads.

Under the heading of the Roadmasters' Convention we print a number of papers and reports submitted at the meeting of the Roadmasters' and Maintenance of Way Association, held in Washington in October. Until comparatively recently the conditions under which electric railway tracks were built have been so different from those met on steam railroads that the experience of the latter was of but little value to the engineers in the construction or maintenance of way departments of electric lines. Street railways proper are for the most part built in streets, and the interurban extensions were at first generally built along the highways where it was necessary to place the tops of the rails practically flush with the surface of the roadway. At the present time, however, it is the policy of interurban electric companies to secure private rights of way wherever possible and the track construction conforms closely to steam railroad practices; if there is any marked difference it is in the tendency to use heavier rails for the electric construction.

Of the papers presented at the Washington roadmasters' convention those on the holding power of spikes in treated ties, on tamping ties, on burned clay ballast, on arrangement of track joints, on steel ties and on long rails are all suggestive to maintenance of way engineers on electric interurbans, and the report on long rails is particularly interesting.

The author of this report, Mr. F. R. Coates, of the Chicago Great Western, in summarizing the matter, says, "the rail itself, if longer than 33 ft., costs more per ton, costs more to handle, costs more to maintain for the same number of tons, and is more expensive to line and surface." On the other hand, there is a slight saving in maintenance due to the fewer joints and the track with longer rails rides better. Mr. Coates, in conclusion, states that he is an advocate of the 45-ft. length and believes that it will become the standard when the mills can furnish it at the same price per ton as shorter rails.

In electric railway practice the fact that electrical as well as mechanical connections must be maintained at joints is a most important reason for the use of long rails, and a level track is considered more than sufficient to compensate for the increased first cost and additional care required in transporting and handling the longer lengths. The experience on several electric lines for which we have data does not confirm the claim that long rails cost more per ton for maintenance; on the contrary, on level track the charge for maintenance (mechanical) was least with the 60-ft. lengths.

On grades the 60 ft. rails, unless provided with anchor plates in addition to those at the joints, will give more serious trouble by creeping. It is not unusual for all the bolts of a joint near the top of a grade to be sheared off, and the joint open several inches. To prevent the joints from breaking, better means of anchoring the rails must be provided. This can be done by drilling the rail web at intermediate points and bolting splice bars to it, as de-

scribed by Mr. Coates; as against this practice, however, it may be urged that drilling the rail web so weakens the rail as to cause it to break at that point and it is better to use shorter rails on grades. Such indeed is the practice adopted by a number of the larger interurban lines, 60 or 62-ft. rails being used on the more level portions of the route and 30-ft. lengths on heavy grades.

It is quite evident that where there is difficulty in preserving the mechanical connection between rails the maintenance of electrical connection will give even more trouble, and to preserve the continuity of the ground return cross-bonds and supplementary ground returns are used at points where a break in the track is liable to occur.

At the present time the street railway situation in Chicago is exciting much attention among all those who have similar interests in other cities, and the developments will be closely watched until a settlement is reached. The street railway companies were originally chartered in 1839 for terms of 25 years, which were extended to 99 years by special act of the Legislature passed in 1865, and under this act the companies claim rights in the streets until 1958. Some 20 years ago when the original 25-year term was about to expire there was a controversy between the city and the companies as to the rights of the latter, and a compromise was effected by the city granting an extension for 20 years without prejudice to the rights of the companies under the act of 1865. In the 80's the city was advised by its counsel that it could not oust the street railways until 1958, and of course the railways have always claimed rights under the 99-year act; neither party, however, considered it politic to press for an adjudication until June last when non-resident stockholders of the Chicago Union Traction Co. brought suit in the federal courts, in order to have the question passed upon. As the case now stands the city claims that the right to operate the main lines, the back-bones of the several systems, expires in July, 1903.

Even if the city's contention be admitted, the companies have franchise grants by ordinances for the principal cross-town and feeder lines which yet have several years to run and if ousted from the trunk lines, could, by delivering passengers to the elevated roads under traffic agreements, render the main surface lines practically valueless in the hands of the new owners.

The conditions obtaining in the large cities of America are to a very great extent the result of the development and operation of the street railways and nothing is more necessary to the welfare of their inhabitants than efficient street railway service. In view of this fact and the claim made by the city of Chicago that after 18 months the street railways will have no rights in the main thoroughfares, the attitude of the city authorities is astounding. The present mayor of Chicago has made two successful campaigns for that office on an anti-street railway platform and his avowed policy is to refuse to discuss franchise extension until an effort shall have been made to secure from the Legislature authority for the city to own and operate street railways. The city council through one of its committees and a special commission has made an effort to formulate a policy, but in the last two years little has been accomplished. The street railway commission was appointed in December, 1899, and a year later filed a voluminous report which was abstracted in our issue for February, 1901. This commission made various recommendations which were embodied in a bill and submitted to the Illinois Legislature, but this bill received scant consideration in that body. The bill drafted by the commission richly deserved its fate, if for no other reason than that it contained the "scrap iron value" purchase clause of the British Tramways Act of 1870.

On page 853 of this issue we publish the text of a report submitted to the Committee on Local Transportation of the Chicago City Council by its secretary, Mr. George C. Sikes. This is presented as a starting point in discussion of the street railway question and Mr. Sikes deserves credit for his effort to place in comparatively small compass the possible contentions of the city. We regret to note that Mr. Sikes still advocates the "scrap iron value" purchase clause; in this connection a paper read before the Economic Science and Statistics Section of the British Association at Glasgow in September last is of interest. The author of this paper, Mr. E. F. Vesey Knox, states that he is in no sense opposed to what is called "municipal trading" and that in his opinion the supply of water and light is better managed by a municipality than

by a company; yet he avers that from the standpoint of an ardent "municipalizer" the British Tramways Act is a failure.

The council committee itself is far from agreement as to what the city's policy shall be, and the mayor's refusal to discuss franchise extension makes it impossible to begin negotiations with any promise of success; yet the council committee has made some attempts in this direction which have been cordially met by the street railway officials.

The street railway companies are anxious to improve the service, which they admit is not what it should be. The cable system of traction is antiquated and for years the companies have desired to install electricity; the city authorities think that they prefer the underground trolley but at no time has their attitude been such as to permit serious negotiations. There are other questions concerning details of construction and operation which the city wishes to take up, such as the use of grooved rails, brake systems, fenders, types of cars and schedules, but until the city is ready to talk business discussion on these points is idle.

Every prudent man must realize that the longer the present state of affairs continues the street railway service will grow worse; the companies would be foolish to incur the expense necessary to effect improvements until the question of franchise extension is settled.

It is the duty of the mayor to abandon his policy of waiting and open negotiations with the traction companies for a speedy settlement, and the longer the delay the more will the interests of the public suffer. Captain McCulloch, general manager of the Chicago City Railway Co., stated the case admirably a few days ago in a statement to the council committee on local transportation. He was quoted as follows: "The real question in this transportation problem is not what particular kind of motive power shall be used nor whether a company shall turn all its earnings over to the city. The real point is that Chicago wants the best possible service, which will insure that the cars always are certain to run. That is what the company wants. That is what the people want. They don't want to find a tied-up street car system when they are in a hurry to get to their homes. They want cars that will run in all kinds of weather and under all conditions. They don't care what power is used. Will the underground trolley satisfy this demand is the question?"

The mayor and the council committee have strong leanings towards municipal ownership, but there is no danger of the necessary grant of power being made so long as the mayor of Chicago is of a different political party from the majority of the Legislature; it would be bad policy to give a political opponent 10,000 city employes to organize into a new machine. As before mentioned, the existing companies, even if ousted from the trunk lines, will have control of the feeder systems for years to come, and the interests of the public preclude grants to new companies. Therefore, even if we assume that the city will win in its contention concerning the invalidity of the 99-year act, the conditions point to a new agreement with existing companies as the only possible solution, if the interests of the public are given proper consideration.

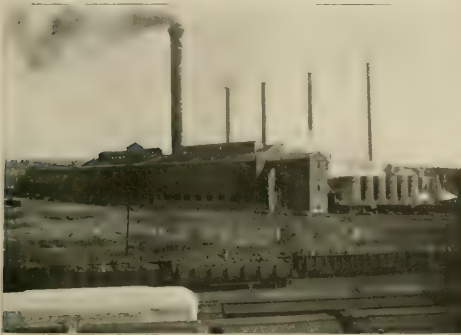
We believe that the most important point to be considered in such an agreement is the adequate protection of the present stockholders and bondholders of the street railway companies, for neither the state nor city can afford to permit anything that savors of confiscation, however strongly such a policy may be advocated by the politicians. The state has been lax in not requiring that adequate allowances for depreciation and impairment of capital be made, and the fact that the companies have pursued a bad business policy because permitted to do so is no reason why comparatively innocent parties should suffer the whole burden.

A plan which commends itself to us would be the extension of all franchises for a term sufficiently long, say 50 years, so that the companies could increase their equipment, improve the service, establish universal transfers, and meet all other reasonable demands of the public, and yet have a chance to recoup themselves for the investment before the expiration of the term. During this term the stockholders should receive a reasonable income, say 4 per cent, upon the present market value of their stock. A proper allowance for depreciation should be made so that in future reconstruction and renewal of equipment will not be charged to capital account. A sinking fund sufficient to insure an unimpaired capital at the end of the term should be provided. The excess earnings then remaining should be expended in further extension and improvement of the service or go to the city in lieu of compensation for franchises.



## New Power Stations of the St. Louis Transit Co.

The consolidation of the street railway companies of St. Louis, which was effected in 1899 and resulted in combining practically all the city lines as the St. Louis Transit Co., has naturally been productive of many changes in operating methods and equipments. One of the most marked of these changes has been the design of two new modern power plants to replace 11 old stations, four of which were cable power houses. The design of the new stations was undertaken by Messrs. W. D. Boyce & Co., in January, 1899,



EXTERIOR OF CENTRAL POWER STATION, ST. LOUIS TRANSIT CO.

and at this time one, the Central Station, is practically completed, while the second, the Northern Station, is about 80 per cent done. The work of building the Central Station has been carried out under difficult conditions due to the fact that it was largely an addition to the existing station on that site, and to the ever pressing demand for more power for operating the railways. The latter condition was in a great measure due to the unfortunate strike of 1900. Several lines were operated by cable traction at that time and the cables were cut by strikers; when the strike was over it was considered better to at once substitute electric power instead of repairing the cables, though this change had not been contem-

plained until after the Northern Station should have been completed.

is in the shape of an oval about 12 miles long by 7 miles wide. The Central Station is at Vista and Vandeventer Aves., where the main repair and car shops of the company are located. This point is about three miles west of the river and is near the geographical center of the system, though it is to the south and west of the center of load.

This station, with its auxiliary buildings, covers approximately three acres. Reference to the plan view which also shows the relative positions of the paint and car shops, will make clear the general arrangement. The engine room is in the center and the boiler rooms are on the north and south sides, the pump rooms intervening; at the west end of the building are the cooling towers. The engine and dynamo room is 222x100 ft. and contains the following equipment:

Four 36 and 70 by 60 in. cross-compound corliss engines built by the Fulton Engine Works, of St. Louis; these operate at 75 r. p. m. and with 150 lb. steam pressure develop 3,400 h. p., each. Direct connected to each of these engines is a 2,250-kw. Westinghouse direct current generator giving 4,100 amperes at 550 volts.

Three 32 and 62 by 60 in. cross-compound Fulton-Corliss engines giving 2,300 h. p. at 75 r. p. m. and 150 lb. steam. Each of these engines is direct connected to a 1,500-kw. Westinghouse generator.

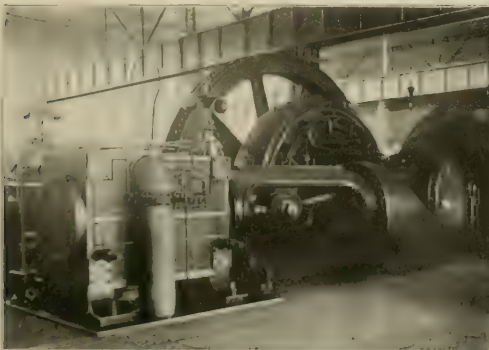
Three tandem compound Porter-Allen engines giving 1,000 h. p. each at 140 r. p. m. and 150 lb. steam. Each of these machines is direct connected to a 650 kw. Westinghouse generator. All engines operate condensing.

The total normal output of this station is 28,130 amperes at 550 volts.

The south boiler house is 278x34 ft. and contains 14 Stirling boilers, 8 of 300 h. p. each and 6 of 375 h. p. each, arranged in batteries of two. The capacity of each of these boilers is 11,250 lb. of water per hour. All the boilers in this house have down draft furnaces. The stacks for these boilers are three in number, all guyed steel chimneys 7 ft. 6 in. in diameter and 160 ft. high; each stack has twin breechings.

The main steam header for the south side of the station is 16 in. in diameter without expansion bends.

The south pump room lies between the boiler and engine rooms, separated from each by a wall, and is 210x22 ft., and contains the heaters, pumps and meters. For the 14 Stirling boilers constituting the south plant there are seven live steam purifiers of 750 h. p.



INTERIOR VIEWS OF CENTRAL STATION.

plated until after the Northern Station should have been completed.

In connection with the new plants the output of which is mostly direct current a rotary converter substation has been built to which three-phase current from the Northern Station is transmitted.

The territory covered by the lines of the St. Louis Transit Co.

each and four "Excelsior" heaters, two of 1,000 h. p., and two of 2,500 h. p. The pumps include four boiler feed pumps, two 12x8½x 12 in., one 12x8x10 in. and one 12x8x15 in. and two tank pumps, 6x12x10 in. and 7½x8½x10 in. One 6-in. cold water meter and three 4-in. hot water meters of the piston type are provided for measuring the boiler feed.

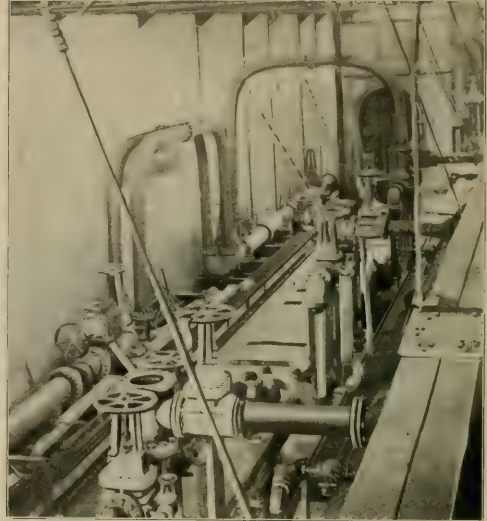
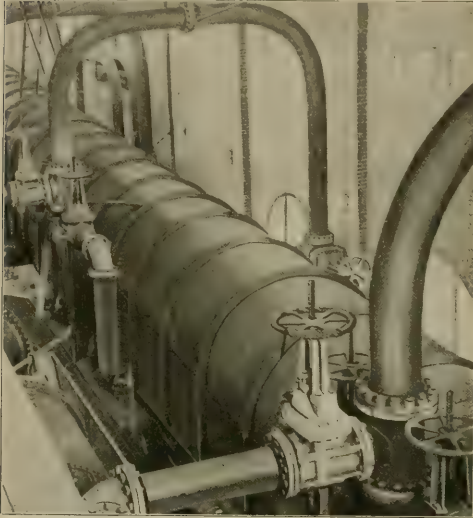
For the south part of the engine equipment a 36-in. condenser



is provided, the engines exhausting into a 36-in. header. There are three rotary dry vacuum pumps with steam cylinders 16x18 in. and air cylinders 12x18 in. in combination with driving engines. Each engine drives by a belt one centrifugal circulating pump having hot and cold water ends with 10-in. suction and 10-in. discharge.

The north boiler house of the Central Station is 316x50 ft. and

shafting and engines being in the basement. The steam header for this portion of the station is 20 in. in diameter with two expansion bends. Each of the expansion bends is made of two 12-in. pipes. Our two half tone engravings give an excellent idea of the piping as it appears in the north boiler room; the leads to the engine are all carried below the level of the engine room floor so that the engine room is free from piping. At each engine is a 12-in. Coch-

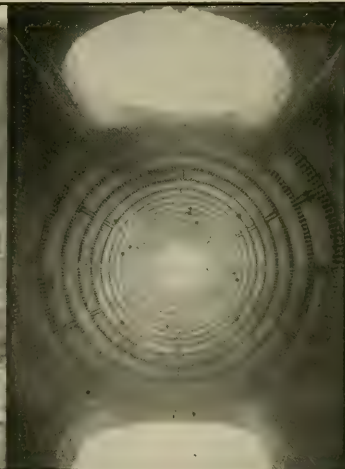


PIPING AND BREECHING IN CENTRAL STATION MCLEOD CO., CONTRACTOR.

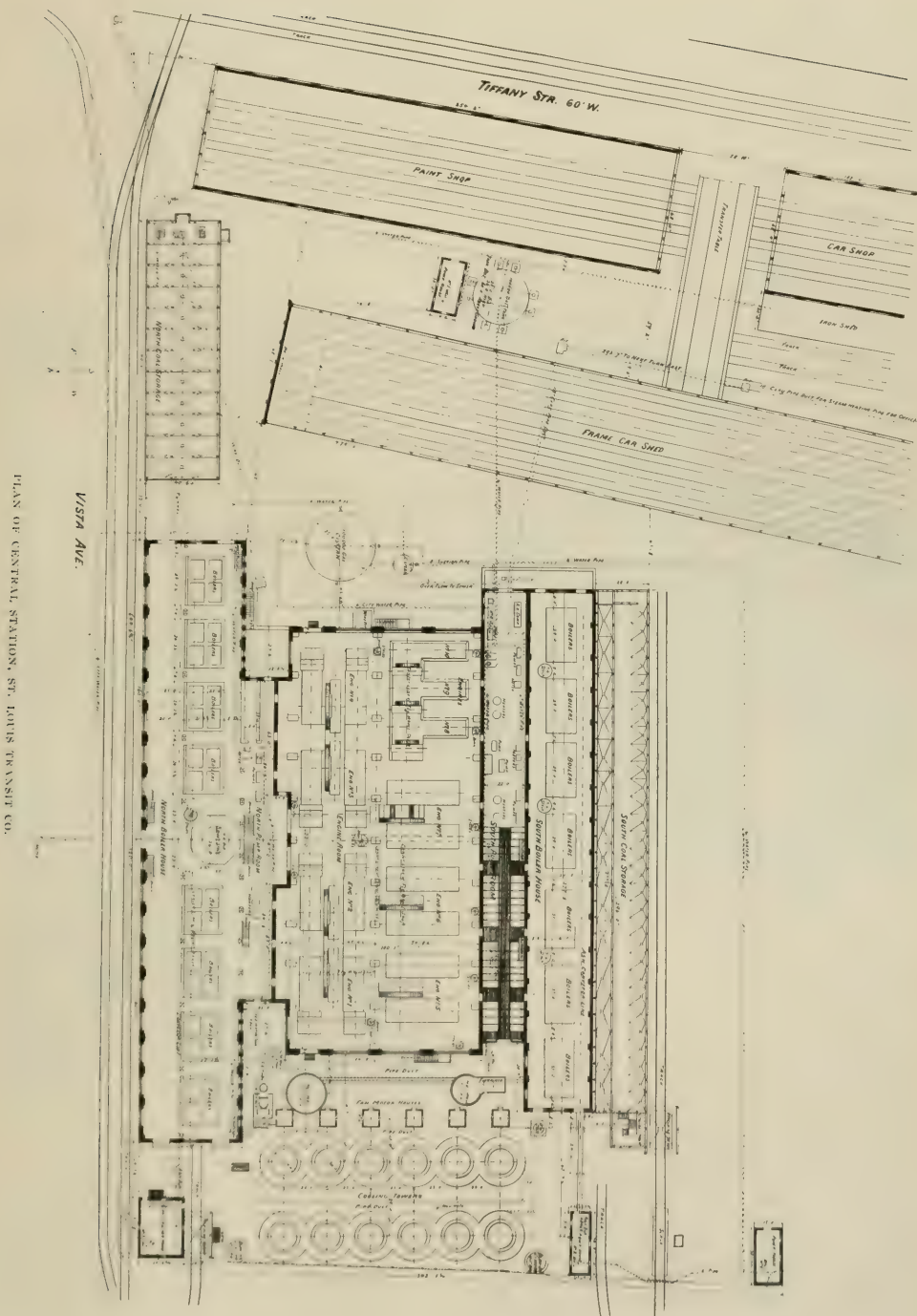
the north pump room is 173x16 ft. The equipment comprises 16 boilers of 400 h. p. each with an aggregate capacity of 20,000 lb. of water per hour. The boilers are arranged in batteries of two and are all equipped with traveling chain grates made by the Green Engineering Co., of Chicago. Each of these grates has an effective surface 9 ft. long by 9 ft. 8 in. wide and will burn 35 lb. of 10,000 B. t. u. coal per sq. ft. per hour. Four Kriebel engines are used for driving the grates, two engines to 8 boilers, all line

range receiver separator. The piping contract for both stations was let to the McLeod Co., of Chicago. Crane Co. valves are used throughout. All piping is covered with asbestos sponge felt sectional covering made by the Manville Covering Co., of Milwaukee.

The engines in the north side of the station exhaust into a 48-in. header which leads to a 48-in. jet condenser. The air pumps are of the dry vacuum type with cylinders 10 and 18 in. by 10 in. stroke, and run at 120 r. p. m. The circulating pumps are three in num-



THREE VIEWS OF THE STACK AT THE NORTHERN STATION.



PLAN OF CENTRAL STATION, ST. LOUIS TRANSIT CO.

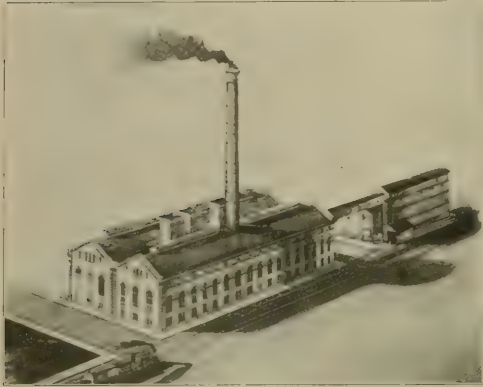
ber of the centrifugal type with 16-in. suction and 16-in. discharge and are direct connected to 17x18-in. slide valve engines.

For the north boilers there are eight 1,000 h. p. purifiers and four 1,500 h. p. heaters with an aggregate capacity of 62,000 lb. of water per hour.

The feed pumps are three 12x8½x10 in. and one 6x4x6 in. One 6-in. cold water meter and three 4-in. hot water Hersey disk meters are used for measuring the water.

The live steam pipes are drained by the Holly system.

The engine room is served by two electric cranes, that on the north side having a span of 41 ft. 4½ in. and that on the south 50



EXTERIOR OF NORTHERN STATION.

ft. 8½ m. The capacity of each is 75 tons; both were furnished by the Case Manufacturing Co., of Columbus, O. The hoist on each crane is about 20 ft. and is operated by a 50 h. p. motor which gives a speed of from 3 to 5 ft. per minute. The bridge is driven by a 25 h. p. motor giving a speed of from 25 to 50 ft. per minute; another 25 h. p. motor permits a trolley speed of 50 to 100 ft. per minute. The station is equipped with the Siegrist automatic lubricator system, and four "Famous" filters are installed to purify the oil for reuse.

The chimney for the north boiler house is 202 ft. high and 14 ft. inside diameter. It is built of boiler steel and is exactly similar to the chimney at the Northern Station. The joints are butt joints with inside and outside straps and these two chimneys are believed to be the only ones so constructed in the United States. For the first 60 ft. the stacks are lined with fire brick, the inside diameter being reduced to 12½ ft.

The details as to thickness of plates, joint straps and rivets are given in the following table:

Length of section.	Thickness of shell.	Horizontal seams.		Vertical seams.	
		Rivets.	Straps.	Rivets.	Straps.
Ft.	In.	In.	In.	In.	In.
40	5⅝	1	16 to 22	1	10 and 16x3⅝
42	5½	⅞	10	¾	6
42	⅝	¾	7½	¾	4½
42	9/32	⅝	6½	⅝	4
36	1¼	⅝	6½	⅝	4
Top	11 0	⅝	—	—	—

At the base of the stack are 12 anchoring shoulders built up of ⅝-in. web plates and 4x4-in. 17-lb. angles, and at each shoulder is a 3¼-in. foundation bolt, upset to 4 in. at the thread, which is 20 ft. long with an 18x18-in. anchor plate on the lower end. On top of the foundation is a 1½ x 13¼-in. face plate to which is bolted a 12-segment cast iron ring 3 in. thick with finished surfaces to receive the anchor shoulders of the stack.

The foundation for the northern stack at the Central Station is a concrete block containing approximately 26,500 cu. ft. of concrete. The foundation of the stack for the Northern Station is somewhat deeper and contains approximately 39,000 cu. ft. of concrete. Both stack foundations rest on solid rock.

There are two flanged smoke flue openings 7 ft. 3 in. wide by 14 ft. high; the metal removed to make the opening is compensated for by 6x6x½-in. angles placed inside, and by an angle of the same weight on the exterior of the opening to which is riveted a ½-in. wrought iron sleeve. Twin breechings 150 ft. long lined with 9-in. fire bricks furnish the connection to the boilers. The top bell is supported by a skeleton frame work of 22 brackets of ¾x2½-in. iron. The stack ladder is placed 18 in. out so that a man may ascend between the ladder and the stack.

In the concrete block forming the base two tunnels are provided so that men may enter to clean the soot.

At the Central Station are six wells 6 in. in diameter and 500 ft. to 800 ft. deep, all of which have been shot with 75-lb. charges of dynamite; they give about 100,000 gallons of water per 24 hours. The deep well pumps are the double acting working head type. The cylinders are 5¾ in. diameter and are placed at a depth of about 300 ft.; these pumps, which are driven by the Westinghouse and Eddy 25-h. p. motors, have a capacity of 100 gallons per minute at 25 r. p. m.

Near the station house is a cistern of 100,000 gallons capacity, and between the shop buildings is an elevated supply tank of the same capacity from which the boiler feed may be drawn. This tank is 18 ft. in diameter and 30 ft. deep and is supported on a 60-ft. tower which is composed of twelve 6 and 7 in. Larimer columns.

The city of St. Louis owns the levee and thereby controls access to the waterfront, and as a result power and manufacturing plants cannot avail themselves of the Mississippi for water supply, but have to buy water of the city or provide wells. Under such conditions cooling towers are a necessity for large plants, and at the Central Station there are twelve cooling towers 20 ft. in diameter and 32 ft. high, located at the west end of the building. The fans are engine driven, one engine for each two towers being placed in an engine house 9 ft. square located as indicated in the plan view. Engines are used for this work on account of it being possible to regulate their speed to suit the temperature of the atmosphere.

An important feature of the station is the handling of the coal. The south coal storage house is 278 ft. long by 28 ft. 8 in. wide and has a capacity for 3,500 tons of coal. The conveyor is of the McCaslin gravity bucket type with 18x24 in. malleable iron buckets; the line is some 700 ft. long. At the end of the storage house is a steam driven crusher to handle 45 tons of coal per hour. The ashes are taken from under the boilers by a Link Belt conveyor



FOUNDATIONS SHOWING FEEDER DUCT, CENTRAL STATION.

648 ft. long and delivered to the ash hopper which is located above No. 2 pump house. This bin has a capacity of 1,100 cu. ft.

The north coal storage is a building 140 ft. by 40 ft. 8 in. and has a capacity of 3,500 tons of coal. All coal and ash handling machinery were furnished by the John A. Mead Co.

The switchboards are located in a gallery above the north pump room which overlooks the engine room. The feeder board is placed at the rear of the gallery, and comprises 80 standard Westinghouse panels 20 in. wide by 7 ft. 6 in. high, making the board 133 ft. 4 in. long. The feeder ends are round bare copper bars of 1,000,000



c. m. cross section painted white and are carried on a rack several feet back of the feeder board, each one being led over to its proper panel. At the end of the building the bars are led down to the basement and are connected to the cables which leave the station through the underground duct shown dotted in the plan view. There are 61 feeders thus led out to terminal poles which are from 500 to 2,000 ft. from the building.

One of the half tone engravings shows an interesting view of this duct as it appeared when the foundation for the north coal storage house was under construction.

The machine board has 12 machine panels and 2 load panels, and does not differ from ordinary boards in its equipment except that there is no negative bus bar, the negative switches being placed at the generators, and that an auxiliary bus is provided for the booster.

The booster unit in the station consists of a Westinghouse motor

in section, spaced 16 in. centers, which form the tension members of the concrete roof. The concrete for this work consists of one part cement, two parts river sand and four screened furnace sinders. The thickness of these roofs is 6 in. The floors are of macadam concrete construction.

The total floor space of the building is 70,000 sq. ft.

#### NORTHERN POWER STATION.

The Northern Station is located at Salisbury and North Second Sts., one block east of the Broadway line and near the river, and is  $3\frac{1}{4}$  miles from the Central Station, in a northeasterly direction. This is a brick building with stone trimmings 302 ft. long by 140 ft. 8 in. wide, giving two rooms each 297 ft. by 66 ft. inside. The roof and floors are similar to those of the Central Station and, as well as the foundations, were done under contract by the Gilsonite Construction Co., of St. Louis. The basement is 15 ft. high; from



GENERAL VIEWS OF IRON WORK.  
FOUNDATIONS IN NORTHERN STATION.

COAL HOPPERS IN NORTHERN STATION.  
REAR VIEW OF BOILERS.

generator operating at 425 r. p. m. This will be removed to substation when the other stations are completed.

As has been mentioned the St. Louis Transit Co. has found itself short of power station capacity, and in order to meet certain extraordinary temporary conditions on certain lines Mr. du Pont has introduced a decided novelty in the matter of boosting the voltage for feeding outlying lines. A temporary switchboard was installed near the three 650-kw. units and they are used as boosters, the speed being varied to meet the need for increased voltage. During the past summer they raised the pressure on feeders supplied by one of the older stations, a voltmeter connection being carried from the bus at the station being fed, back to the temporary switchboard mentioned.

There is one line which has an exceptionally heavy traffic on a very few days, and on such occasions the three 650-kw. units are all placed in a series with one another and with the station bus and the pressure raised as high as 1,800 volts.

The building has a frame of structural steel with walls of selected hard red brick trimmed with Bedford stone. The roof is of cinder concrete on which slate is nailed. The purlins are 9-in. I-beams placed about 10 ft. apart; across these are hooked straps  $1\frac{1}{2}$  x 11 in.

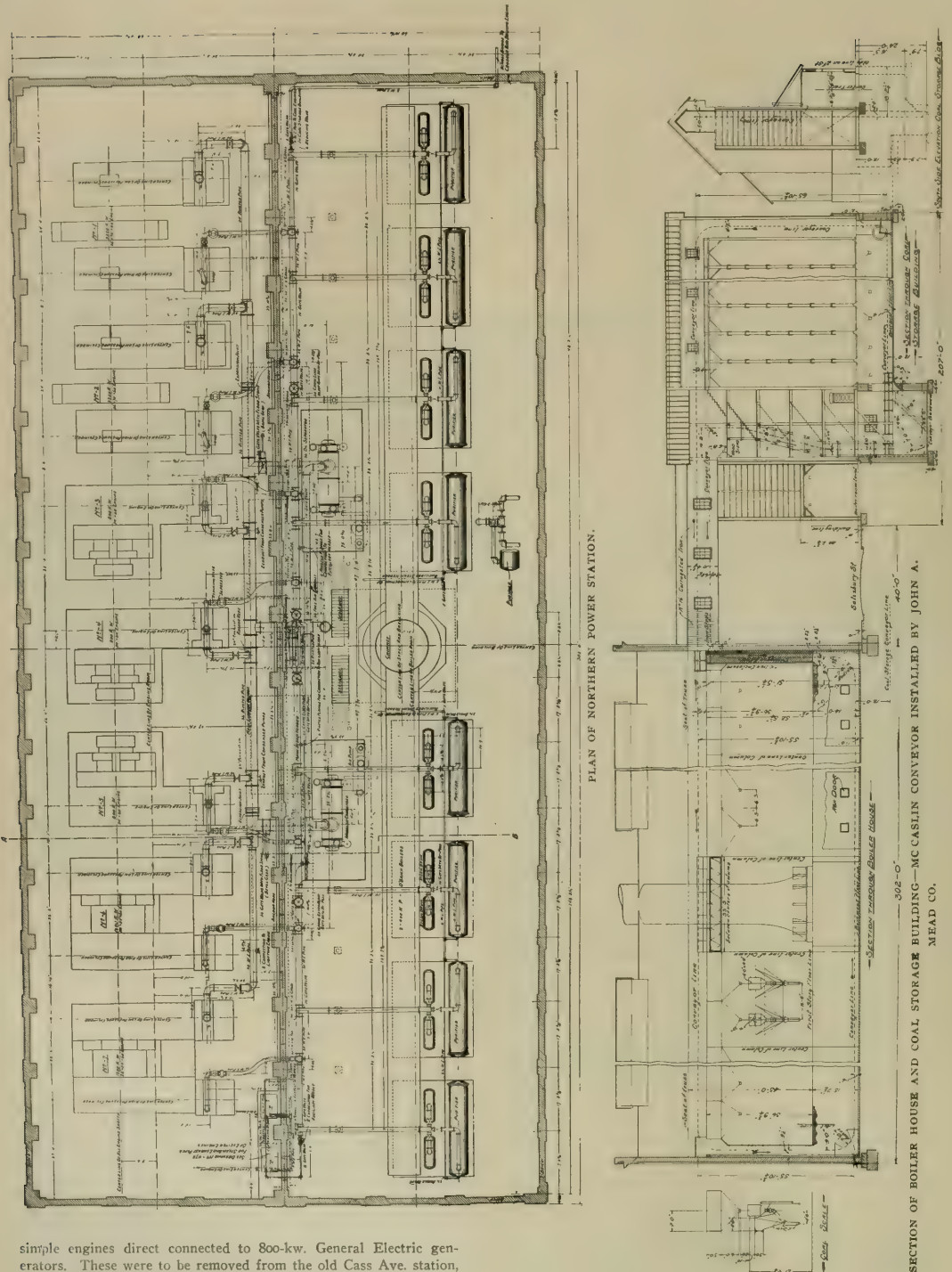
first floor to the truss line is 43 ft. and from the basement floor to the peak of the monitor roof is 70 ft. The tops of the cooling towers are 40 ft. higher.

The foundations of the building are some 6 ft. below the grade and contain 91,000 cu. ft. of concrete. The foundation for the stack and seven engines contain 315,000 cu. ft. of concrete, requiring some 12,000 barrels of cement. The number of piles under foundations in the building is 2,344. The weight of structural steel is 2,550,000 lb.

The engine room has white enamel brick to a height of 6 ft., where there is a heavy oak moulding; above this point the interior walls are covered with a coating of Keen's cement plaster and laid off in blocks to imitate stone. The general effect is a most pleasing one.

The engine room is to contain two 36 and 70 by 60 in. cross compound Fulton-Corliss engines, each direct connected to a General Electric 2,250-kw. railway generator and two 28 and 54 by 60 in. cross compound Fulton-Corliss engines direct connected to 40 pole, 1,200-kw. three-phase General Electric alternators. All four units run at 75 r. p. m.

The design also contemplated and the plans show three 34 x 60 in.



simple engines direct connected to 800-kw. General Electric generators. These were to be removed from the old Cass Ave. station, but it is doubtful whether these engines will ever be installed in the new station.

The exiters for the alternators are two 4-pole, 50-kw. 125-volt G. E. generators motor driven at 400 r. p. m.

The engine room is served by a 75-ton Case crane of 64 ft. 8 in. span. The speeds are: Bridge travel, 50 to 100 ft.; trolley, 25 to 50 ft.; hoist, 3 to 5 ft. per minute. The motors are respectively 30, 25 and 50 h. p.

The boiler room has 16 boilers, rated at 400 h. p., each arranged in batteries of two. Each boiler has a traveling chain grate made by the Green Engineering Co., of Chicago; these grates have an effective surface 9 ft. 8 in. wide by 9 ft. long and are similar to those installed in the north part of the Central Station.

Above the boilers is a row of steel hoppers holding coal supply for 12 hours. Each hopper has a 2-ton weighing hopper with Howe recording scales under it.

There are four "Excelsior" heaters designed to heat 63,000 lb. of water from 110° F. to 210° with 20,000 lb. of exhaust steam per hour supplied to the four heaters. There are eight purifiers 68 in. by 26 ft., each having 1,750 sq. ft. of lint collecting surface.

The condensers, two in number, are located below the engine room floor, but in an open well surrounded by a railing. They are Wheeler surface condensers, admiralty type, rectangular pattern, each having 10,000 sq. ft. of cooling surface. The exhaust connection to each condenser is 36 in. diameter. Each condenser is mounted above a compound Blake circulating pump, of the single type, with steam cylinders 14 and 24x24 in. in the center, and two water cylinders at the extreme ends, each 30x24 in. These pumps deliver the circulating water through the condensers to the top of the cooling towers, located on the roof of the engine room, 105 ft. 9 in. above the pumps. Of course, the pressure on the suction side of the pumps is that due to the height of the base of the cooling towers, so that the net work done is only that of lifting the water the height of the towers, or 36 ft. 3 in. The arrangement of the two circulating pumps sending the water in opposite directions through one-half of each condenser is a very effective one.

The air pumps are of the Conover independent type, with single acting air cylinders 40x16 in. These cylinders have valves in the pistons, and also diaphragm and valves above the pistons. The air pumps are driven by the Conover special compound trunk engines, with corliss valve gear on the high pressure cylinder, and

A 30-in. free exhaust pipe is placed near the stack, as shown in the plan view of this station.

The stack at the Northern Station is in all respects similar to that for the north side of the Central Station. The foundation is somewhat heavier, however, being 42 ft. deep.

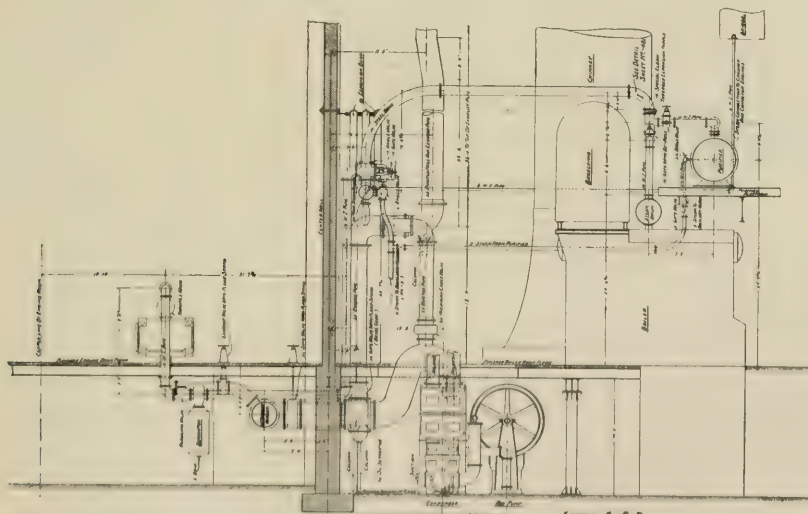
The piping contract for the Northern Station, as for the Central, was let to the McLeod Co. of Chicago. The valves are of Crane



GREEN TRAVELING CHAIN GRATES.

make, extra heavy with by-pass and tested to 800 lb. for the steam lines, and "standard" for the exhaust lines. Asbestos sponge felted sectional covering supplied by the Manville Covering Co. is used on all steam and exhaust piping.

The feed piping for one-half of the station is shown in plan and elevation in one of our line drawings. It will be noted that there



SECTION OF NORTHERN POWER STATION.

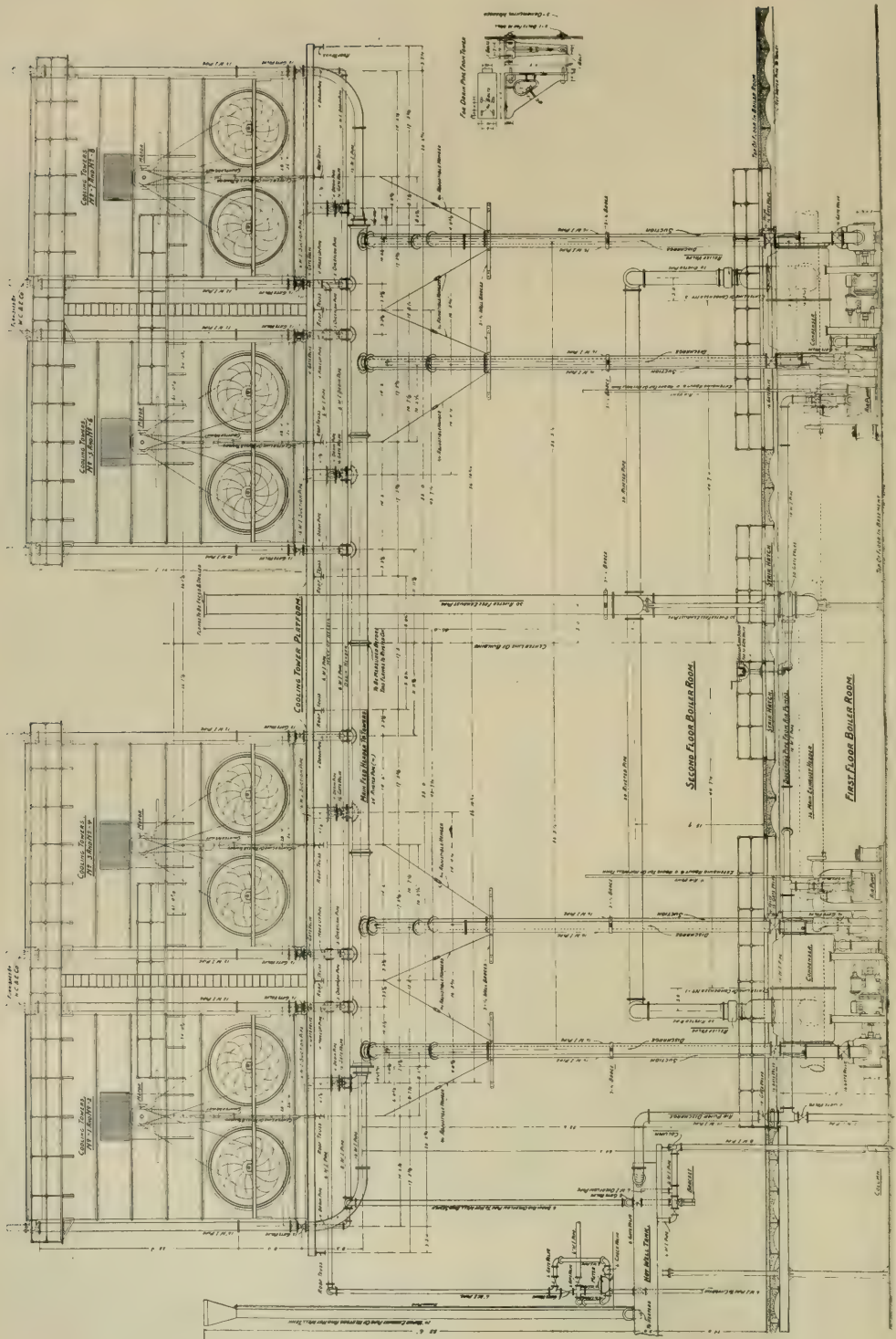
double corliss valves with fixed cut off at  $\frac{5}{8}$  stroke on the low pressure side.

A 36-in. Cochrane oil separator is placed in the exhaust connection to each condenser, and also a 36-in. Kennedy valve operated from the engine room floor by a double crank valve stand.

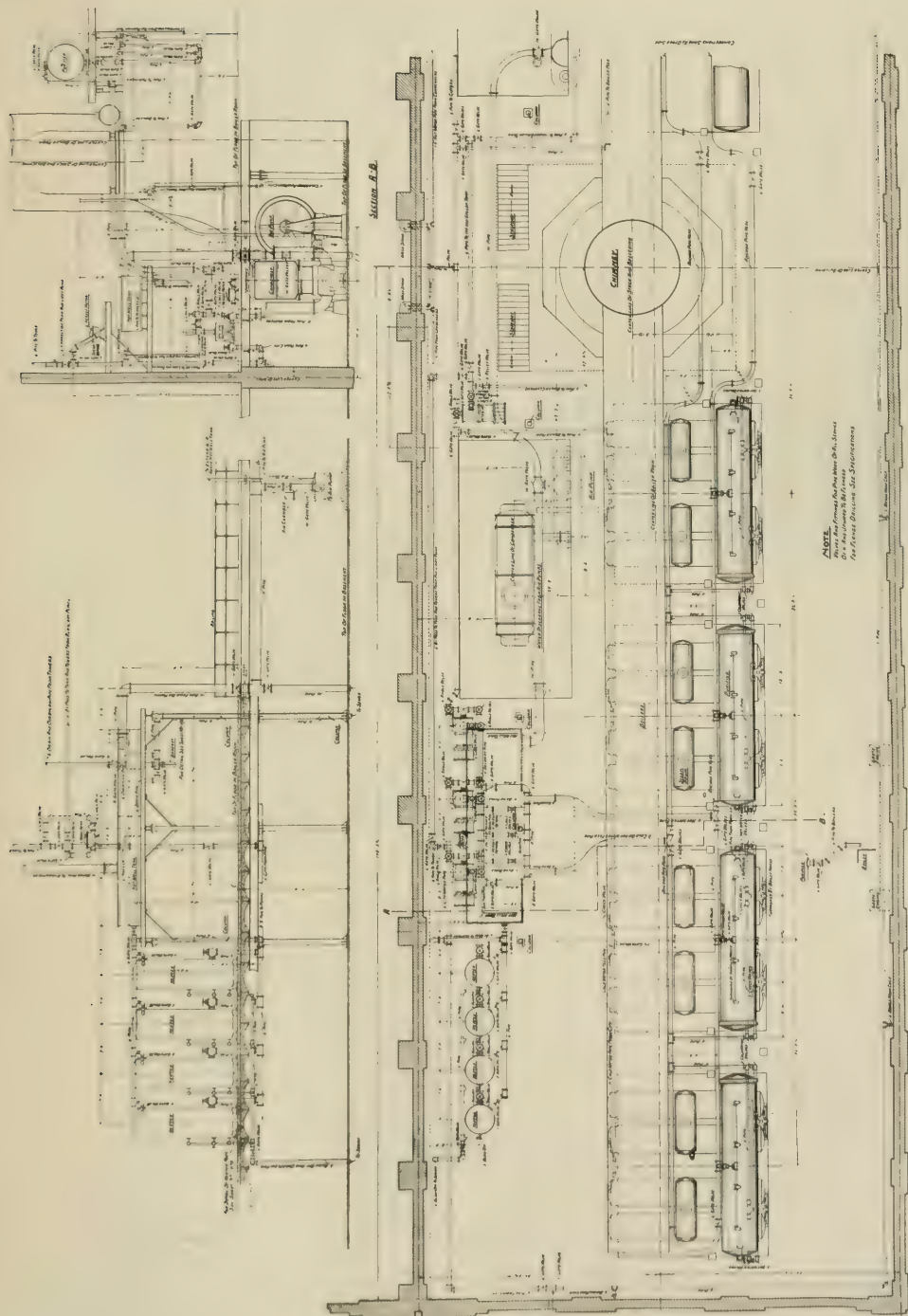
is a ring above the boilers, with two 8-in. connections to the pumps, one a hot water pipe, and the other for either hot or cold water.

There is a 6-in. connection to the city water mains, and a tank of 49,000 gallons capacity will be located on top of the coal storage house. For measuring the feed water there are two 4-in.





INSTALLATION OF BARNARD COOLING TOWERS—NORTHERN STATION. WHEELER CONDENSER & ENGINEERING CO.



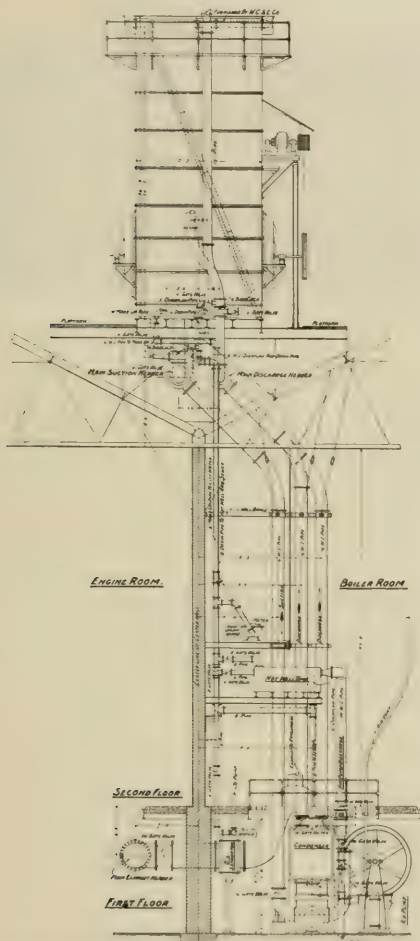
PLAN AND ELEVATIONS SHOWING FEED PIPING - NORTHERN STATION.





condensing water necessary for 27,000 lb. of exhaust steam per hour. Each tower is 15 ft. 3 in. by 13 ft. 2 in. by 36 ft. 3 in. high and weighs with the contained water about 80,000 lb. Each tower has its own fan, being connected by rope drivers to one 550-volt variable speed motor, the speed of which is 250, 200 or 125 r. p. m.

The station is equipped with the Siegrist lubricator system, which supplies oil under pressure to all the engine cylinders and bearings. The journals are also water jacketed. The piping for the Siegrist system and the water piping are shown in plan and elevation in



END ELEVATION COOLING TOWERS, NORTHERN STATION.

one of the drawings. In connection with this two "Famons" oil filters, each of which can filter 600 gallons per hour, are used.

The coal storage is located just across the street north of the boiler house and has a capacity for 3,500 tons. The building for the coal storage proper is 185 ft. long by 33½ ft. wide, and 52 ft. 5 in. high from the datum line (level of the boiler room floor) to the bottom of the monitor in which the conveyor runs. The framing is of timber, painted with fire proof paint, the posts resting on the stone foundation walls or brick piers, which in turn rests on a concrete footing supported by piling. The main elements are four rows of 10 in. posts, spaced about 10 ft. 6 in. crosswise and 14 ft. 6 in. lengthwise. At the intervals of 7 ft. 2 in. vertically a

3x14 in. piece is placed on each side of the posts and covered by 3x16 in. pieces which extend between the posts; a 1-in. tie rod is placed under each of the inverted troughs thus formed. Diagonal braces are inserted in both directions. The object of the inverted trough form given to the transverse bracing is to insure better ventilation. The 12 troughs which are in every bin provide clear passages to the atmosphere for gases given off by the coal. On one side the 3-in. plank is held away from the posts by cast iron washers on the bolts so that gases may pass the intermediate posts. The building is divided into 16 bins, each completely separated from the adjacent ones.

The conveyor line is along one side of the bin, the outlets at the bottom of course being on the same side. It had been found that there was a tendency for the coal dust to collect in the lower corner of the bin on the side opposite the hopper opening, there being no opportunity for it to work out unless the bin were completely emptied. This condition is particularly undesirable on



EXTERIOR OF SUB-STATION.

account of the increased danger of spontaneous combustion, and it has been obviated by placing an inclined screen instead of an apron under the discharging conveyor line.

The screens consist of ½ in. iron rods 11 ft. long spaced ½ in. apart and at a slope of about 4 to 5; the rods are supported on purlins made of 1¾-in. T-bars with the stem punched to form semi-circular seats for the rods. This plan permits the dust and pieces less than ½ in. in size to fall directly through to the bottom of the hoppers while large pieces are deflected to the opposite side of the bins.

The storage house is set back from the railroad far enough to permit an additional track being put in and made the company independent of other demands on the siding.

The longitudinal section showing the coal storage building also shows the location of the coal crusher and the ash bin. It will be remarked that by putting the ash bin between the boilers the conveyor can handle both coal and ashes at the same time.

The conveyor is the well known McCaslin overlapping gravity bucket type with malleable iron buckets and was installed by John A. Mead Co. of New York. The crushing machine was supplied by the same company.

#### SUB-STATION.

The Sub-station is located at Delmar and De Balivere Aves., being 4¾ miles almost due west of the Northern Station and three miles northwest of the Central Station. Thus practically all the heavy traffic lines are within a radius of two miles of one of the three supply stations, while the location of the sub-station is favorable for feeding suburban lines that may be added.

The sub-station is a steel and brick building 45 ft. 6 in. by 115 ft. 9 in., with slate roof and cement arch floor, of construction similar to the other stations described. The walls are 33 ft. high to the truss line. At one end of the building are two wire towers, as shown in our engraving; the three-phase feeder lines enter the left hand tower and the direct current feeders leave from the right hand one. The building now has a temporary wall at one end, as it is the intention to double its length.

The interior finish is similar to that of the engine room in the Northern power station and is very handsome. Underneath both transformers and rotary converters are ventilating tunnels.

The sub-station equipment includes four 8-pole, 600-kw., 600-volt

General Electric rotary converters running at 375 r. p. m., and 13 air blast 250-kw. 25 cycle 6,000 380-volt General Electric transformers. For ventilating purposes there are two 80-in. Buffalo blowers direct connected to 3-h. p. General Electric motors which run at 75 to 200 r. p. m.

The station is served by a crane of 40 ft. span and 15 tons capacity. The trolley, bridge and hoist travels are respectively 50 to 100, 25 to 50 and 3 to 5 ft. per minute, power being furnished by  $7\frac{1}{2}$ , 2 and 25 h. p. motors.

The booster mentioned in connection with the equipment of the Central Station is to be removed to the sub-station. There is also

## EXPERT REPORT ON THE IMPROVEMENTS OF THE BROOKLYN BRIDGE TERMINALS.

The board of engineers appointed to devise plans for improving the terminal facilities of the Brooklyn bridge, in accordance with the directions of the McCarren act, has submitted a report the substance of which is given in the following extracts.

The board consisted of Messrs. T. C. Clark, Memt. Am. Soc. C. E.; Alfred P. Boller, Mem. Am. Soc. C. E.; Henry G. Pront, Mem. Am. Soc. C. E., editor of the Railroad Gazette. The board organized by the election of Mr. Clark as chairman and Mr. Pront as secre-



Under the rotaries.

VENTILATING TUNNELS AT SUB-STATION.  
Under the transformers.

Transformers from above.

a 20-kw., 550-volt generator direct connected to a 350-volt induction motor.

The sub-station switchboard was furnished by the General Electric Co. This board is 37 ft. 4 in. long and comprises 2 three-phase line panels, 4 alternating current machine panels and 10 direct current 1,200 ampere feeder panels. The high tension switchboards in the Northern Station and the sub-station will have the General Electric push button system of control.

Concerning all the stations herein described it may be said that they are essentially modern as regards details, sanitary plumbing, lockers for employees, etc., are provided. The lighting is by means of incandescent arcs.

The active executive officer of the St. Louis Transit Co. is Mr. A. B. du Pont, second vice-president and general manager. Mr. John Grant is superintendent of the operating department, Mr. W. T. Cook superintendent of power, and Mr. C. A. Mareno engineer of maintenance of way.

Messrs. W. D. Boyce & Co., consulting engineers and superintendents for the St. Louis Transit Co., are in sole charge of the

tary. On the death of Mr. Clark, on July 16th, Mr. Samuel Whinery, Mem. Am. Soc. C. E., was appointed his successor and Mr. Boller was elected chairman of the reorganized board.

It became apparent shortly, in the study of the subject, that it was impossible to greatly increase the capacity of the bridge without practically rebuilding it, and in order to deal intelligently with the situation at the bridge terminals the following controlling principles were taken into consideration:

### CONTROLLING PRINCIPLES.

(1) The required capacity of the terminal is measured by the capacity of the bridge itself. Nothing would be gained by enlarging the terminal beyond the capacity of the bridge.

(2) The traffic capacity of the present bridge has been nearly reached, and it cannot be greatly increased without making radical changes in, or rebuilding the structure, which it would not be practicable to undertake until the completion of bridges Nos. 2 and 3.

(3) No satisfactory permanent relief for the congestion at the terminal of the bridge can be provided or hoped for, except through the completion of the new bridges, now under way; these when opened and properly connected with the downtown district will divert travel from the old bridge, and thus reduce the burden it now carries.

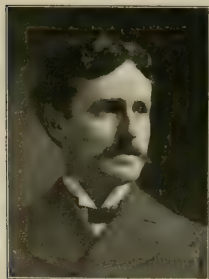
(4) Any general plans for relieving the present conditions should contemplate not only improving and increasing the capacity of the present Manhattan terminal, but should make it possible and practicable to diminish the pressure at the terminal by extending the bridge car and elevated tracks so that a part of the mass of people can be handled at stations other than the bridge terminal.

(5) The greatest measure of utility in serving the public and relieving the present bridge will be secured by connecting it with Bridges Nos. 2 and 3 in such a manner that the bridge trains may operate in both directions in a circulating system embracing the three bridges.

(6) Pending the opening of the new bridges measures should be taken to utilize, as far as possible, the full capacity of the old bridge, and to make such improvements at its terminal as will relieve the congestion and discomfort to the greatest possible extent.

(7) To relieve the congestion at the terminal, dependence must be placed, not so much in increasing its capacity as on diverting from it a part of the travel to other stations, thus virtually converting it from a terminal to a way station. The circulating system of bridge trains having way stations on the connecting roads will be an important factor in accomplishing this purpose.

(8) Since a large part of the crowds that now use and will



W. D. BOYCE.



W. R. MACKLIND.

designing of these stations, as well as superintending the construction, all the work being done under the personal supervision of Mr. W. D. Boyce and Mr. W. R. Macklind, to whom we are indebted for the data and assistance in preparing this article. Mr. R. E. Gurley, who has charge of the construction and erecting department, has been ably assisted by Mr. W. S. Ludington at the Central and Sub-station, and Mr. O. E. Overpeck at the Northern Station. Another member of W. D. Boyce & Co's. permanent staff closely associated with the work is Mr. W. W. Stroop, who has had charge of the office department.



continue to use the bridge and terminal come from the dense business district south of the bridge, some provision should be made for intercepting and handling a part of this travel before it reaches the present terminal.

(9) In connecting the three bridges and providing other station for handling a part of the people who now use and will continue to use the present bridge, regard should be had to making suitable connections or transfer points with the north and south transportation lines of Manhattan, to supplying some crosstown facilities in the downtown district, and to a connection with the more important of the North river ferries.

(10) No system of local loops for handling the bridge cars west of the present platform would materially improve or increase the present bridge car service.

(11) The terminal of the trolley car service over the bridge must for the present remain in the Manhattan terminal. The trolley car tracks cannot be extended across Park Row and its existing surface tracks. These tracks are now burdened to their full capacity, and to cross or cut into them would result in serious obstruction to both systems, and would increase the congestion at that point.

(12) The terminal trolley tracks should be so spaced as to pro-

(14) These changes should be of such a character that substantial benefit may be realized in the shortest possible time.

(15) While the existing conditions at the Manhattan terminal are such as to justify, if necessary, the expenditure of a large sum of money to provide a remedy, economy must not be disregarded, particularly since the question of arranging the finances so that the work may proceed without delay is of the utmost importance.

The principal recommendations of the board are as follows:

#### RECOMMENDATIONS.

(1) That an elevated road be built from the Manhattan terminus of the New York and Brooklyn Bridge along Center St. and Marion St. to Spring St., and thence along Spring and Delancey Sts. to the terminus of Bridge No. 2; and that a branch of this Centre St. line be built on Canal St. to the terminus of Bridge No. 3. That the first named portion be completed by the time Bridge No. 3 shall be opened for travel. That that portion of this elevated road from the bridge terminal along Centre St. to Canal St. be constructed with four tracks, the remainder to be double-track road. That the portion of the proposed elevated road from the existing bridge terminal to a point on Centre St. north of Worth St. be built at once, and a commodious station be built at Worth St., with sidings and switches north of this section for tail-switching and returning trains.

(2) That a double-track elevated road be built as soon as practicable from the Manhattan terminus of the New York and Brooklyn Bridge southward along Park Row and across Broadway to Vesey St.; thence westward along Vesey St., crossing the Sixth and Ninth Ave. Elevated roads above grade to West St., and southerly along West St. to the vicinity of the Cortlandt St. ferry on North River. That the terminus on West St. be provided with a suitable station and such extra sidings and switches as will enable trains to be returned to the bridge. That a commodious station be placed on Vesey St., between Church St. and West Broadway, with connections by stairs and platforms to both the Sixth and Ninth Ave. Elevated roads. We regard this Vesey St. line as very important, and it is strongly recommended; but it is independent of the Centre St. line, and its omission would not affect the other improvements recommended.

(3) That the present gallery floor (second floor) of the Manhattan terminal building be converted into, and be used exclusively for, a trolley car terminal, the loop tracks to be wide apart and each track to be reached by two separate stairs from the ground floor, one for outgoing and one for incoming passengers.

The remaining recommendations are of minor importance, and include the building of a commodious stairway entrance to the terminal to be made at Rose St. Plans for this stairway have already been completed by the chief engineer and superintendent. The recommendations also include the widening and straightening of the present stairway leading from William St. up to the first floor of the terminal, the building of a corresponding stairway opening into William St. on the north side of the building, the separation of the trolley tracks and wagon roadway by means of curbs placed between them over the whole length of the bridge, thus preventing vehicles from using the trolley tracks and the cleaning and repairing of the roadway during hours of minimum traffic only. The committee also recommends that, until the Centre St. line can be ready for operation to the Worth St. station, the present system of operating the bridge cars be unchanged, as no temporary changes would materially increase the present capacity of the bridge trains.

The map of lower New York shown herewith explains the elevated extensions, and connections between the three East River bridges, proposed by the committee.

The remainder of the report is devoted to the discussion of the facts which led the board to the conclusion noted above.



MAP OF LOWER NEW YORK.

vide ample platforms between them, passengers should be prevented from crossing tracks at grade, and incoming and outgoing passenger-carriage should be separated.

(14) Any changes at or enlargements of the Manhattan terminal, should, so far as possible, be of such a character that they may be carried out without serious interruption to travel.



In regard to the proposed Centre St. elevated railway, it is suggested that it might well constitute a loop system on which the trains passing over the present bridge in one direction could use these elevated tracks to reach bridge No. 2 or No. 3 and cross over in the reverse direction. This would constitute a circulating system in both directions from which close connections would be made at several different points with a large number of main lines of transit on Manhattan Island.

The part of the report which has been subjected to the most severe criticism is the recommendation for the elevated road through Park Row and Vesey St. In regard to this, the report is as follows:

"The elevated double-track road from the bridge terminal through Park Row and Vesey St. to West St., with its terminal in the vicinity of the Cortlandt St. ferry, will be a convenience to passengers between many New Jersey points and Brooklyn, and its station on Vesey St., between Church St. and West Broadway, will provide easy transfer between the Sixth and Ninth Ave. Elevated roads.

"Its most important function will, however, be to take up and deliver passengers who now use the terminal station, at the commodious Vesey St. station, thus still further reducing the congestion at the bridge terminal. This Vesey St. station will be nearer to and can be more conveniently reached by many of the people in a dense business district than the present terminal station. This proposed extension will doubtless be used by trains from the Brooklyn roads that cannot well use the circulating system via the new bridges, but a system of transfers at convenient points will make it available for passengers to and from all sections of Brooklyn.

"Objections will doubtless be made crossing Broadway with an elevated railroad. Such objections must be purely sentimental, and, while they should not be disregarded, we do not believe that aesthetic considerations should be allowed to stand in the way of commercial exigencies in lower New York. Our plans contemplate, and our estimates provide, for a bridge of sufficient span and elevation to offer no obstruction to travel, so designed as to be as unobjectionable as practicable from an aesthetic standpoint.

the present buildings; it leaves the ground floor of the terminal unobstructed by tracks and leaves ample room for commodious passageways to and from all parts of the bridge; it effectually prevents passengers from getting off or on the cars in the roadway alongside the terminal station.

This plan seems to provide an effectual remedy for the more objectionable and dangerous features of the present plan. It makes the crossing of tracks impossible to pedestrians thereby avoiding one of the principal sources of danger incident to the present plan.

### THE STRIKE AT SCRANTON, PA.

Notice was given in our last issue of a strike of employes on the Scranton (Pa.) Railway Co., and the statement was made that the direct cause was the refusal of the general manager to reinstate two conductors who had been discharged. In reply to a request for additional information, Mr. Frank Silliman, jr., general manager of the Scranton Ry., very pointedly states the position of the company in the following brief but positive language: "I would say that our conductors, motormen and shop hands struck work, on October 1st. on account of the discharge of two conductors, one for failing to collect and register all of the fares on his car, and the other for issuing more transfers than he had passengers on his car."

The union took up these two cases and arbitrarily demanded the reinstatement of the two men, which demand was necessarily courteously, but positively, denied. The men then struck, but in a few days the company was able to resume operation on practically all its regular schedules, with such of its old men that applied for reinstatement, aided by a few non-union substitutes. The union leaders, seeing that defeat was inevitable, instituted a boycott, which, through a misunderstanding of the true condition of affairs on the part of the public, was for a time more or less successful. The company continued to operate its cars regularly, but the citizens, for a week or two, either refused or feared to ride. From last reports the strike and boycott were still nominally in force, but cars are running as usual and the travel is rapidly reaching normal proportions.



SCENES IN SCRANTON, PA.

"As this extension must cross the Sixth Ave. and Ninth Ave. Elevated lines overhead, it may be objected that the great elevation of its station on Vesey St. will prevent people from patronizing it; but the elevation above the street at this point will not be greater than the elevation of the bridge car tracks above Park Row at the bridge terminal, and therefore will not increase the height to be climbed by bridge passengers. Besides, ample room could be had at the Vesey St. station for a system of elevators to transfer passengers from street to station."

The plan of raising the trolley car terminal to the gallery floor, as mentioned, involves supplying each trolley track with two flights of stairs from the street level floor to the trolley floor—one for passengers going to and one for passengers alighting from the cars. It is intended that the cars shall stop at one side of the loop to discharge their loads and then move to the opposite side of the loop to take them on. The tracks will be separated by fences and longitudinal fences will separate incoming from outgoing passengers.

Among the advantages pointed out for this plan are the following. It will become possible to separate the incoming and outgoing passengers; it provides liberal platform room for each track; it can be carried out on the present property of the city, within

The strike has been attended by considerable rioting and disorder, several citizens and policemen having been dangerously wounded during these vicious outbreaks. Our illustrations show some of the obstructions placed on the tracks and the overhead wires by the strikers or their sympathizers.

On the night of the 8th dynamite was placed on the track and a car wrecked. As everybody in the mining settlement is familiar with the use of explosives, fears are entertained that similar attempts to injure the cars will become epidemic.

A 3¼-mile electric railway will be built in Natchez, Miss., by a recently organized company, in which Memphis, Greenville and local capitalists are interested. Construction work will be begun early in November and is to be finished in three months.

The Pere Marquette R. R., owing to an alleged disagreement, has taken up its switch in Holland, Mich., in order to force the interurban electric railway company operating between Holland and Grand Rapids, to convey the coal used in the Holland power house over its own tracks.

## The Operation of the "Great Gorge Route."

BY GODFREY MORGAN, GENERAL MANAGER NIAGARA GORGE R. R.

There is probably no road of its size about which so much has been written from a scenic and engineering standpoint as the "Great Gorge Route," and a road built in the peculiar position of this road is necessarily interesting both as a scenic road and as an engineering problem. There is, however, still another point of view and about which there has been very little written, which to the practical railroad man must be of interest, and that is the operation of this remarkable road. I will not go into its engineering or the scenic features of the road, but present briefly the facts and problems of operation and maintenance.

It is a double track road of seven miles, and as shown in the illustrations, is built practically upon a shelf in the talus of the

Niagara canyon. On one side is the bank averaging between two hundred and two hundred and fifty feet high, and on the other is the river, running at a speed varying from six to twenty-five miles an hour. Tower wagons, shunts, sidings and the many conveniences of the ordinary railroad are consequently debarred from this, and for repairs, maintenance and improvements we are necessarily confined almost entirely to the roadbed for the storage of material, and all our work during ten months of the year must be done while operating. Consequently we are obliged to have



GODFREY MORGAN.

all materials and tools on cars to be transported rapidly from place to place, in order to keep out of the way of the regular service. With these conditions to contend with, and a track where a tangent is the rare exception, it can readily be seen that temporary work is to be discouraged as much as possible, and arrangements made whereby permanent work of the best material can be put in at the cheapest possible cost.

### Track and Roadbed.

The most notable changes were made in regard to the construction on the water side of the track. Small rubble masonry walls built of

building walls of much heavier character having stones for foundations none of which weigh under two or three tons, and often times we are able to put down stones weighing five tons. In this way we have overcome the action of the water on these walls, and what was temporary work requiring handling every year can now be counted permanent improvements. Some of the wooden cribs put in a few years ago still remain, but they are in places that give us little trouble, and on account of being limited in time to a month and a half a year for this work, we have found it necessary to keep them in until such time as we can replace them with our standard



RETAINING WALL BUILT ON STONE DROPPED INTO RIVER.

construction of wall. Some of these cribs and walls are very clearly shown in the illustrations.

One of the illustrations shows a large wall where in order to secure a foundation we were obliged to drop stones weighing from two to three tons into the river for some two or three weeks before the stones were seen above the water. We persevered, however, and gradually filled up this immense cave made by the rushing waters, and upon this rip-rapping built the rubble masonry wall shown, thereby overcoming what had been one of the most difficult problems of maintenance ever since the opening of the road.

In the original construction a guard rail of 6x8-in. timber was



DERRICK CAR.

stones varying in weight from ten to fifty pounds, with a few possible exceptions of a stone weighing between one hundred and one hundred and fifty pounds, and a number of wooden cribs were used to support the track on the outside. Many of these had to be replaced yearly, but in the reconstruction of the road which has been going on now for the past two years, we entirely changed the plan of construction. Instead of the cribs and small walls, we are now

placed the full length of the road, and all the curves were strengthened with angle irons. In addition to this there was a 12x12-in. guard stringer placed upon the long grade into the Gorge. The former is a common form of construction for electric railroads, and the latter was placed as an additional safeguard. While I have allowed the wooden guard to remain, I have in addition placed a T-rail at a distance of eight inches from the inside rail of the river track. We



have come to the conclusion that in the future we will not replace the guard stringer for two reasons: The cost of maintenance is very much higher than the cost of maintenance of T-rail guard, and it is not as efficient. The life of the wooden guard is from five to eight years and is exceedingly expensive to maintain. Unless it is guarded with angle iron it is usually a menace instead of an advantage in case of a derailment, as a derailed wheel will climb much more readily over wood than it can over the steel rail. The angle iron is objectionable unless it is bolted through the timber, for the rails will rust out, and we have found that we are subject to the old terrors of steam railroads when they used strap iron for rails. The ends are liable to spring up and catch the car and cause all kinds of damage. The guard timber looks well to the inexperienced eye of the passenger, but the advantage gained is not commensurate with the disadvantages, due to the fact that it makes the outside of the track very

With ordinary care a track gang of from ten to twelve men can keep the track in very good shape during the season in spite of the heavy traffic, frequent interruptions and many curves.

On account of the inaccessibility of the road by any other means than an electric car, we have found it necessary to arrange the trolley wire in sections of about a thousand feet, each section being fed from the main feeder and properly fused. In case of a serious break in the line we are thus able to get to the point with our line car, a necessary substitute for the tower wagon.

At the meetings of the New York State Street Railway Association, I have been an interested listener to the many papers and remarks on "How can we increase the efficiency of our employes," and the subject has attained such prominence that at the last meeting a standing committee to handle the subject has been appointed. The advance is being made more particularly in the line of considerate



SHOWING 12X12-IN. GUARD STRINGER.  
BRIDGE AROUND ABUTMENTS OF RAILROAD BRIDGE OVER GORGE.

VARIOUS WALLS ALONG WHIRLPOOL RAPIDS.  
SHOWING DIFFERENT FORMS OF GUARD RAILS.

much heavier and requires frequent renewal. We have, therefore, adopted standard T-rail guard instead of wooden guard rail, and for the curves we use a ribbon guard which extends about one inch above the T-rail. The illustration shows clearly the advantages in one case and the disadvantages in the other of the guard rails. It will be noted that in spite of the fact that the road has been in operation but six years, parts of the wooden stringer guard are decayed, and the angle iron has begun to loosen. A very clear idea is given of the use of the ribbon guard and T-rail guard, and in case of a derailment the trucks must necessarily ride in the channel formed by the inside rail and the T-rail guard; in order to mount and climb over this guard, the truck must be raised high enough to allow the flange of the wheel to ride over the top of the T-rail guard. Important changes have also been made in all crossovers, reversing them from "head on" switches and equipping them with standard spring frogs.

treatment rather than "brute force and profanity." We employ at the present time eighty conductors and motormen, whereas in winter we employ but six. The selection yearly of efficient men for these positions is by no means an easy task, and the unique position of the road, the many curves and "slow points" add greatly to the difficulty in securing efficient employes. A reliable superintendent who understands the handling of men with us is an absolute necessity. An aid which has proven itself of great value is that of signs, of which the following are examples: A white painted tie means "throw off power," and a striped tie means "put on power." "R" means "ring gong," and "stop" means stop and not "slow down." We are using these helps to employes rather extensively and we find it proves a valuable reminder to the experienced employe as well as of inestimable value to the instructor and inexperienced men.

As in the case of almost all short lines, the general manager is



the practical head of all the operating departments. The superintendent, the general inspector, the master mechanic, the lineman, the auditor and the ticket accountant all report directly to him, and he in turn reports to the executive committee. In this manner the general manager is kept in close touch with the details of each of the departments of the road. During the past year ending June 30, 1900, the road carried nearly 200,000 passengers, but due to the Pan-

use this car. I would add that this method of reversing the rear truck has proved with us entirely satisfactory.

One of the illustrations shows what is known as the Searchlight Car, a flat car upon which is mounted a General Electric motor-generator set together with controlling rheostats and instruments and a 24-inch standard Navy projector fitted with the ordinary circular beam lens and a divergency lens for widening the ray. This



PRIVATE CAR SHOWING REVERSED MAXIMUM TRACTION TRUCK.

American Exposition this number has been very greatly exceeded this year, and in three months and a half we have carried over 600,000 passengers. These passengers, it must be remembered, are all "long haul" passengers, as passengers entering upon our cars at one end are carried through to the other, stop-over privileges not being counted as fares. In order to prepare for this we added materially to our equipment, but the full capacity of the line has been taxed more than once during the current season, as practically all the traffic is between 10 a. m. and 4 p. m. We have carried between those hours over 14,000 passengers in a single day.

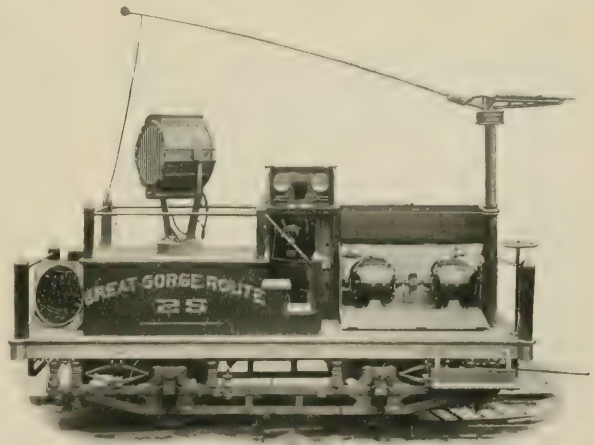
#### Rolling Stock.

It seems but natural that a road so unique in its position and operation should have many special devices for its operation. The accompanying photographs show some of the cars on this road.

The derrick car shown in the illustration, was designed and built for the construction of the walls referred to. It was built in our very limited barn, and although in a measure crude, it has saved its cost many times. On account of the bridges under which we pass, it is limited in height to twelve feet and is thirty-two feet long and six feet wide, having four twelve-inch steel beams for stringers and oak bumpers. The boom has a sweep of thirty feet and by a device whereby we can guy the top to the inner rail we are enabled to use the boom at right angles to the car. The trucks are standard Brill maximum traction, upon which are mounted G. E. 57 motors.

The private car was rebuilt at our barns and was made from a standard open car. Cushioned, revolving chairs are used, and it has proved itself a most satisfactory observation car for small parties. The late President McKinley, who was our guest the day he was shot, expressed great enjoyment of his trip over the Gorge Road in the private car, and we feel grateful that he should have taken this his last pleasure trip in this car. It will be noticed that the rear truck, as in the trail car shown, is a standard maximum traction truck reversed so that the pony wheel will always be the trailer. This was done for safety of operation on the high speed service between Buffalo and Niagara Falls, on which line we occasionally

is used for illuminating the Whirlpool Rapids, and many readers of the "Review" will remember pleasantly having witnessed this when attending the recent convention of the American Institute of Electrical Engineers. One of the color slides is shown on the car at the left of the picture. This car is coupled to one of the regular cars and taken down the line where an exhibition lasting probably half an hour is given at the Whirlpool Rapids every evening. The effect of the searchlight on the seething waters is indescribable.

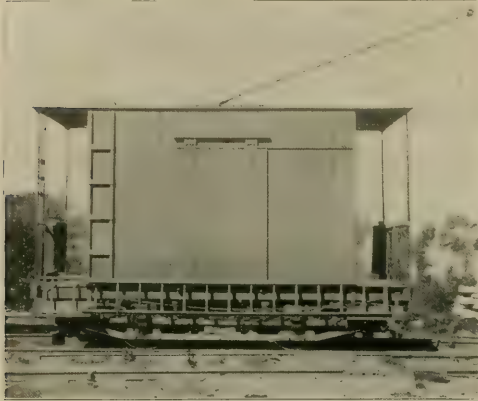


SEARCHLIGHT CAR.

The shadows are greatly heightened, thereby making the already turbulent waters seem even more turbulent, and the coloring produced by the use of gelatine slides calls forth many expressions of admiration and awe, which with the gratifying receipts, are most encouraging returns for the outlay and experimenting which the writer made to make possible the illumination of the Whirlpool Rapids. In addition to the above, forty 2,000 candle power lamps

with silvered reflectors are used to effect the general lighting of the Rapids.

Since we have secured such ticket representation as enables us to ticket the passenger from Niagara Falls through the Thousand Islands to Montreal and points beyond, and also via Lake George and the Hudson River to New York, we have found that the tourist business has increased to such an extent that a baggage car became a necessity. We therefore constructed from an open car a baggage



LINE REPAIR CAR.

compartment shown in the illustration. For ordinary purposes this proves sufficient, but on crowded days we find it necessary to use our line car in addition. The small box car is a combination baggage, line repair and sand car, built to take the place of that very useful but to us impossible device, the tower wagon. The picture describes it fully, but it would take many pages to describe the numerous uses to which this small unattractive looking car is put.

In conclusion I cannot resist the temptation to convict myself of prejudice against the trail car. So far this year it has been of

## FRANCHISE TAXATION IN ILLINOIS.

October 24th the Illinois Supreme Court rendered its decision in what is popularly known as the franchise tax case, a mandamus proceeding brought by the Chicago Teachers' Federation against 23 corporations doing business in Chicago, including 20 street railway, 1 telephone and 2 lighting companies.

The court said in part: "The State Board of Equalization on December 3d adjourned its session for 1900 without having valued and assessed at any amount the capital stock and franchises of thirteen of said corporations, and after having valued and assessed the capital stock and franchises of seven of said corporations at an amount so low, as is contended by the petitioner, as to amount, in law, to a fraudulent valuation and assessment, and therefore to amount to no assessment at all. The question, therefore, presented here for our determination is not whether the court has power to review the judgment of the State Board of Equalization in the fixing of values upon property assessed by it, but whether, when property has been wrongfully omitted which is taxable or fraudulently assessed at so low a rate as to amount, in law, to no assessment at all, the court may compel said board to perform its duty by assessing said property."

The court disclaimed making any new rules as to franchise valuation and after citing the constitutional provisions and statutes said: "The State Board of Equalization, in assessing the capital stock and franchise of corporations, does not act as a board of review, but as an original assessor, and the duty resting upon said board to value and assess the fair cash value of the capital stock, including the franchises, over and above the assessed value of the tangible property of all companies and associations, is mandatory, and the performance of such duty, when omitted or evaded, may be enforced by mandamus."

The unfortunate fact in connection with this decision is that it can have no effect except upon the assessments of corporations whose stocks are listed or whose property can be easily found. The real estate now assessed at ridiculously low values and the other property which is not assessed at all will escape, leaving the corporations to bear an unjust burden.

One paper in discussing the decision says: "It has been stated that the decision will drive corporations away from the state. This is unimportant. Our governments, state and local, have already driven away about all that can get away."

## HIGH PRESSURE STEAM GENERATORS.

Mr. H. S. Brunot, United States consul at St. Etienne, France, has recently reported to the State Department the tendency to increase boiler pressures. French locomotive boilers, he states, carry 225 to 250 lb. per sq. in. ordinarily. Attention is called to a company which has been organized to make and introduce a new steam generator which will insure a pressure variable from 280 to 1135 lb. per sq. in.

This boiler has been constructed by M. Serpollet of cast steel which fused at 1800° C. Within, it is an arrangement of noncapillary tubes, and it is in these that the instantaneous vaporization is effected without danger of escape, up to a pressure of 1135 lb. per sq. in. The apparatus placed in the fire box constitutes a sort of blower, allowing great facility to the fire draft. On account of its heavy construction, it offers ample resistance to the pressure.

It is claimed that it is not affected by immediate contact with the fire, and that capillary action is completely suppressed.

## CATALOGS WANTED.

The Cuba Co. is building several hundred miles of railways in Cuba and is in the market for various classes of material and equipment for both railway construction and operation. Mr. R. G. Ward, manager of construction, whose headquarters are at Ciego de Avila, Cuba, advises us that he would like to have dealers in construction and railway supplies forward their catalogs and price lists to him. It is quite important in mailing catalogs to Cuba that sufficient stamps be attached as otherwise the packages will be greatly delayed or may never reach their destination. The Cuba Co. will gladly refund cost of postage or express charges incurred in sending the literature desired.



COMBINATION BAGGAGE AND PASSENGER CAR.

inestimable value and cheaper by long odds to operate than a motor car. We have had no accidents, and I am wondering why I have allowed this prejudice to stand in the way of what has proved a big reduction in operating expenses. With the exercise of ordinary care, I see no reason why accidents should be more frequent on roads using trail cars than on ordinary steam roads.

The officers of the Niagara Gorge Railroad are: Captain Joseph T. Jones, president; Herbert P. Bissell, vice-president; Bert L. Jones, secretary and treasurer; Godfrey Morgan, general manager; Thomas Keller, general inspector, and E. E. Nicklis, superintendent.



## NOTES ON MODERN ELECTRIC RAILWAY PRACTICE.

A paper on this subject was read by Mr. Albert H. Armstrong, before the American Institute of Electrical Engineers, in which he reviews the progress of electric traction work from the small city service up to the class of work hitherto accomplished with the steam locomotive, into which field electric traction is gradually encroaching. The first question considered is the small city railway for which 500-volt direct current distribution amply suffices. As the city grows the demand for suburban service increases and it becomes necessary to install either a large amount of feeder copper, a booster or a storage battery. All of these expedients to take care of the suburban road are temporary, however, as they do not possess qualifications sufficient to care for a rapidly growing city. Transmitting energy by alternating current affords the means of feeding a large territory from a single generating station, but in the case of a city road the amount of alternating current required is a small proportion of the total generating station capacity, the bulk of which requires 500 volt direct current. The best method of meeting this demand for suburban service is, therefore, to install in a direct current generating system a standard rotary converter operated from the direct current bus bars as an inverted machine, and feeding a similar machine at the objective point by means of step-up and step-down transformers. The advantage of this method is that both machines may be used as converters later on when the suburban railroad has increased sufficiently to warrant the installation of alternating current generators replacing the direct current machines in the city station. Double current generators may be used, furnishing direct current for local consumption and alternating current for distribution, but the use of such machines presupposes that the ultimate load will be about evenly divided between the direct current and the alternating current output. It is probable, however, that the alternating current output will increase much faster than the direct current with its restricted area of distribution, so that double current machines do not afford the convenience for taking care of future growth that is obtained with the standard alternating current generators.

The direct current system of generating, even for city use, becomes greatly handicapped with the continued growth of the line. The alternating current system with substations scattered throughout the city appears to be the trend of the city distributing systems, even where suburban lines do not exist. One great advantage of the alternating current lies in its affording a means of consolidating adjacent roads into one system, and, in fact, the alternating current is the prime factor in such consolidations, as it effects a large saving in operating expenses by doing away with a number of small direct current stations required with the 500-volt direct current system.

Another class of railroads which differs in many respects from the ordinary city lines is the elevated or underground rapid transit road. The problem presented here is the operation of trains of two to six cars weighing from 50 to 150 tons, at schedule speeds ranging from 13 to 16 miles per hour with two or three stops per mile. The motive power to operate these trains at high schedule speeds and with frequent stops must be so designed that it can give an enormous torque during acceleration, and the controlling apparatus must provide for the efficient handling of these motors during fractional speed running. Direct current has generally been used for such work, but in the newer installations it is being substituted by alternating current with rotary converter substations operating at about 600 volts direct current. The reasons for this change are the same as those influencing the surface lines. The direct current series motor is particularly adapted to rapid transit trains running at variable speeds, as all the losses occurring in the motors and in the controlling apparatus are less than 30 per cent of the total energy input to the train. Where the lines are long and the train is permitted to go over them at full speed the losses are considerably less, but even with great frequency of stops the "efficiency of acceleration," so called, is very high.

There is a new class of railways which is becoming the center of great attraction. These are the high-speed interurban or cross-country lines of considerable extent. These operate on a private right-of-way, are carefully graded, have few sharp curves and use cars weighing from 30 to 40 tons at schedule speeds as high as

40 miles per hour, including stops every three miles or more. These roads are paralleling the steam roads, and make the same schedule speed, with the additional benefit of more frequent stops. Owing to the great tractive effect provided with motors connected to each axle, these trains can accelerate much faster than the steam locomotives. These interurban lines operate cars over the city streets at the termini, thus picking up and discharging passengers at the most objective points, thereby making them still keener competitors of the steam railroad systems. The starting current for each car or train may reach from 400 to 600 amperes per car, falling to 150 to 200 amperes when running at a constant speed of 50 miles per hour.

As these interurban systems are now being installed with 100 miles or more of track, the advantages of alternating current distribution at high potential is evident, and this is universally used. Substations are erected at intervals of 10 to 15 miles and they may or may not be equipped with storage battery plants. The storage battery effects a more uniform load curve on each substation individually, but the effect of such storage battery auxiliaries upon the generating system load curve may be quite small, due to the number of substations fed from a single generating station. A single alternating current generating system operating at 26,000 volts may feed a territory lying within a radius of 50 miles from the power-house, and although the fluctuations may be violent at the individual substations, the total load upon the bus bars of the generating station may be comparatively level. The direct current series motor shows itself to be capable of taking care of widely different demands placed upon the motive power. For instance, the cars must be able to run for long distances at full speed with infrequent stops and must also be capable of operating over city streets at schedules of from 6 to 10 miles per hour. The series parallel control of motors is a great help in this case, as it permits of half speed running with motors in series, but even this is generally too high for city work, thus calling for considerable rheostat control.

Another method of electrical distribution is coming into notice, which consists of alternating generation and transmission and alternating induction motors upon the cars. The system, in brief, comprises a multiphase generating system feeding into transmission wires extending along the line of travel, feeding at frequent intervals into step-down transformers, which reduce the transmission potential to a degree suitable for the overhead trolleys. Induction motors receive their power direct from these trolleys and are geared to the car axles by the usual methods. A particular advantage of the induction motor lies in the reduction of the labor cost due to the elimination of attendance at the substations, where the transformers require only casual inspection. As the induction motor system introduces several features which are new, viewed from the direct current standpoint, some of its characteristics are touched upon. A car equipped with induction motors will run at practically the same speed up grade and down or on a level, thus making the car speed nearly independent of the profile of the road. The speed of the induction motor, depending upon the frequency of the source of supply, is not affected by the voltage, provided the voltage be sufficiently high to provide the torque required. This constant speed appears at first sight to be a desirable feature, but a great objection to it, however, is that the practically constant speed of the induction motor car up the severest grades calls for a very large motor output and produces much more violent fluctuations upon the distributing and generating systems than is the case with the direct current series motor, which falls off considerably in speed on heavy grades. The system being alternating throughout provides no means of introducing storage batteries to smooth over its excessive fluctuations. The motive power must provide for the running of a car or train up the steepest grade at practically the same speed at which the car operates on a level, and the motors must therefore be designed to stand a greater output for the same service performed than the direct current series motor. The induction motor can give only a certain torque with a given impressed line voltage, and as this torque increases with the square of the impressed line voltage it is necessary to determine the operating conditions of the motor and of the distributing system in order that the motor may be able to operate its car or train upon the heaviest grade with the minimum line potential met with in operation. The direct current series motor can give a torque much in excess of any service demanded with-



out sacrificing its running qualities at light loads. Railway service calls for large overload capacity, and the induction motors can meet infrequent overload demands only by a design which sacrifices some of its advantages for normal operation. It is evident that the practically synchronous operation and limited torque of the induction motors introduce a number of problems not met with in direct current distribution, and that the whole generating and distributing systems must be designed very liberally in order to take care of infrequent, violent and large fluctuations.

While this system is operative, there is no reason for its adoption unless it shows superiority over present methods. Our interurban roads possess a very great advantage in being able to traverse city streets en route and at their termini. All the large cities in this country and most of the smaller ones have direct current railway systems in operation, and the direct current interurban system can therefore operate its cars over existing city systems. The induction motor, on the other hand, would necessitate changing cars at the outskirts of the cities or running around the cities passed en route. The chief advantage of the induction motor system lies in the ability of running motors from trolley potentials far in excess of 600 volts. Not having any commutator, the induction motor can use trolley potentials of several thousand volts, and proper line insulation and safety in operation are the only limits to the trolley voltage. The induction motor, however, is not adapted to city lines, calling as they do for constant acceleration and efficient operation at fractional speeds. Instead of efficiencies of acceleration in the seventies obtained with direct current motors, the induction motor may give an efficiency of only 40 to 45 per cent during acceleration with a corresponding increase in coal consumption, making it compare very unfavorably with the direct current motor for city work. The adoption of the induction motor for interurban work seems limited therefore to those roads running on private right-of-way throughout and having no connection with existing city systems at their termini or en route. Even in this class of roads if the service is at all frequent and the profile very irregular, the direct converter system with its third rail distribution may prove cheaper to install and operate.

A new class of electric railway work now being considered is mountain railroading and long systems of cross-country roads for either high speed passenger or freight work. The conditions covering both these classes of work are practically the same in that they demand a constant sustained output of the motive power, and it is in this class of work that the induction motor is being seriously considered.

It is possible that the electrical operation of trunk lines will be brought about by the equipping of some of the new high speed, third rail interurban systems with overhead trolley operating at 3,000 volts alternating current. These systems are rapidly being extended and interconnected and will soon be able to take care of long distance work when the different systems are sufficiently joined together. The establishment of a line of generating stations, all operating at a standard frequency of 25 cycles, may offer a means of feeding such a system with a comparatively small cost for equipping. The various substations, however, and the direct current copper distribution are not adapted to the operation of large, heavy units, although the transmission lines and generating systems could well feed those trains with a reasonable outlay for high tension overhead trolley construction. It is along such lines that the writer looks for the introduction of the induction motor as a railway factor in this country.

#### DAYTON & NORTHERN COMPLETED.

The new electric road from Dayton, O., to Greenville was completed and opened to traffic on October 10th. The line passes through a rich section of country, and, with the exception of a small distance, is built upon a private right-of-way. The cars are built to operate at as high a speed as 50 miles an hour, and the roadbed is of standard construction, well balanced and substantially built. The cars were built by the Barney & Smith Co. and are equipped with "Steel" motors and air brakes. Each car has a smoking apartment. The power plant is situated at Brookville, near the center of distribution and is equipped with Westinghouse three-phase generators. The cars leave Dayton hourly from 6 a. m. until 11 p. m.

#### NEW ALLIS-CHALMERS SHOPS.

Since the publication in the "Review" for March last of the plans of the new shops of the Allis-Chalmers Co., designed by Mr. Edwin Reynolds, a large amount of work has been done in the erection of some of the buildings. During the past six months there has been expended in manufacturing plants at West Allis over \$3,000,000, or more than the business building investment in the city of Milwaukee during the same time. The first of the buildings of the new factory is now erected and roofed over. This building is 515 ft. long, 120 ft. wide and 51 ft. high. The next building, for which the material has just been unloaded on the grounds, is the erecting shop, which is to be 1,200 ft. long, 115 ft. wide, and 80 ft. high.

A new electric lighting plant established by the company is about ready to be put into operation, and when this is done a night force of workmen will be put on to hasten the work on the various buildings. A number of arc lights have been mounted on traveling cranes so that the lights can be moved about to follow up the workmen.

Other manufacturing plants are rapidly going up in this neighborhood and a large number of lots have been sold for residence purposes. A large flat building is about to be erected in the neighborhood of the new factory, which promises within a very short time to be center of a very populous suburb.

#### INCENDIARY FIRES ON WORCESTER CONSOLIDATED.

An attempt was made on October 13th to burn the car barn of the Worcester Consolidated Street Railway Co., at Milbury, Mass. Two men living in the neighborhood passing the barn found a hole had been broken in the wall and a fire started at a point where the draft favored a quick blaze. They fortunately found a hose connected to a hydrant near by, and extinguished the flames without having to call on the fire department. A few days before this a gang of laborers employed by the company discovered a small fire which had obviously been started with a view to destroying the barn. The building is assessed at \$11,000, and is at present only used for the storage of cars. As it is not in daily use, there has been no watchman in charge.

The crime was subsequently traced to a youth of 16 years of age named Fred Burns, who made a confession. He said that he was alone in the work and that he did it solely for the purpose of seeing the excitement which it would produce.

#### OSHKOSH-OMRO INTERURBAN.

Work has begun on a new electric line from Oshkosh to Omro, which later will reach Berlin, Wis. The line is being built by the Columbia Construction Co., of Milwaukee, of which Mr. Clement C. Smith is president. This company has been organized to construct and operate lines between several cities in the Northwest. The Omro line, which will be run in connection with the Winnebago Traction Co., is expected to be more of a freight than a passenger road. It is the intention of the promoters to carry light freight and baggage and some farm products. It is also expected the line will carry mail. This is said to be the beginning of an extensive street and interurban railway system which will center at Oshkosh. Mr. Smith, who superintended the beginning of the work on the new line at Oshkosh, is also the vice-president of the Falk Co., of Milwaukee, which position he has held for the last five years.

#### MELLON LINES LEASED.

The Mellon lines near Pittsburgh have been leased to the Philadelphia Co. for a period of 999 years on a 5 per cent basis. This completes the consolidation of all the lines in and around Pittsburgh by the Philadelphia Co., and the stock of the Consolidated Traction Co. of that city is to be exchanged for new certificates of the Philadelphia Co. not later than Jan. 1, 1902.

Three new cars have been received for urban service on the electric railway lines at Utica, N. Y.

### W. E. HARRINGTON.

Mr. W. E. Harrington, vice-president and general manager of the Camden & Suburban Railway Co., of Camden, N. J., was born in Wilkesbarre, Pa., June 3, 1866. He is the son of David C. Harrington, an attorney-at-law, and was graduated from the mechanical engineering department of the University of Pennsylvania, with the degree of B. S. in 1887. In 1888 he entered the employ of Keasbey & Mattison, of Ambler, Pa., as a designer, and in 1889 and 1890 supervised the construction of an electric railway at Atlantic City for the Pennsylvania Railroad Co. In 1891-92, as general manager of the consolidated electric railways at Wheeling, W. Va., he supervised the reconstruction of the lines and entire system. During the next two years he acted as supervising and consulting engineer for a Pennsylvania syndicate, and from 1893 to 1896 acted in a similar capacity for the



W. E. HARRINGTON.

Camden Horse Railway Co., the Camden, Gloucester & Woodbury Railway Co., the General Electric Co., the Cutter Electric & Manufacturing Co., of Philadelphia, and others. While in the employ of the Cutter company Mr. Harrington invented and commercially exploited and introduced its entire line of I-T-E circuit breakers. When the consolidation of the electric lines entering Camden, N. J., was completed in 1896, Mr. Harrington was selected as general manager of the system. The consolidated company is known as the Camden & Suburban Railway Co., and, at the time Mr. Harrington assumed charge, the system comprised 35 miles of track, which was in bad condition, and with no systematic organization. During Mr. Harrington's connection with the company, the entire system has been almost entirely rebuilt, and 16 miles of new track added. A new car house and power station have been designed and built under his supervision, and a park has been laid out. The latter contains a theater, merry-go-round, boats, etc., and has been remunerative to the company. Mr. Harrington has always had the greatest consideration for his employees. He has established a reading room for them, and was instrumental in organizing an association, which holds monthly meetings and provides instruction and entertainment for them. The service stripe system was also introduced by Mr. Harrington, and a stripe is given for each five years of service. Faithful service is also rewarded by each employee being presented with a uniform after five years of service and each succeeding year until ten years are reached. After completing ten

years, and each succeeding year until fifteen years have been completed, the men are given a uniform and an overcoat. For each year after fifteen years have been served, the men are presented with two uniforms and an overcoat. Mr. Harrington was president of the Electrical Section of the Franklin Institute in 1898, and has been a member of the American Institute of Electrical Engineers since 1889. He has presented papers on engineering subjects before various technical bodies. At the New York meeting of the American Street Railway Association he presented a paper on "The Value of Storage Batteries as Auxiliaries to Power Plants." Mr. Harrington's method in handling railway properties is to analyze results in operating details by charts and curves, and he has been very successful in this method.

### BLUE-PRINTING BY ELECTRIC LIGHT.

A paper on the subject of blue-printing by electric light was read by Mr. S. B. Whinery, before the Engineers' Society of Western Pennsylvania, in which he describes two methods of blue-printing by artificial light.

There are two types of machines for this purpose on the market, one being the cylindrical frame with one movable lamp, and the other a flat frame with a number of lamps and a hood reflector. The standard machine of the cylindrical type is made in halves of cylindrical glass which are held together by brass bands at the top and bottom and rests on a revolving base to facilitate loading and unloading operations. The tracing and sensitized paper are held in place and in good contact by means of a canvas cover which wraps around the outside of the cylinder. The lamp by which the printing is effected is suspended from a bracket directly over the center of the cylinder and it is lowered by means of a pendulum and escapement gear. The cylinder is made of the best quality of plate glass and must be perfectly free from flaws of any kind. It is impossible to get an absolutely perfect half cylinder of glass by bending it over a form as these are made; but the deviation from the true cylindrical form is very slight and does not affect the practical working of the apparatus, even where the most sensitive paper is used.

The lamp used with this apparatus has been specially designed and adjusted for this work and gives a very white light of high actinic power. It is an enclosed arc, constant current lamp with exceptionally long arc, and correspondingly high potential is developed across the terminals.

The standard direct current lamp consumes 10 amperes and the alternating current lamp requires 15 amperes. An 18-ampere lamp is also built to meet the requirements for which the standard lamp would print too slow.

With the flat frame type the ordinary sun printing frame is used, which requires no general description. The lamp used in this case is the General Electric Co.'s standard lamp, which gives a very even light, using about 5 amperes on a 110 volt circuit. The number of lamps varies with the size of the frame used, one lamp being required for approximately 4.8 sq. ft. of printing surface.

A sheet iron hood and parabolic frame with white enamel coating on the inside surface is placed above the lamps to concentrate the light on the printing surface. Where more than one frame is used the lamps and hood may be arranged to run on a rail directly over a row of frames.

Among the advantages and disadvantages of the two types enumerated by the author, the cylindrical machine requires the minimum amount of floor space, which is often of prime importance. Taking, for example, an outfit for making prints 42x84 in., the cylindrical machine requires about 5 sq. ft. of floor space and approximately 11½ ft. head room. The corresponding flat frame type of slightly larger capacity requires two frames, each with a printing surface 46x86 in. or a floor space of about 75 sq. ft. with about 7 ft. head room. The current consumption is lowest with the cylindrical type. Taking the sizes mentioned and assuming equal time for printing, for example 2½ min. for each, the cylindrical type with its single lamp will consume only 10 amperes to make two prints, or 12½ ampere minutes per print. The flat frame type with four lamps using 5 amperes, each will use 20 amperes or 50 ampere minutes per print. The flat frame type of machine is cheaper in first cost than the cylindrical type, the price of the latter for making prints 42x60 in. being \$425. If complete flat



frame of corresponding capacity is desired it would require two frames and carriages, two reflector hoods, and lamps for both frames if they are to be operated simultaneously. The total cost with two hoods would be \$402, and for one hood and a trolley arrangement, \$340. With the latter arrangement, however, less than one-half as many prints per day could be made as with the \$402 outfit, and with the cylindrical machine 10 per cent more prints per day could be made than with the \$402 flat frame outfit. The time required per print is considerably less with the cylindrical machine, as two prints are made simultaneously. It also has the advantage of requiring less time the smaller print. The flat frame possesses the advantage of being adaptable for sun printing in case of a failure of current, which in some places may be an important consideration. With the cylindrical machine, all prints can very easily be made of exactly the same tint, while this is almost impossible with either the flat frame machine or the sun process. With the cylindrical machine the tint over the whole surface is absolutely even, while with the flat frame a slightly deeper tint is generally found directly under each lamp.

### RICHMOND (VA.) RAILWAY BANQUET.

October 18th, the Richmond Passenger & Power Co., of Richmond, Va., served a banquet to more than 500 of its employees at the Masonic Temple in that city. The banquet was intended primarily as an evidence of the company's grateful recognition of the admirable service rendered by all of its employees during the carnival week in Richmond. Mr. Geo. E. Fisher, one of the principal owners of the company, presided, and Capt. Guigon, Maj. Miles M. Martin, Gen. Mgr. W. S. Dimmock, Supt. Wilber and other of the active officials of the company were also present and made sure that no one was crowded out from the feast. The affair was a decided success and it is rumored will probably be repeated once or twice each year. The banquet was well served and consequently there was no one at any of the long tables which filled the room who was not in a good humor.

Beginning with the tomato puree, the feast spread out over numerous courses ending with the conventional black coffee and cigars. There was all that could be desired to eat and drink and when the time came for speech making it was hard to keep the men from naming their own speakers. Mr. Martin, the general counsel for the company, made a fine toastmaster, however, and succeeded in holding the men to the set order of speeches. In response to loud calls for Mr. Fisher who would not respond, Mr. Martin remarked that Mr. Fisher could not make a speech, "He pays me to do all this talking." President Patton of the company made a clever speech and Mr. Geo. Simmons, representing the motormen, made an excellent response. Mr. B. F. Hobart on behalf of the conductors, read a brief address which elicited much applause. Capt. Frank W. Cunningham gave a short talk and sang "The Blue and the Gray," which was strongly encored. General Manager Dimmock was then called upon and spoke as follows:

"I was in hopes that I would not be called upon to make any remarks here to-night, for speechmaking is a little out of my line. However, as I am somewhat of a stranger to many of you, I feel that no better means could have been chosen to make your acquaintance than to mingle with you in good fellowship while wrecking this sumptuous feast.

"After the magnificent service which you performed during carnival week the directors of the company thought of many ways in which they desired to express their thanks and appreciation to you, and while some other way might have been better, I am sure that none could have been more beneficial to you and the company than to meet here as one body off duty and enjoy the society of each other. And after scrutinizing the faces which I see around these tables and thinking over the loyalty you have shown in the company's interest, not only during carnival week but in many cases during a long term of years, I want to say that I am proud to be numbered among the officials of the Richmond Passenger & Power Co. And it shall be my aim in performing my duties to be just and honest with every employee and ask for your hearty co-operation in maintaining discipline and order in our ranks, for no company or manager can succeed where the employees and the officials are divided.

"Then, let us stand together and show our appreciation to the stockholders by making this one of the best organized railways in the country. It will take a little time and patience, but we will succeed by and by. Large sums of money have been expended to make this property one of the finest of its kind and it will not be long before we have reached that mark, and it is through the efficient service and strict attention to duty you are performing which helps us to make it a success, and in helping the company you are advancing your own interests."

Mr. Dimmock was given perhaps the heartiest welcome of the morning, he was new to the majority of the men and the occasion was in fact, his introduction to them. He made an excellent impression and the cheers of the men in response to his speech shook the building. It was after three o'clock before the proceedings were brought to a close. It is doubtful if the company could have done anything which could be more effective for promoting good fellowship between the men than this good-will feast.

At the same time the banquet was going on in the Masonic Temple, the colored employees of the company, who number over a hundred, were feasted at Price's Hall to the accompaniment of music and speeches.

This attention to the men on the part of the company was highly appreciated; it gave the employees an opportunity of coming into closer relations with the officers and there is undoubtedly a better feeling between the company and its employees than ever existed before.

### UNIQUE ENGINEERING IN NEW YORK SUBWAY.

A rather remarkable undertaking in the engineering line has recently been completed in the rapid transit subway in New York City, between 135th and 137th Sts. This section of the subway was completed late last year and since its completion the plans for the tunnel have been changed so that there will be three instead of two tracks at this point. When the change was made the contractors were faced with the problem of either tearing the work to pieces and rebuilding the tunnel wider, or of moving the completed wall bodily. They chose the latter plan which was an entirely novel undertaking.

On the first block of this length of tunnel, two walls weighing about 200 tons each were shifted. These walls are of concrete, heavy blocks of stone and pressed brick. Their height varies from 3 to 15 ft. and their thickness from 3 to 9 ft. Each of these walls was moved intact over a distance of 5½ ft. They are about 180 ft. in length and the only breakage in moving this length of wall was the cracking of a small corner of the concrete base. The moving was done by Terry & Tench, the contractors for the iron work in six sections of the subway.

To prepare for the moving, wedges were placed under the wall at short intervals. These wedges are immense wooden beams about 1½ ft. square; then on top of the wedge, between it and the bottom of the wall, thin strips of metal were inserted, the lower strip being fastened to the wedge and the upper one laid upon the lower on which it was intended to slide. Grease was poured upon these strips and when the power was applied to push the wall, the upper strip slid upon the lower one carrying the wall with it.

The second block of this construction which is being prepared for removal presents considerably greater difficulties than the work already done, as the walls in the latter case consist of steel work and almost every foot of them will have to be braced to prevent a collapse of the whole structure.

Only 23 men were employed to move the masonry wall and it is estimated that the work of removing the steel construction will be accomplished by 35 men.

Surveys have recently been made for an interurban electric line from Minnesota City, Minn., to Minneapolis and St. Paul, to connect with the lines of the Twin City Rapid Transit Co. The road will touch many growing Minnesota towns at present without railroad communication with Minneapolis and St. Paul. It is announced that Chicago and Philadelphia capital is interested, but the promoters' names have not been given. Construction work is to be begun in the early spring.



### THREE-CENT FARES THREATENED.

A bill has been introduced in the Board of Supervisors of San Francisco to reduce street car fares to 3 cents. The plan of the authors of this bill is to hold it over the street railway company as a club to compel it to do certain paving and remove certain unused tracks from the street. The bill is the result of a dispute between the Market Street Railway Co., and the city officials as to the time in which certain improvements in paving between tracks should be completed.

The bill provides that the fare for transporting passengers between any points in the city and county of San Francisco on any street railway or extensions, including transfers, shall be established at 3 cents. The bill also provides for a penalty of \$500 and imprisonment of not more than six months for charging or collecting more than 3 cents for such transportation.

It is hardly probable that such a bill can be passed, but the plan of the board seems to be to pass the ordinance to print and threaten the railway company with its final passage unless the improvements under contention are speedily made.

### MEETING OF EVERETT-MOORE MANAGERS.

The second monthly meeting of the managers of the Everett-Moore roads was held at Toledo on October 21st, Mr. L. E. Beilstein, general manager of the Toledo Railways & Light Co., being the host. The subject discussed was the standardization of cars and their equipment. Those present were: A. E. Lang, president; L. E. Beilstein, general manager; J. F. Collins and E. J. Bechtel, superintendents, Toledo Railways & Light Co.; C. W. Wason, president; Joseph Jordan, superintendent, Cleveland, Painesville & Eastern Railroad Co.; R. L. Andrews, general manager, Cleveland & Eastern R. R.; I. A. McCormack, general manager, Cleveland Electric Ry.; A. F. Edwards, general manager, Detroit & Toledo Shore Line R. R.; C. E. A. Carr, general manager, London Electric Ry.; A. H. Stanley, general superintendent, Detroit United Ry.; Charles Currie, general manager, Northern Ohio Traction Co.; R. E. Danforth, general manager, Lake Shore Electric Ry., and F. W. Brooks, manager, Rapid Ry.

### MANN AERIAL RAILWAY.

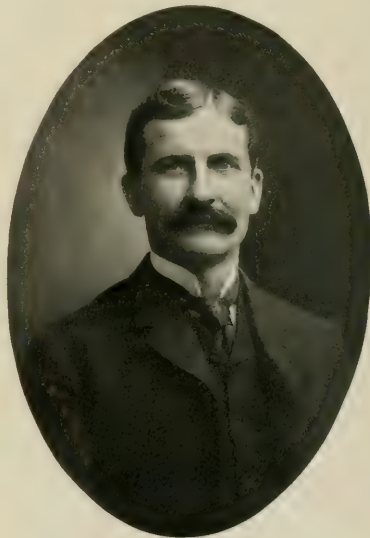
A proposed leading feature of the Louisiana Purchase Exposition at St. Louis in 1903 is a structure known as the Mann Aerial Ry., the design for which is owned by Messrs. A. S. Mann and Paul Winton. The plan of the railway is a spiral track which winds around a cylindrical steel structure of great height. This forms a continuous, endless, single track electric railway without switches or crossings, the length of which, from the upper to the lower station is two miles. The following dimensions of the structure are given: The distance between stations is 500 ft. and the grade 250 ft. per mile; the outside diameter of the railway is 175 ft. and the diameter of the tower is 150 ft. The lower station which it is proposed to reach by electric elevators, is 25 ft. above the ground and the upper station, 525 ft. high. The building on which it is proposed to erect this spiral track consists of an arcade on the ground floor with four large spaces at each corner suitable for theaters, music halls, restaurants, etc., there is also a rotunda on the ground floor 206 ft. square which will contain ticket office, telegraph and telephone stations, etc. On top of the structure, a roof garden is planned which may be reached from the upper car landing by means of electric elevators. This is designed to seat 14,000 people, being circular in shape with a diameter of 316 ft. About 40 cars will be operated on this structure which will be specially constructed and handsomely fitted up.

The Lake Shore Electric Railway Co., of Cleveland, will close its branch offices in Fremont. The fixtures and furniture will be removed to the Cleveland offices.

The city council of Belleville, Ont., has decided to purchase the local system of electric railways from the Bank of Montreal for the purpose of reselling it. The prospective purchaser will extend the line to Trenton.

### H. C. MACKAY.

Mr. H. C. Mackay, the newly elected president of the Street Railway Accountants' Association, was born at La Salle, Ill., Oct. 6, 1869. He commenced railroading as a clerk in 1886 in the general offices of the Minneapolis, Lyndale & Minnetonka Ry., of which he was appointed paymaster in 1888. This company was later leased to the Minneapolis Street Railway Co., and Mr. Mackay was retained in the employ of this company and its successor, the Twin City Rapid Transit Co., with which he successively occupied the positions of clerk, bookkeeper, paymaster, chief clerk and assistant auditor. The latter position he resigned in 1897 to accept his pres-



H. C. MACKAY.

ent position of comptroller and auditor of the Milwaukee Railway & Light Co. He has been an active member of the Street Railway Accountants' Association since 1898, at which meeting he was elected a member of the executive committee, and his selection to the presidency is a well merited recognition of the work he has done in this field.

At the Chicago convention of the association he read a paper on car-mileage, in which he showed the unreliability of the car-mile as a unit of comparison and advocated the use of the car-hour for general comparisons. This method of comparison has received the endorsement of the association.

### CARS DERAILED IN RACINE.

Three cars of the Milwaukee Electric Railway & Light Co. were thrown from the tracks in the city of Racine on the night of October 23d, and each of them was badly wrecked. In each case obstructions consisting of heavy pieces of timber and barrels of sand had been placed on the track in the darkest portions of the town, and the passengers received severe jolts. The cars were thrown from the track while running at a high rate of speed in each case. No clue to the perpetrators has been discovered and the police were obliged to guard the track through the night to avoid further accident.

Wernher, Belt & Co., the Anglo-African house projecting extensive electric railway construction in Cape Colony, will probably make large purchases of American equipment, awarding its contracts within the next two or three months. The town council of Johannesburg will shortly let contracts in connection with the projected electric railway system in that city.

## NEW RAILROAD BRIDGE AT CLEVELAND.

The Cleveland, Cincinnati, Chicago & St. Louis Railway Company several days ago placed into service the new double-track Scherzer rolling lift bridge across the Cuyahoga River at Cleveland, Ohio. This bridge replaced a double-track swing bridge which was obstructive to navigation, and also frequently placed the very heavy passenger traffic crossing it at a serious disadvantage. The bridge is used by the main lines of the Big Four, the Lake Shore, the Erie and other railroads, and is the principal railroad bridge crossing this river near Cleveland.

The first Scherzer rolling lift bridge, built several years ago for the Big Four across the Cuyahoga, proved so satisfactory in every respect that the company determined to remove the obstructive swing bridge at this much more important crossing and substitute a Scherzer bridge.

Railroad traffic was constantly maintained over the swing bridge during the construction and erection of the new one. Vessel traffic in the river was also maintained, as the new bridge was erected in the upright position, on the piers which support the bridge when completed, the trains being operated through the new bridge during erection. Upon the completion of the new bridge, the center of the old bridge was removed; the new bridge was immediately closed and put into service, and within fifteen minutes five passenger trains crossed the river on the new bridge. It has since been in successful operation and the railroad service has been greatly improved.

The entire work of preparing designs and plans and the construction of the bridge, together with the removal of the old swing bridge, was under the immediate charge and supervision of Mr. George W. Kittredge, chief engineer of the Big Four. The Scherzer Rolling Lift Bridge Co. furnished the plans and specifications and checked the shop plans for the superstructure of the new bridge and also furnished a consulting supervision over the erection of the bridge until completion. The plans for the substructure were prepared by the railroad company.

## WHY HEAVEN PERMITS OVERCROWDED CARS.

Mr. J. Albert Stowe, treasurer of the Sterling-Meaker Co., sends us the following interesting "squib," chipped from a local New York daily newspaper:

"The — company have added hundreds of new cars to its equipment during recent months and many more are building, but I suppose it will be a good while yet before all who ride in this fast growing city will always find seats awaiting them in the cars. Thinking so, I venture to suggest that many passengers could add much to the comfort of other passengers by a little change in their method of moving to and fro in the car when other persons are standing.

"A kindly or courteous person will manage to edge his way through so as to occasion as little inconvenience as possible, and it is surprising through how small a space a full sized man can work his way without offence to his fellow travelers. It only requires the will to be agreeable and a little gentle suasion with one's physique. It is a regrettable fact, however, that many passengers, and sometimes conductors, seem to be lacking in consideration for others, or else are so deficient in mathematical powers as to suppose that they can march square shouldered and unimpeded through a crowded car as upon an open plain. If such a person is large, so that his requirements encroach aggressively upon the temporary domains of his neighbors, and his impetus is great, the suffering of those in his way is correspondingly general and intense. The reason why we do not hear much about this is, no doubt, that swearing in public places is contrary to law.

"It is of course perfectly right and commendable to condemn the railroad company for all that is amiss, not forgetting the hard-working conductor in the distribution of our left-handed prayers; but we humans seem to be in this world chiefly for two Divine objects—to learn goodness and to practise the same. Suppose, now, we use the crowded car from day to day as one of our school-rooms, taking discipline to ourselves and showing kindness to others. I am not sure but that is the Omniscent purpose in permitting cars to be crowded."

## SUNDAY OPERATION IN PENNSYLVANIA.

By courtesy of Mr. H. C. Moore, vice-president of the United Power & Transportation Co., Reading, Pa., we have received a copy of the opinion delivered in habeas corpus proceedings in behalf of four employes of this company.

After hearing an argument by counsel on both sides Judge Endlich of the Berks County Court rendered the following oral opinion:

"On Oct. 14, 1901, informations were laid before a magistrate of the city of Reading against seventy motormen and conductors of the United Traction Company, a corporation of this state conducting the business of operating street cars in the city of Reading. In these informations the defendants were charged with violation of Sec. 1 of the Act of 1794, 3 Smith Laws, 177, in working the company's cars on Sunday, Oct. 13, 1901, between the hours of 5 a. m. and 12 p. m. in the city of Reading. The object of these prosecutions, as frankly stated by counsel for the prosecutors, was not to stop the running of cars on Sunday, but to punish the defendants for their participation in the operation of the street car line. The defendants were admitted to bail, but on Oct. 18, 1901, the sureties for four of them—William H. Baum, Clarence Brown, Hiester Obold and William Gottshall—without the knowledge of those parties threw up their bail, took out a bail-piece, and these defendants were committed; thereupon on the same day they applied for writs of habeas corpus, which were issued, the hearing being fixed for Oct. 19, 1901, at 10 o'clock a. m. In the meanwhile the hearing before the magistrate had been appointed for 2 o'clock in the afternoon of Oct. 18, 1901. At the time appointed the relators did not personally appear before the magistrate, neither did any of the other defendants, but there was an appearance by counsel which was misunderstood by the magistrate as being an appearance for the relators as well as the remaining 66 defendants. The magistrate, who had notice of the pendency of the four writs of habeas corpus and of the time fixed for the hearing of them, under this misapprehension proceeded to hear testimony as to all of the defendants, the inclusion in their number of the relators having apparently passed unnoticed by their counsel, who also represented the remaining 66, and on the evening of October 18th the magistrate rendered judgment against the entire number of defendants. In the absence of any distinct, actual and voluntary submission by the relators to the jurisdiction of the magistrate, the proceedings, so far as they are concerned, were clearly irregular, and do not stand in the way of a disposition of these writs now. In that disposition the controlling question is whether the act charged against the relators is a violation of Sec. 1 of the Act of 1794, or whether it comes within the exception made by that act as to works of necessity.

"On that question, there is no decision pointed out conclusively determining it one way or the other. The case most closely touching it is that of *Sparhawk v. Pass. Ry. Co.*, 54 Pa. 401. In that case, however, the court was passing upon the question whether private property owners alleging that the operation on Sunday of street cars in the streets upon which their properties fronted had a standing to complain of it as constituting such a nuisance as entitled them to ask for an injunction restraining their operation, and the Act of 1794 was brought into the case only incidentally as bearing upon that question, because of its supposed effect in rendering the operation of the cars on Sunday unlawful. The decision of the Supreme Court was that the running of cars as complained of did not constitute such a nuisance as gave the plaintiffs a standing to ask for the injunction prayed for, and that, granting the unlawfulness of the business under the Act of 1794, that circumstances did not aid their complaint. The decision, therefore, cannot be understood as involving an adjudication of the question whether the operation of street cars upon Sunday is a violation of the Act of 1794 or not; and the expressions of opinion on that question by the various justices who delivered opinions in that case do not appear to be controlling. In the case of *Com. v. Matthews*, 152 Pa. 166, it is said by the Supreme Court, at p. 169:

"The Act of 1794 is a wise and beneficial statute, and we would regret to see it interfered with. We must, however, be allowed to express the fear that too literal an interpretation and enforcement of it may create an antagonism that may lead to its repeal, or at least serious modification. There may be such a thing as



excessive zeal in invoking its penalties in extreme cases. The act is in more danger from its friends than from its enemies."

"Looking at the statute in the light of this authoritative declaration, it is evident that the question whether a given act is a work of necessity or not depends not upon conditions and situations as they existed in 1794 or 50 or 35 years ago, but upon conditions as they presently exist. What was deemed a necessity generations ago may not be looked upon as a necessity today; and what was not thought of even as a convenience no more than a generation ago, may very well be, and is in some instances a necessity today. The universal usage of the present time is valuable testimony upon the question whether a thing is presently a necessity or not; and the enlightened opinion, based upon conditions as they existed 35 or 50 years ago, is not at all conclusive of that question today. Having regard to conditions as we know them to be at the present time, the necessities of the people of a large city, the necessities of persons residing in the suburbs, and so many other obvious considerations that it would be a waste of time to enumerate them, I am of the opinion, and so decide, that the running of street cars on Sunday is not a violation of the Act of 1794; and for that reason, it being apparent from the information and commitment that these relators were arrested and committed for no offence, they will now be discharged, and the costs of these writs of habeas corpus will be imposed upon the prosecutors."

### RULES FOR MOTORMEN AND CONDUCTORS.

The Louisville Railway Co., at Louisville, Ky., has published a book of rules and regulations for the guidance of motormen and conductors which contains concise instructions to this class of employees.

The position of the motorman or conductor is clearly defined in the introduction to these rules. The employee is the representative of the company to the public. Whatever the company is forbidden to do he must not do, and whatever the company is required to do he must do.

The success and reputation of the road, to a very great extent, depend upon the civility, honesty, good judgment and tact of the conductor and his ability to please all sorts of people. While certain instructions are very clearly laid down, considerable leeway is left the conductor in many cases, as instances constantly arise in which no general instructions can be given, and when these occur it is expected that employees will use good, sound judgment.

The rules cover 48 pages of the book, which is 4x7 in. in size, convenient to carry in the pocket.

Every conductor and motorman on the road is supposed to be familiar with the rules so as to know what to do in every case without referring to the book, and ignorance of the rules is not accepted as an excuse for breaking them.

### SAWDUST MORTAR AS A BOILER COVERING.

Sawdust mortar,—a mixture of sawdust and lime,—has latterly been mentioned a number of times as a good covering for steam pipes, with the virtue thrown in of affording a means of utilizing waste sawdust. Something like twenty years ago a covering of this general character, made up of sawdust and plaster of paris, was used with satisfaction in one large steam plant, not only for steam pipes, but for the boilers as well; but the development since then of specially manufactured non-conducting coverings, in sections so as to permit easy removal and replacing should examination or repair of the covered-in parts become necessary, and at a cost about as low as that of the home-made product, long since led to the abandonment of the latter. It is doubtful, therefore, whether this sawdust mortar of more recent date is worth using except as a makeshift.—From Cassier's Magazine for November.

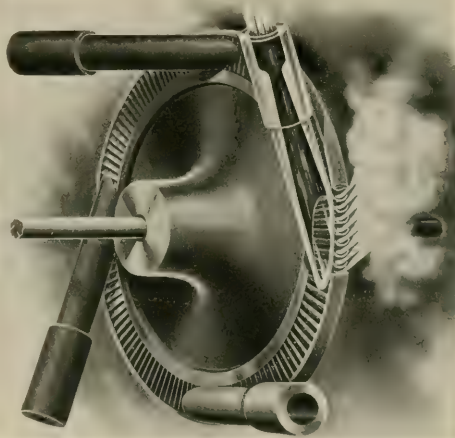
Contracts have been awarded for the equipment of the power plant which the Amsterdam (N. Y.) Street Railroad Co. will build at Tribes Hill. The Allis-Chalmers Co. will furnish three engines of 1,500 h. p.; the Springfield (Ill.) Boiler Co., ten boilers aggregating 5,500 h. p., and the Cromwell-Schmidt Co., of York, Pa., the economizers. The electrical equipment will be installed by the General Electric Co.

### THE DE LAVAL STEAM TURBINE.

The development of steam turbines has of recent years excited the deep interest of engineers, and the various experiments have been closely followed by all who are working to reduce the cost of power for commercial purposes. At various times the "Review" has published descriptions of steam turbines and the results of tests made with them, and we now give some extracts from an illustrated pamphlet descriptive of the De Laval steam turbine, advance proofs of which have kindly been furnished:

In 1883 De Laval made his first successful steam turbine, using it in direct connection with the shaft of the well-known cream separator manufactured in this country by the De Laval Separator Co. This turbine, in design and construction a reaction wheel was, however, soon replaced by one of the Branca type, and Professor Thurston says: "The result was an astonishing efficiency, and the Branca form, particularly, exhibited such satisfactory qualities as constructed by De Laval for this use as to make it a permanent and standard addition to our list of prime movers."

However, satisfactory as these results were, the steam turbine was yet very limited in its application and comparatively wasteful



THE DE LAVAL TURBINE WHEEL AND NOZZLES.

of steam, and to successfully compete with the reciprocating steam engine, it was necessary to introduce means for the complete expansion of the steam. Should the true Branca type be retained, which was desirable on account of its simplicity, as compared with a combination of the Branca and Hero types, the constructive difficulties arising out of the high speed would have to be overcome. This De Laval aimed at and accomplished by the use of the diverging nozzle, which secured a complete and adiabatic expansion of the steam and the conversion of its entire static energy into kinetic. To overcome the impossibility of producing a wheel accurately enough balanced to revolve about its center of gravity at a velocity sometimes as high as 1,350 ft. a second, without causing a side pressure destructive to plain bearings and a rigid shaft, he produced a flexible shaft which (and the diverging nozzle) he patented.

The De Laval nozzle and the flexible shaft are remarkable inventions in steam engineering. With the advent of the diverging nozzle and the flexible shaft the turbine has steadily progressed, thousands of machines in sizes from 3 h. p. to 300 h. p. having been built up to the present time, and outside of the United States De Laval steam turbine companies are operating in Sweden, Germany, France and England.

In a properly constructed nozzle, a volume of steam of maximum pressure (as every element of the nozzle assumes a temperature constant and equal to that of the passing steam) adiabatically expands to minimum pressure, and as this pressure is that of the

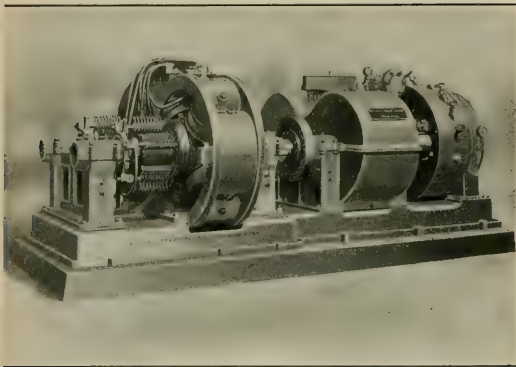


surrounding medium, the steam at the point of discharge issues in a solid jet without tendency of its particles to divert in any direction.

Through numerous experiments Professor Zenner has shown that theoretically the work of this adiabatic expansion converts the entire static energy of the steam into kinetic, and that the stored energy of a jet of steam issuing from the nozzle is identical with the work produced if an equal volume of steam is allowed to adiabatically expand behind the piston of a cylinder and at the same ratio of expansion—the diagram ending in a point.

The importance of a high steam pressure and a good vacuum when operating the steam turbine are recognized. Not that the steam turbine cannot, as far as the mechanical results are concerned, be operated equally well with low pressures and non-condensing, and even then successfully compete with the reciprocating engine, but whenever the best economy in operating is sought, high pressures and a condenser should be used, and as the difference and gain in economy in the case of the steam turbine is more marked than in the reciprocating engine it will be found in many cases, even for comparatively small sizes, of advantage to operate condensing, even in places where the scarcity of water would render the employment of a cooling tower necessary.

A characteristic of this steam turbine is that none of its running parts are subject to the full pressure of the steam, as the steam is fully expanded in the nozzles before it reaches the turbine wheel.



30-H. P. DE LAVAL STEAM TURBINE AND DYNAMO.

The restriction as to the steam pressure that can be used is only with the boiler, and the turbine has been operated successfully with 3,000 lb. per sq. in. Considerable increase in economy can be attained by using superheated steam, for which the turbine is well adapted, having no rubbing parts requiring lubrication, or packing glands in contact with the superheated steam, and, as with pressures, the limit depends on the boilers.

The speed regulation is unexcelled. The high speed, the simple and direct connection of the governing mechanism, and the exceedingly sensitive governor insure a perfect and safe control of speed, at the same time keeping the variation within small limits. The value of this cannot be over-estimated, especially where a machine is used for driving electrical apparatus. This turbine is particularly adapted for operating alternating machines in parallel, as there is an entire absence of variation in angular velocity which is responsible for so much trouble with reciprocating engines. The absence of reciprocating motion and the light weight and perfect balance of all revolving parts removes the necessity of foundations, except such as are required to sustain the weight of the larger-sized machines, and as this is much less than the weight of reciprocating engines of the same capacity the saving in cost of foundations is an important item. Turbines of any size may be placed in the upper stories of high buildings without any preparation except strength enough to sustain the dead load.

There is no danger from water being carried over into the motor as there are no valves and no clearance spaces where damage could result, the only effect of a large body of water being a slight slowing down of the wheel until it is disposed of. It is well, how-

ever, in all cases to use a separator as wet steam decreases the efficiency of the turbine. Experience extending over eight years, during which time there have been put on the market from the European factories upwards of 4,000 steam turbines, has demonstrated that the wear in every case is much less than any reciprocating engine. Some of these machines have operated during the entire time with practically no repairs, and at the most it has been only a matter of renewing some interchangeable babbitt bearings which can be removed or replaced without lifting the turbine shaft or the gear shaft from its position.

High speed is not objectionable in the turbine; the parts being so small, so perfectly balanced, and so well lubricated, are more durable than those of even a slow-moving reciprocating engine. The speeds used in the De Laval turbine are common in other lines of work where the conditions are more severe than with the turbine. The De Laval Separator Co. has, during the last 20 years, put on the market over 250,000 centrifugal cream separators, which are running at speeds once considered absolutely out of the question, and these have been placed in operation on farms and in creameries where they are handled by the cheapest class of help, and oftentimes with practically no attention and almost no repairs. In addition to these many thousands of other makes have been sold and are in operation every day at speeds varying from 6,000 to 25,000 r. p. m. They are set up with poor foundations, or none at all, and in a number of cases where care is not taken with the engine governor the speed exceeds these figures.

### REORGANIZATION AT WASHINGTON.

The plan of the reorganization of the Washington Traction & Electric Co., which was published in the "Review" for October, has been declared to be operative, as more than 93 per cent of the mortgage bonds of the old company has been deposited for exchange according to the plan outlined.

Upon the request of a number of the stockholders, Justice Bradley of the Supreme Court of the District of Columbia appointed Mr. Allen J. McDermott, of New Jersey, receiver of the City & Suburban Railroad Co., a constituent company of the Washington Traction & Electric Co. This action grew out of the failure of the company to pay the interest on its bonds. Mr. McDermott is president of the City & Suburban and was also the receiver of the Washington Traction & Electric Co.

There has been an effort on the part of the minority stockholders of the City & Suburban to secure a separate receiver for its line and to withdraw its interests from the syndicate which controls practically all of the Washington street railways. A petition of the minority stockholders for a receiver, which was filed early in September, has been ignored by the court, which is generally construed as meaning that the court considers the syndicate the rightful manager of the company's affairs.

### POWER HOUSE IMPROVEMENTS.

The Toledo Railways & Light Co. has found the growth in its business such as to demand further increase in power house capacity and has placed an order with the Westinghouse company for a 2,000-kw., 550-volt direct current generator to be direct connected to a 44 and 88 by 48-in. Allis cross-compound engine.

In June last a McCaslin coal conveyor, with a capacity of 40 tons per hour, was put in operation, and McKenzie furnaces, after having been thoroughly tested under one battery of boilers, are being installed throughout the plant.

A three-phase generator is being installed to replace the single-phase machines now in operation on lighting circuits, the lamps to be placed on the different legs of the polyphase circuit. In connection with this work the pressure of the primary circuit is being increased from 1,000 volts to 2,000 volts and the periodicity changed from 125 cycles to 60 cycles.

Numerous changes have been made in the switchboards and a new board for lighting work is being erected.

The Milwaukee Electric Railway & Light Co. declared a regular quarterly dividend of 1½ per cent on its preferred stock, payable November 1st.

## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### UNDER RIGHT TO REGULATE RUNNING OF CARS CITY MAY PRESCRIBE CARE TO BE TAKEN.

Schmidt v. St. Louis Railroad Co. (Mo.), 63 S. W. Rep. 834. June 12, 1901.

A city having reserved the right "to regulate the running of cars and the rate of speed at which cars shall be run on said railroad," the supreme court of Missouri, division No. 1, holds that this does not refer only to the speed of the cars, but is very much more comprehensive. To regulate the running of cars, it says, includes the power to prescribe the care that is to be taken to run them through the populous streets with as little danger as may be, consistent with a reasonable exercise of the franchise granted.

### PEDESTRIAN SHOULD OBSERVE AND USE JUDGMENT—TROLLEY CARS NOT A CLASS BY THEMSELVES.

McGrath v. North Jersey Street Railway Co. (N. J.), 49 Atl. Rep. 523. June 17, 1901.

The court of errors and appeals of New Jersey holds that one who passes on foot along a crosswalk over a highway is bound to use his powers of observation to discover approaching vehicles, and should exercise a reasonable judgment as to when and how to cross without collision. This rule governs the relation of a pedestrian to all vehicles, including trolley cars. Trolley cars have characteristics of their own, but are not, therefore, set apart for legal treatment in a class by themselves. Their peculiarities are circumstances that have sometimes to be taken into account in applying the general rule to a particular case.

### DEMAND AS TO FARE ON ANOTHER BRANCH IS VOID WHERE NO FOREIGN CONDITION CAN BE ATTACHED TO APPROVAL OF PLANS.

Fair Haven & Westville Railroad Co. v. City of New Haven (Conn.), 49 Atl. Rep. 863. July 23, 1901.

A street railway company being authorized, under the state statutes and its charter to lay a double-track railway over a certain route, on complying with the conditions which the city may impose, it having no power, however, to impose conditions wholly foreign to the plan submitted by the company, the supreme court of errors of Connecticut holds that an imposition of a condition requiring that a five-cent fare be established to a certain point more than a mile from any portion of the route referred to and described in the plan submitted by the company, and upon a different branch of its road, is wholly foreign to the plan, and beyond the power of the city to impose, and is void.

### CLASSING SURFACE WITH ELEVATED AND UNDERGROUND STREET RAILWAYS GIVES NO NEW RIGHT TO DAMAGES.

Ruckert v. Grand Avenue Railway Co. (Mo.), 63 S. W. Rep. 814. May 21, 1901.

The kinds or species of street railways being elevated, underground, and surface, the supreme court of Missouri, division No. 2, holds that they are all clearly included in the act of March 26, 1887, entitled, "An act to restrict the legislative authority of incorporated towns and cities in regard to granting franchises for using the streets and alleys of incorporated towns and cities of this state for elevated, underground, and other street railway purposes, and to provide for the payment of damages caused by the construction and operation thereof," which, as amended in 1889, provides that, "before taking or damaging any property in the construction of a railroad" under its franchise, the company shall cause to be ascertained the damages that will be done to property on the route and shall pay same to the owner or owners or into court for them. But the court

does not consider that this creates any new right to damages, or, in other words, gives an abutting property owner any claim for compensation when it does not appear that he has suffered any damage by the laying of a surface street railway track on the street different from that sustained by all other abutting proprietors on the street.

### A COMPANY ADJUDGED NEGLIGENT CANNOT RECOVER AGAINST A TELEPHONE COMPANY.

Atlanta Consolidated Street Railway Co. v. Southern Bell Telephone & Telegraph Co. (U. S. C. C., Ga.), 107 Fed. Rep. 874. Mar. 14, 1901.

A judgment having been recovered against an electric street railway company for damages for what is thereby adjudged to be original and actual negligence on its part, as where, for example, a recovery was had against one on the allegation that it had negligently and carelessly permitted a feed wire to rest upon a call wire of a telephone company, causing the death of an employee of the telephone company, the railway company cannot, after having paid the judgment, the United States circuit court, northern district of Georgia, holds, recover over against the telephone company, as for instance on the allegation that it was that company that was guilty of the fatal negligence, as in letting its call wire rest on the feed wire, and this even assuming that the telephone company was also guilty of negligence, it being necessary, in view of the adjudication, to then consider the two as joint tortfeasors or wrong-doers.

### STATUTE AUTHORIZES TRAFFIC ARRANGEMENT FOR CARRIAGE OF MERCHANDISE.

State v. Dayton Traction Co. (Ohio), 60 N. E. Rep. 291. Mar. 26, 1901.

Section 3443-11 of the Revised Statutes of Ohio provides that interurban street railroad companies "shall have power to lease, purchase or make traffic arrangements with any other street railroad company as to so much of its tracks and other property as may be necessary or desirable to enable them to enter or pass through any city or village, upon the same terms and conditions applicable to other street railroads. And any existing street railroad company owning or operating a street railroad shall receive the cars, freight, packages or passengers of any other road, upon the same terms and conditions as they carry for the general public." By favor of the provisions of this section, which it holds contain definite authority therefor, the supreme court of Ohio holds that an electric railway company owning and operating a road upon a street of a city and an interurban electric railway company may enter into a valid traffic arrangement for the carriage of merchandise for hire upon said street.

### ENFORCEMENT OF RETALIATORY ORDINANCE LIMITING SPEED TO SIX MILES AN HOUR ENJOINED.

United Traction Co. v. City of Watervliet (N. Y. Sup.), 71 N. Y. Supp. 977. July, 1901.

A city ordinance passed at a time of excitement limiting the rate of speed of all street cars in the city to not exceeding 5 miles per hour, notwithstanding that for a long time prior thereto a speed of 12 miles per hour had been permitted, and making a violation of the ordinance a misdemeanor, a special term of the supreme court of New York, Albany county, holds is one materially impairing the property rights of the company; is subversive of the interests and convenience of the public; is unreasonable, and therefore void; and that the aid of equity may therefore be invoked to restrain the enforcement of the ordinance. To this the court adds that if there had been any unjust discrimination against the residents of the city on the subject of transfers by the company, or if the act of the company in abrogating the sale of reduced-rate tickets has resulted in an unjust increase of rates for the transportation of passengers, as was claimed in this



case, the remedy must be found otherwise than in the passage of a void ordinance, the enforcement of which was not only destructive of the property rights of the company, but also a serious interference with the rights of the traveling public, not all of whom, by any means, were residents of the city.

**WHERE FRANCHISE, ROLLING STOCK, TOOLS, ETC.,  
ARE TAXABLE—INJUNCTION AGAINST SEIZURE  
OF CARS FOR TAX.**

*City of Detroit v. Donovan* (Mich.), 86 N. W. Rep. 1032. July 10, 1901.

Under a statute providing that the personal property of a street railroad shall be assessed in the township, village, or city where its principal business office is situated, and that the track, road, or bridge of any such company shall be held to be personal property, and may be assessed in the township, village, or city where the same is located, used, or laid, the supreme court of Michigan holds that, as the franchise should be treated as a part of the roadbed, within the statute, and attaching to every part of the same, as it does, it seems clear that the assessment of the franchise should be made in the townships through which the railway runs. But the rolling stock, tools, etc., being no part of the track, but personal property, should be assessed, under the statute, in the city where the principal business office of the company is located. Moreover, the court holds that, while, as a general rule, injunction will not lie to restrain the collection of a personal property tax, an exception exists where a valuable franchise would be interfered with, as where the receiver of taxes threatens to seize a company's cars to satisfy a personal property tax assessed against it, and injunction will be deemed an appropriate remedy.

**STARTING CAR WHILE INTENDING PASSENGER HAS  
HOLD OF SAME.**

*Fay v. Metropolitan Street Railway Co.* (N. Y. Sup.), 70 N. Y. Supp. 763. June 7, 1901.

As a car stopped, an intending passenger with a transfer took hold of the upright rail, to be ready to step up when the people in front of him had got on. But when he went to step up, the car gave a sudden jerk, and he went with it, and fell into a trench. The first appellate division of the supreme court of New York holds that a dismissal of his complaint was error. It says that the company was bound to give him a reasonable time to board the car, and the evidence would have justified finding that it was negligent in this respect. Neither does it think that the man was, as a matter of law, guilty of contributory negligence. Having hold of the car about to board it, when the car suddenly started, there was presented an emergency which required the exercise of judgment as to the best course to avoid being injured. If, to avoid being thrown down by the sudden starting of the car, he held on to the car to steady himself until he could let go in safety, it was certainly not negligence as a matter of law. But for the existence of the trench in the roadway alongside of the track, which he had not observed, he would probably have escaped injury by adopting the course that he did; but his falling into the trench was caused by his being dragged along by the car. And the court says that it seems to it that the question of contributory negligence was one for the jury. Nor can there be any doubt, it declares, but that the starting of the car was the proximate cause of the injury.

**BEGINNING EXTENSION BEFORE MAIN LINE—WHEN  
IT MAY BE ENJOINED—WHERE AUTHORITY  
FOR MAIN LINE IS WANTING.**

*Hannum v. Media, Middletown, Aston & Chester Electric Railway Co.* (Pa.), 49 Atl. Rep. 789. July 17, 1901.

Undoubtedly, a company, having a charter route, and legally adopted extensions, may begin the construction at any point most convenient to itself. But beginning at an extension is not the natural and usual way, and, when challenged, the supreme court of Pennsylvania holds, the company must show affirmatively its intention to complete the whole, and that its work on the branch

is the bona fide beginning of the entire operation. No case affords any sanction to the idea that the company may proceed to construct an extension, and in the meantime abandon or indefinitely defer the carrying out of its original franchise. Again, the court says that municipal consent cannot create or enlarge corporate franchises. Here, in this case, there were a trunk franchise and branch franchises. Assuming that the city had consented to the branches, though that was disputed, yet, if the trunk had no sufficient legal existence, the branches also must fail, and the city's consent would not avail the company. And the court holds that, the charter route or trunk franchise not including any part of the city, an owner of property on the line of a proposed extension in the city, being as much entitled to attack the foundation as the superstructure, could apply for an injunction against the work in the city on the ground that the company had no authority to construct its charter or trunk route in the townships, and the company would be bound to show at least prima facie a complete right to do the act complained of.

**RIGHT TO PUT IN ADDITIONAL TURNOUTS.**

*Detroit Citizens' Street Railway Co. v. Board of Public Works of the City of Detroit* (Mich.), 85 N. W. Rep. 1072. May 7, 1901.

A company was duly authorized by a city ordinance to construct and maintain a single-track street railway along certain streets. The ordinance authorized it "to construct, use, and operate all necessary and convenient tracks for turnouts, side tracks, curves, and switches, wherever the same might be necessary," the same to be constructed and in operation within one year from the date of the passage of the ordinance. It was constructed within the time. In the neighborhood of ten years afterwards, a written application was presented to the board of public works of the city to put in four additional switches on one of the streets, to be placed exactly half way between existing switches. This application was denied for the reason that the authority of the board of public works to grant such terms was questioned by the common council, in which was vested by statute the sole power to convey authority to construct street railways within the city. But the supreme court of Michigan holds that no new grant of power from the common council was required, and affirms a judgment giving the company a writ of mandamus to compel the board of public works to grant its application. It says that the common council had exercised its legislative function, and thereby defined the streets which the company might occupy, and the character of the track to be placed and maintained thereon. The contract was that the company might construct and maintain a single track, with such turnouts as should be made necessary by the increase of travel. No further legislative act was necessary to confer this right. This right was not limited to those needed at the time the road was constructed. Both parties contemplated that travel might increase, and thereby more cars and more turnouts would be rendered necessary. If a new grant of power from the common council were required, it would follow that the roadbed as originally constructed must remain so during the life of the company, unless amicably changed; for a contract cannot be changed except by mutual consent. Moreover, the company's right at the time of construction to lay switches, etc., was limited by public convenience, and it would not then have been permitted to lay more than the then traffic demanded, and when public travel demanded more, the company could be compelled to lay same.

**THROWING PASSENGER FROM RUNNING BOARD BY  
JERK AFTER ALMOST STOPPING—STAND-  
ING AFTER SIGNALING.**

*Sweeney v. Union Traction Co.* (Pa.), 49 Atl. Rep. 66. May 13, 1901.

A passenger riding in an open summer car with transverse seats when 100 feet from the crossing where he wished to get off, arose, turned towards the back platform, raised his hand as a signal, and called to the conductor to stop at that street. The conductor pulled the bell, and, as the speed slackened while the car was crossing the street, the passenger stepped to the side, and stood with one foot on the car and the other on the cur-



ning board. Then, when he observed that the car was not stopping on the further side of the street, he withdrew his foot from the running board to the body of the car, and again signaled the conductor to stop the car. The conductor then again pulled the bell, and the speed was slackened until the car came almost to a stop, and it was then suddenly accelerated, giving the car a jerk, which threw the passenger, who was standing on the body of the car, and holding firmly to the vertical hand rail, to the street. Under this testimony the case was for the jury, the supreme court of Pennsylvania holds, in affirming a judgment for damages against the company. It says that such management of the car indicated negligence on the part of those in charge of it, and the passenger could not, as matter of law, be adjudged negligent because he stood at the side of the car, holding the hand rail, after his signal to stop had been promptly responded to by the ringing of the bell, and the speed was being reduced. Had he been jolted from the running board while crossing the street referred to, or had he remained standing inside the car while he waited to reach the next regular stopping place, a square distant, a different question would have arisen. But whether, after there is a response to his notice, a passenger should resume his seat while the car is being brought to a full stop, depends upon circumstances, and, unless they are exceptional, it is a question of fact for the jury.

#### DEPOSIT CONSIDERED AGREED DAMAGES FOR FAILURE TO CONSTRUCT ROAD.

Whiting v. Village of New Baltimore (Mich.), 86 N. W. Rep. 403. June 4, 1901.

A village ordinance granting a franchise for the construction of an electric railroad through the village contained a provision that the same should be void unless accepted within 10 days and the grantee should further within 30 days after the acceptance "deposit with the clerk of said village a certified check payable to the village treasurer of said village in amount the sum of \$2,000, which said check shall be returned to said grantee, or to his order, upon the completion of said railway within the time herein provided for; and in case of a default of construction of said road within the time provided shall be collected and the proceeds thereof placed in the village treasury in such fund or funds as the board of trustees of said village may at that time direct." The supreme court of Michigan holds, reversing the judgment of the lower court in favor of the assignee of the check for the amount thereof with interest from the commencement of suit, that the \$2,000 was to be treated as liquidated damages, and not as a penalty, or security for the performance of the contract, the construction of the road never having been entered upon. In other words, it holds that unless the road was completed within the time specified, the check was not to be returned, but was to become the property of the village. It says that this was one of that class of cases where the damages for a breach of contract are impossible to be estimated with certainty by reference to any pecuniary standard. In such cases the parties themselves, being more intimately acquainted with all the peculiar circumstances, may compute and agree upon the actual or probable damages. It even says that it might be conceded that the city, in its corporate capacity, suffered no damages by failure to build the road; but the contract was made by the corporate officers for and in the interests of the inhabitants, and for such damages they could and did agree with the grantee of the franchise. And it holds that the fact that other franchisees were granted to other parties with a less deposit of money, or with no deposit at all, was of no consequence here, in determining what the parties intended in this particular instance. The parties were bound by the contract made.

#### CARE REQUIRED IN EXERCISE OF PARAMOUNT RIGHT WHERE A STREET USED BY VEHICLES ENTERS BUT DOES NOT CROSS THAT USED BY CARS.

Hewlett v. Brooklyn Heights Railroad Co. (N. Y. Sup.), 71 N. Y. Supp. 531. July 25, 1901.

It is well settled, says the second appellate division of the supreme court of New York, that a surface street railroad car has a paramount right of way over the part of a street covered by its

rails, and lying within any two lines of corresponding rails, save at intersecting streets, or where there is a practical continuation of a bisecting street, where the rights of the car and of the vehicle crossing are equal. The reason for this limitation is plain. The car has a right to cross, and must cross, the street; and the vehicle has a right to cross, and must cross, the railroad track. But the reason for the rule ceases where there is no cross street. Continuing, the court states that it has said that this paramount right must be exercised in a reasonable and in a prudent manner, and that therefore it thinks that, though such right exists where the rails pass a cul-de-sac, or street running into, but not running across, the street on which the rails are laid, yet the exercise thereof must be commensurate with the obvious difference between the unbroken part of a street and the part where broken by the entrance of a cul-de-sac which is used by vehicles for access to that street. For though the vehicles cannot use the cul-de-sac to cross the street, which necessarily is to pass over the rails, they may use it to enter the street; and therefore the paramount right must be exercised with ordinary reason and prudence, in view of this use and the physical condition of the locality. For example, if a motorman knew, or, in the exercise of ordinary care, prudence, and experience, ought to have known, that at the locality in question vehicles were accustomed to enter the street, and that the condition of the entrance was such as warranted such vehicles, when managed with the same degree of care, to encroach temporarily upon the track while turning into the street from cul-de-sac, it would be error for this court to refuse a request to charge the jury that this paramount right must be exercised with such ordinary and reasonable prudence as was commensurate with such circumstances. Such qualification would be proper, because the right is but paramount, and not exclusive.

#### RAILROAD AGREEING TO MAINTAIN TURNPIKE BRIDGE IS NOT BOUND TO REBUILD IT STRONG ENOUGH FOR TROLLEY ROAD.

West Shore Railroad Co. v. Bergen Turnpike Co. (N. J. Ch.), 49 Atl. Rep. 578. July 6, 1901.

A contract by which a right of way across a turnpike was obtained for a steam railroad provided that the railroad company should erect and maintain a substantial permanent iron bridge over its railroad, so that the turnpike travel might be carried over the railroad by such bridge. The railroad was constructed to an excavation as provided for in the agreement, and an iron bridge for the turnpike over the railroad was erected in accordance with the provisions of the contract, and in a manner and with a strength satisfactory to the turnpike company. Subsequently, the turnpike company proposed to install railroad tracks for a trolley line over its bed and across the bridge. The railroad company thereupon applied for an injunction to restrain the turnpike company from using the bridge for the purpose of its trolley road until the turnpike company should have reconstructed it with sufficient strength to maintain a trolley road, or indemnify the railroad company against any damage that might result from overloading the bridge. In other words, the real question raised was, which of the parties should incur the expense of rebuilding the bridge. The engineer of the railroad company stated, in effect, in an affidavit, that the bridge, while it was sufficiently strong for all ordinary travel by vehicles and foot passengers, was not strong enough to sustain the increased weight due to tracks and trolley cars. Nor was there anything to show that at the time the bridge was built it was in the contemplation of either of the parties that it was to be used for anything else than the ordinary travel over a turnpike. It was designed and adapted for that purpose, and was accepted by the turnpike company as sufficiently strong. Under these circumstances, the court of chancery of New Jersey holds, that the burden of increasing its strength was cast upon the turnpike company. A learned argument was addressed to the court to sustain the indisputable proposition that the laying of a trolley road over the highway was no additional burden upon the land. But that proposition, it says, had no application to this case. There was no objection on the part of the railroad company to the laying of the trolley road as such. The objection was to the casting upon it of the burden of rebuilding and maintaining a bridge of a more expensive character than that contemplated by the parties, and practically agreed upon by them at

the time of making the contract. And the court granted the injunction asked for by the railroad company.

#### ROAD THAT OF COMPANY LAWFULLY HAVING CAR ON IT AS TO PROTECTION DUE EMPLOYEE.

Kelly v. Union Traction Co. (Pa.), 49 Rep. 70. May 13, 1901.

Under a statute providing that when any one shall be injured or killed while lawfully engaged on or about the road or premises of a railroad company, or in or about any train or car thereon, of which company such person is not an employee, the right of action against the company shall be such only as would exist if such person were an employee, the supreme court of Pennsylvania holds that the road on or about which the accident occurs need not be owned by the company to bring it within the terms of the statute, but the use, by agreement, of the road of another company makes it the latter's road in contemplation of the act. Applying this rule where the two tracks of one company were not only used by it but by another company under a contract therefor and there were two switches near the end of the line for transferring cars from one track to the other, the first car to arrive using the switch nearest the end of the line, the court holds that, when a car of the company owning the tracks went to the end switch and a car of the other company stopped at the other switch and the first-mentioned car came back down the track, because the motorman had failed to turn his switch, and struck and injured the conductor of the second car while putting up his fender, the conductor was lawfully engaged in the service of his employer (the company using the tracks under contract), on or about its road, within the meaning of the statute, and not on or about the road of the company owning the tracks, and hence the statute could not be invoked by the latter as a defense to his action for damages. The court says that the track at the point where this conductor's car stood was in the use of the company for which he was working, and therefore had, by agreement of the parties, become for the time being the road of that company. Its employees in the operation of its cars had a right to be there, and they could enforce their right to protection against the negligence of every one save the co-employees of that company. Wherefore, it holds, that it followed that, as the conductor was not engaged on or about the road of the company owning the tracks, or in or about any car thereon, at the time he was injured by the negligence of its servant, the statute did not make him a quasi employee of the latter, and it could not, as above stated, invoke the statute as a defense to the conductor's action for damages.

#### LIABILITY FOR INCOMPETENCY OF MOTORMAN AND DEFECTIVE APPLIANCES—EXTENT OF RIGHT OF WAY—DOCTRINE OF TRESPASSERS INAPPLICABLE.

Little Rock Traction & Electric Co. v. Morrison (Ark.), 62 S. W. Rep. 1045. May 4, 1901.

The supreme court of Arkansas holds that it was not error, in an action for damages for injury to a horse, to refuse to give an instruction to the jury which only made the company liable for the personal negligence of its motorman in not exercising the proper care to avoid the injury after he saw the perilous situation of the horse, and ignored the question of the incompetency of the motorman and the defect of the brakes and appliances, as factors which, one or both, might have been the real cause of the failure to avoid the injury after the danger was apprehended. The court says that if a motorman does not know how to stop a car when it is desired to stop it, and the circumstances go to show that the incompetency was known or should have been known to the master when he put the motorman in charge of the car, the master is directly to blame; for he has, in effect, failed to provide himself with the means to prevent injuries which he could otherwise do. And the same rule applies in the case of defective brakes and other appliances. Besides, the court holds, negligence in employing servants and in using defective machinery, while antecedent, in a sense, is yet contemporaneous with such an injury, in the more important and the more practical sense.

Again, the court says that the cases cited in support of the

contention that the company owes no duty to trespassers on the track, and therefore is not liable for antecedent negligence such as want of care in selecting servants and keeping machinery in repair, in cases of contributory negligence, were railroad cases, and were in most respects not applicable to cases involving the duty of street car companies; for it may be said, in a general way, that there are no trespassers on the streets of a city. Every one has a right to go on the streets, and on any part of them. In a sense, it is said that street cars have the right of way; but that is because of the weight, speed, and momentum of the cars, the great number of persons carried on them, their necessity to run on schedule time, and their strict confinement to the appropriate track, and other like circumstances. Except to accommodate these peculiarities, the street cars have no real right of way over all travelers on the streets, and it cannot, therefore, be said there are any trespassers. The case is different with railroads. The crossings of public roads are the nearest analogy of the case of railroads to the case of a street car line. The street car company owes a duty to all persons on the streets, perfectly commensurate with the relative situation between it and them. One of those duties is to exercise reasonable care not to injure, for the privileges of both are such as call forth such care at all time.

#### CONSTRUCTION OF VALIDATING ACT—UNWARRANTED PROVISION AS TO FREIGHT NOT FATAL—NO INJUNCTION BECAUSE PART OF PROPERTY ACQUIRED IN VIOLATION OF LAW—MAY CONNECT ACQUIRED LINES—INJURY TO INTEREST IN ANOTHER LINE—DOUBLE TRACKS NOT TWO ROADS.

Brown v. Atlanta Railway & Power Co. (Ga.), 39 S. E. Rep. 71. May 20, 1901.

The supreme court of Georgia holds that the act of that state of August 31, 1891, providing that "all charters heretofore granted by the secretary of state to street and suburban railroad companies are hereby confirmed and declared to have had full effect from their dates," was, in effect, a general law giving the consent of the general assembly that street and suburban railroad companies theretofore organized under the charters referred to might in the future exercise the corporate powers mentioned in such charters; and with this legislative consent such companies became, after either an express or an implied acceptance of the provisions of the act, de jure or lawful corporations, with all the powers granted in the charters; and this was true whether the charter in a given case was originally granted without authority of law, or in violation of law. And the court holds that even if in 1891 the general assembly had no power to confer upon street car companies the authority to become common carriers of freight, the grant of such authority would not in any way affect other powers which had been lawfully granted to such companies.

That a corporation may have acquired a portion of its property in violation of law is not a sufficient reason, the court holds, for enjoining it from exercising its legitimate corporate powers, at the instance of a private citizen whose property will be damaged by the exercise of such powers.

A street car company which has acquired the lines of street railway of two other companies may, when authorized by its charter, and with the consent of the authorities of the city in which its lines of railway are situated, connect the lines acquired from the other companies by laying its tracks upon such portions of a street of the city as may be necessary to make the connection.

A street car company having authority to lay its tracks along the streets of a city will not be enjoined from laying its tracks along a given street, at the instance of one claiming to have an interest in a line of street railway in another street, on the ground that the construction of the new line may operate as an abandonment of the line in which he is interested.

A general power in the charter of a street railway company to construct a line of street railway authorizes the construction of double tracks upon the streets of a city, provided the authorities of such city consent that the streets may be so used. There is no merit, the court says, in the contention that a double-track railroad is two railroads, and that a single track is one railroad.

## New Street Railway Draw Bridge at New Bedford, Mass.

BY WILLIAM F. WILLIAMS, CITY ENGINEER.\*

The first New Bedford & Fairhaven Bridge was built in 1800, entirely destroyed by "the great storm of 1815," rebuilt in 1819, partially destroyed in 1869 and again rebuilt. The present structure, authorized in 1894 by act of the legislature, was commenced in 1896. The total length of the "bridge" from the east line of Water St., New Bedford, to the west line of Main St., Fairhaven, is 4880 ft., with a clear width throughout of 70 ft. There are three

7 in. high and weighing 97 lb. to the yard. For the rest of the bridge—now under construction—rails of similar section will be used, but 9 in. in height and weighing 108 lb. to the yard. On the steel work the rails are laid directly on the upper plate of a rail stringer consisting of two channels 25, 30 and 35 lb. to the foot, depending upon the length of the panel span. On the solid fill sections of the bridge—already completed—the rails were laid upon



GENERAL VIEW OF NEW BEDFORD AND FAIRHAVEN BRIDGE.

sections of steel work with a total combined length of 2,060 ft., and three sections of solid fill construction with a total length of 2,820 ft. At the New Bedford end the bridge passes over the Old Colony R. R. tracks, abolishing a grade crossing at that point. There will be about 5,000 tons of steel and iron in the bridge when completed. The masonry work of the retaining walls of the solid fill sections and of the piers and abutments of the water sections is all of first class, quarry faced, coursed granite. The bridge crosses over and partly rests upon two islands in the arm of Buzzard's Bay. The roadway of the bridge on both the solid fill and steel work east of

the regular wood tie, but as the pavement has yielded somewhat adjoining the rails it has been decided to lay the rails on the rest of the solid fill section of the bridge on a cement concrete stringer dispensing entirely with the use of wooden ties.

On the bridge the cross span method of supporting the trolley wire was followed. The overhead construction is carried on iron tubular poles, set at the curb line, the poles themselves being carried on metal brackets bolted to the main girders of the bridge, beneath the sidewalk level. A little below the surface of the walk there is a cast steel collar riveted to bridge plates, through which

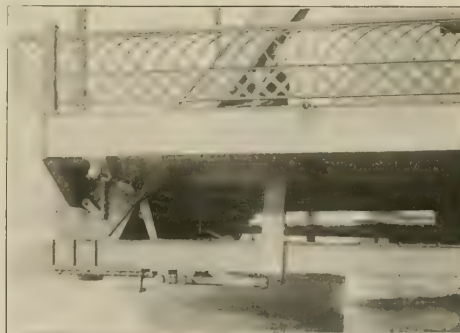


BUCKLE PLATES BEFORE LAYING CONCRETE.

Fish Island—with the exception of the draw span—is sheet asphalt on a cement concrete base. The roadway on the section from Water St. in New Bedford to the east side of Fish Island will be paving brick laid on a concrete base.

There is a double track electric railway line the entire length of the bridge. The rails on that portion of the bridge east of Fish Island, about 3,500 ft. in length, are known as the "Trilby" section,

Mr. Williams has been city engineer at New Bedford since 1893, and is chief engineer of the New Bedford and Fairhaven Bridge.

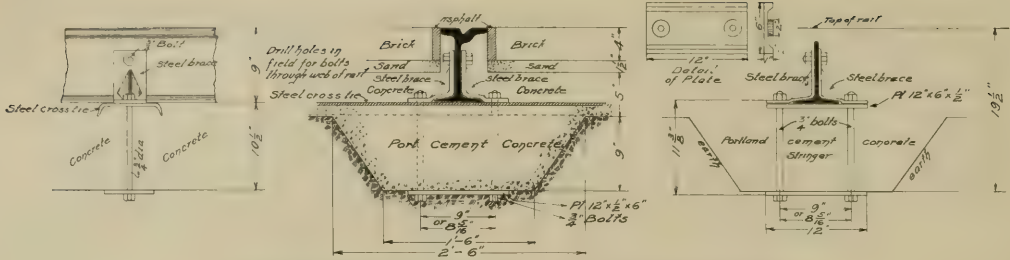


SIDE VIEW OF DRAW SHOWING JACK AND WEDGE.

the pole passes and which serves to maintain the pole in proper upright position.

With the exception of the draw span the rest of the steel work of the bridge is the regulation deck plate girder construction of a very heavy type as compared with ordinary highway bridge work. No steel members used are less than  $\frac{3}{4}$  in. in thickness, with the exception of the buckle plates, which are 5-16 in. thick. The steel is all made by the open hearth process known as "medium," with an ultimate tensile strength of from 60,000 to 68,000 lb. per sq. in.

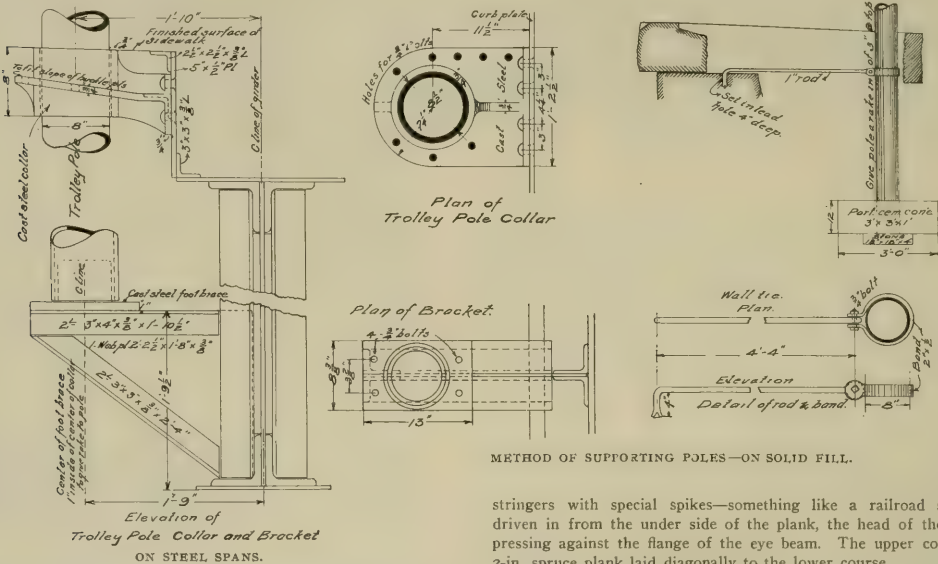




TRACK CONSTRUCTION ON SOLID FILL.—AT AND BETWEEN CROSS TIES.

The east section of the steel work was built by the Maryland Steel Co.; the middle section, including the draw span, was built by the A. & P. Roberts Co., and the west section is now under construction by the American Bridge Co. at its Berlin plant. The foundations, masonry and roadway work of the east and middle sections was performed by Steward & McDermott, of New York. The foundation, masonry and roadway work of the west or final

abola each way from the tower. The upper chord of the two arms of the span are connected across the four posts of the center tower by eye bars. When the bridge is closed and in use by the public the strain is taken out of these eye bars by lifting the ends of the bridge. When swinging, the load is on the eye bars. The floor of the draw span consists of two courses of plank. The lower course is 4 in. thick, of yellow pine fastened direct to the steel eye beam



METHOD OF SUPPORTING POLES—ON SOLID FILL.

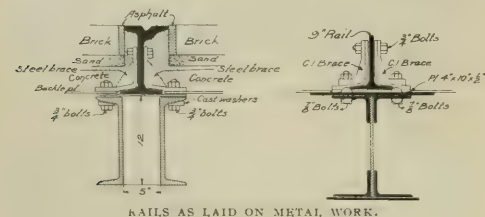
section—now under construction—is being done by Miller & Ellis, of Boston. The actual total cost of the entire bridge, including the damages for land taken and grades changed, will be about \$1,050,000.

The draw span of the New Bedford & Fairhaven bridge is 290

stringers with special spikes—something like a railroad spike—driven in from the under side of the plank, the head of the spike pressing against the flange of the eye beam. The upper course is 2-in. spruce plank laid diagonally to the lower course.

The extreme width of the bridge between railings is 70 ft. The two channel openings are 100 ft. wide in the clear, by requirement of the United States War Department. The bridge swings on a rim-bearing turntable with 69 cast steel wheels. The diameter of the center line of the drum and track is 36 ft. The weight of the bridge is carried to the drum by two box-plate girder loading beams resting on four short girders boxed in to the web of the drum on the lines of an octagon. This secures the transfer of the weight of the bridge to the drum at eight points. This method of loading was adopted to save grade in the elevation of the bridge. The total weight on the track when swinging is about 1,000 tons.

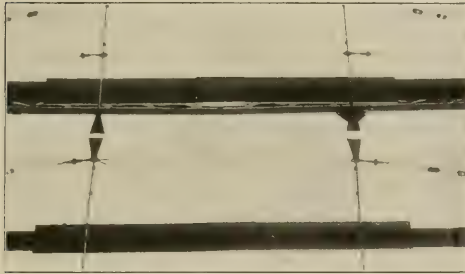
The bridge is turned by two 50-h. p. General Electric motors of the encased street railway type placed on platforms over the drum and diametrically opposite to each other. The motors stand horizontal and are connected with a vertical pinion shaft by bevel gears. Upon each pinion shaft above the bevel gears is also connected the gearing for hand turning, and upon the upper end of each pinion shaft there is a hydraulic brake which is controlled from the operating room. The ends of the bridge are lifted by four hydraulic jacks 12 in. in diameter and 6-in. stroke, and are held in position when at rest by four cast steel blocks which are pushed in and drawn out by hydraulic rams 4 in. in diameter and 36-in.



RAILS AS LAID ON METAL WORK.

ft. in length on the center line. It is a through truss span with two pin connected trusses 54 ft. apart on center lines. The lower chord is straight, the upper chord on the lines of an inverted par-

stroke. The hydraulic system is operated by a Watson-Stillman four-plunger horizontal pump located on the platform carried on the radial struts of the turntable beneath the floor of the bridge. The liquid used in the hydraulic system is a product of petroleum made in Germany, known as "petrolatum." It is a very low temperature oil clear and colorless and does not show any appreciable thickening at a temperature of 5° below zero. The oil is forced by the pump into the accumulator, which consists of two pressed steel tanks, one containing air; the other the solution under pressure. In commencing an operation of the bridge the pressure is about 2,500 lb. per sq. in. The lifting of the ends and drawing of the wedges reduces this pressure to about 1,500 lb. per sq. in. The pump is



TROLLEY SUPPORTS AT DRAW.

driven by a General Electric motor of the encased street railway type, attached to the main shaft of the pump.

On the fixed spans approaching both ends of the bridge are steel truss gates which are operated by electric motors placed underneath the floor of the bridge, the operation is controlled entirely from the operating room of the drawbridge. The gates swing in two parts and when not in use are in line with the curbing and directly over it. The current is carried to the gate motors by a submerged armor cable.

The entire operation of the bridge, including movements of gates and draw, is conducted from a small building, or cab, carried on girders between the posts of the center tower and over the roadway. The one room is 12 ft. square with windows on all four



VIEW FROM FAIRHAVEN END.

sides, and is reached by an iron stairway from the sidewalk. The turning motors, pump motors and gate motors are operated by General Electric controllers of the railway type. There is a switchboard with a main switch, and a switch and circuit breaker for each motor, also a voltmeter, ammeter and a recording wattmeter. The current used is the street railway direct grounded circuit from 550 to 560 volts. The resistance boxes for the turning motors are carried on a platform attached to the outside of the building. Those for the gate motors and pump motors are in a case on the floor on one side of the room, the cover to this case forming a seat. Within convenient reach of the controllers are double acting hydraulic lever valves, made by the Watson-Stillman Co., which operate the end jacks and the rams for the end blocks. The hydraulic brakes are applied by a valve similar to those on the rams and blocks but

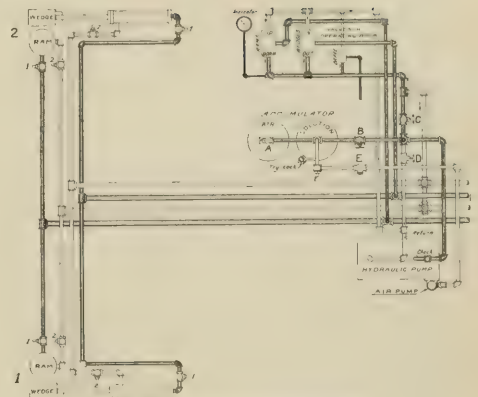


DIAGRAM OF HYDRAULIC SYSTEM.

### EXPLANATION OF HYDRAULIC SYSTEM.

- A. Stop valve on air accumulator.
  - B. Stop valve on main air pipe.
  - C. Stop valve to operating system.
  - D. Release valve to entire system.
  - E. Check valves on air pump pipes.
2. Stop valve between accumulator and air pump.
1. Shut off valves on pressure to rams and wedges.
  2. Shut off valves on pull back to rams and wedges.
- Shaded pipes are on the pressure system.
- Pipes in outline are on the pull back system.
- To charge accumulator with air:
1. Close valves A and C.
  2. Open valves B and D until solution is all out of accumulator, as shown by the try-cock.
  3. Close valves B and D.
  4. Start air pump and run until there is a pressure of 100 lb.
  5. Stop air pump and start solution pump, open valve B, run until pressure in solution accumulator is 150 lb. in excess of pressure in air accumulator.
  6. Open valve A; when solution reaches try-cock, close valve A. Then open valves B and D and proceed as before.
- The operating air pressure should not be less than 1500 lb.
- To connect operating room with system:
1. See that working pressure in solution accumulator is greater than air pressure.
  2. Close valve D.
  3. Throw lever to wedges IN.
  4. Open valve A slowly.
  5. Open valve B slowly.
  6. Open valve C slowly.
- Valve C should always be closed at night, or when the bridge is out of commission, and when charging the air system.

smaller and operated with a small crank handle in place of a lever. The actual position of the rams and blocks is known at all times in the operating room by an electric enunciator which shows whether the rams are up or down, or the blocks in or out. The opening between the ends of the draw span and the adjoining fixed span is closed by a steel apron which is lifted by crank arms working on a shaft beneath the floor, which is operated by a crank arm connected with the piston rod of the end block rams, so that when the blocks are drawn out the aprons are lifted, and when the blocks are pushed in the aprons drop back to their proper place. While the bridge can be absolutely centered by the operator, to save time, especially in strong winds, a simple vertical latch is used, operated with a lever by the assistant on the floor of the bridge. It is expected in time to replace this with a centering wedge operated by hydraulic power from the operating room. With this one exception the entire operation of the bridge, including the opening and closing of the gates, is performed by one man in the operating room who can reach all of the operating apparatus, above indicated, without moving out of a space of 3 ft. square. Signals of vessels wishing to pass through the draw channels are acknowledged by hoisting a signal on a mast above the operating room.

The electric equipment of the bridge comprises: 3 G. E.-52 motors for gates and pump; 2 G. E.-57 motors for turning; 4 G. E. magnetic blow-out controllers; 1 G. E., form L<sub>1</sub> automatic cir-

cuit breaker for each motor; 1 G. E. direct current lightning arrestor, magnetic blow-out type M. D.; 1 G. E. Thompson inclined voltmeter; 1 G. E. Thompson ammeter; 1 G. E. wattmeter.

The current to the gate motors passes through a solenoid brake on the main shaft of the motor, so that the instant the current is released the brake is applied and stops the motor. In addition to this there is a clutch arrangement which releases whenever the pressure exceeds the power required to swing the gates freely. These devices are to prevent the swinging of the gates too far and the breaking of the gearing connections.

Mr. Frank C. Taylor has been first assistant engineer of the bridge since the work started in 1896.

### THE ROADMASTERS' CONVENTION.

At the convention of the Roadmasters' and Maintenance of Way Association, held at Washington, D. C., in October, a number of papers and committee reports were read which, while referring to steam railroad practice, are equally applicable to the heavy interurban electric railways of modern design. In regard to the chemical treatment of ties, a paper by Mr. J. E. McNeil, of Southern California, was read by the secretary, as follows:

#### DOES CHEMICAL TREATMENT OF TIES INCREASE THE HARDNESS OF THE WOOD AND THE HOLDING POWER OF THE SPIKE?

This paper refers only to the zinc-tannin, or Wellhouse, process of timber preservation, and the committee to whom the subject has been assigned has made several tests with the treated ties available and has received the written opinions of persons in different parts of the country who have had experience in the treatment and use of treated timber.

The consensus of opinion, supported by the tests made by your committee, is that treatment does not increase the hardness of the wood, but does increase its density and transverse crushing strength in proportion to the amount of treating material absorbed. But while the timber is not hardened by the treatment it is made more flexible and tough, and will, by reason of the increased density of the wood and action of the chemicals used, prevent the rail from cutting into the ties, in proportion to the amount of preservative absorbed, or about 30 per cent in coarse-grained pine.

Common mountain pine, such as is found in New Mexico and Arizona, now largely used as tie timber on western lines, is an open-grained, coarse wood and absorbs, when treated, about 30 per cent of the preservative. Close-grained, firm timber absorbs less of the chemicals than does the open-grained, soft wood, and is therefore proportionately less affected by the treatment.

We find that the spikes, when driven, damage the fiber of the timber less in treated than in untreated timber. The holding power of the spike is not noticeably increased at the time the tie is treated, but increases as the timber dries out, until at the end of from six to nine months, when the timber has become seasoned, a pine tie which has absorbed the usual amount of chloride of zinc, tannin and glue, will have increased the holding power of the track spike not less than 30 per cent.

The discussion of this paper brought out the fact that the weight of the tie decreases considerably after the treatment has had time to be affected by the air. It requires two men to pile the newly treated ties, while in six months after treatment one man can handle them easily. Spikes were found to loosen in time in treated ties, although they drive harder at first. The rails also cut more readily into the ties where some time has elapsed since their treatment. On several roads no difference in the holding power of spikes had been noticed in treated and untreated ties.

Mr. Collins, of the New York, New Haven & Hartford Railroad, read a committee report on the tamping of ties, as follows:

#### TAMPING OF TIES.

The roadmaster has almost daily occasion to study and give instruction pertinent to the subject submitted to your committee for their consideration and report. It is one of the most important questions he has to deal with, much of the future surface of track and condition of rail being dependent on proper tamping of ties. Were it not for the fact that there are innumerable and different conditions for our study the question could be more easily and

satisfactorily dealt with, the various and variable climates of the several sections of territory covered by the members of this association, together with different classes of nature of ballast used, each calling for a treatment peculiar to its class, form many combinations which the roadmaster must meet if he be successful.

Regardless of what ballast is used, tamping the ties is a very important matter, and if it is not thoroughly done, bad results will follow. A perfect riding track is only to be obtained when absolutely round wheels and perfectly balanced engines are run over rails that are in perfect condition and thoroughly supported on sound ties solidly tamped in good ballast. This implies ties so thoroughly bedded that no yielding occurs when a train or engine passes over the track. To obtain this result thorough tamping, intelligently performed, is the only means to be employed, and by thorough tamping it is understood that each tie is to have the ballast so compact under it that it will be able to withstand the load when applied without settlements. No satisfactory results on track with any kind of ballast can be obtained except by tamping the material under the ties with shovels, bars or tamping picks. As a perfect track presupposes the fact that the joint must be as strong as the other portions of the rail, no harder tamping would be required at the joint than at any other point, but, as under most existing conditions the joint is only about 33 per cent as strong as the rail, harder tamping of joint ties is necessary, the degree of which must necessarily be left to the judgment of the foreman in charge. When new ties are placed in track they should at once be tamped to as solid a bearing in the ballast as the ties immediately adjoining, regardless of whether the track is to be immediately surfaced or not, in order to avoid a possible bending of rails. When the track is surfaced after new ties are put in the new ties should receive no harder tamping than is required to make them equal to the others in the immediate vicinity. Ties should not be equally tamped for their entire length, but an equal space each side of rail must be thoroughly tamped and the center of the ties may be more lightly tamped in order to avoid center-bound track.

When ballasting or raising track above 1 in., where the ballast consists of gravel, it should first be shovel tamped, including joint ties. After this has been thoroughly done, and in course of one or two days after track and gravel has been settled and packed, this track should be gone over and carefully resurfaced and all ties bar-tamped in order to secure a good and true level track. Before any bar-tamping is done in general surfacing of track the ties should be held up to the rail and spikes firmly driven down in order that track may not be made uneven in process of tamping. When ballasting track it is, of course, understood that the material will be put under ties as fully as possible with shovels, or shovel-tamping, as it is called, after which it must be gone over again and tamped with bars. Material can be placed much more quickly in this manner than with bars and answer for a temporary purpose only, and for a lift over 2 in. we should recommend shovel first and bar afterward. On roads with fast and heavy traffic shovel tamping will not hold the surface so as to be safe for fast speed, hence the bars should soon follow the shovels.

Joint ties should be tamped harder than any other ties, also all ties should be tamped the hardest outside and under the rail. In light surfacing we would recommend tamping from the center of rail toward joints as being more conducive to track remaining in good surface. When placing new ties in main track they should be shovel tamped on the day they are put in. The following day the proportion of track which is low should be raised to a true level and all ties so raised should be tamped with tamping bars or picks. Also all new ties should be retamped with tamping bars or picks, even if track does not require raising at points where they are put in. The tamping should be well done.

Track raised above 2 in., when ballasting with broken stone, should first be shovel tamped—that is, the stone to be pushed under the ties with shovels. After this has been thoroughly done tamping picks should be used in forcing or packing the stone under the ties, and in course of one or two days after the track has been raised, the track should be gone over again and carefully resurfaced, and all the ties pick tamped outside and under the rail; also the joint ties inside for about 18 in., the remainder of joint ties inside, as well as other ties outside, should be bar tamped. Better results are obtained in tamping ties on both sides, viz.: First dig out and lightly fill ties on side from which trains approach, then tamp the



other side firmly, tamping reverse side, inside of rail, for about 15 in. In light surfacing great care should be used; a raising bar needs to be used only in exceptional cases. Most of the work in taking out "nips" or low places should be, and can be, done with tamping picks; too frequent use of bar is apt to loosen up track, giving a more uneven bearing than when the picks are alone used. When placing new ties in stone ballast they should all be thoroughly pick tamped the same day they are put in to avoid bending or kinking of the rail. An important feature on stone ballast track is that every tie must be solid, and in all cases where there is any doubt about joints not being thoroughly tamped in first going over they should be given a second tamping before leaving. With many it is a practice when track is raised more than 1 in. to first tamp on the receiving side, on the outside of the rail, then tamp the leaving side in the same manner. On the inside they first tamp the leaving side and then the receiving side. Ballast forks are best adapted for handling stone ballast.

When the ballast consists of sand and it is dry much better results can be obtained by shovel tamping than by use of the tamping bar, but when sand is wet bars should be used, the blade or pad of which should be at least  $\frac{1}{2}$  in. thick. After the tie is tamped sand should be drawn in beside the ties with the bar, so that the earth, which has been forced under the tie, will not be loosened or jarred out; then, in case of a sudden, heavy shower, the sand thus pulled in will prevent the water from softening the tie bed. Better results are obtained by tamping towards the middle of the track, about 18 in. from the rail, than when the tie is tamped the whole length. In renewing ties they should be bar tamped soon after they are put in.

When ballasting with natural soil, burnt clay or gumbo, if the track is raised above 1 in. the material is to be pushed under the ties with a shovel, when thoroughly done. The shovel handle should be used to pack the material as hard as possible. After the track and soil has settled, in the course of a day or so, this track should all be carefully gone over again and uneven places raised and retamped with shovel handles or thick, especially constructed tamping bars for soil tamping. When placing new ties or surfacing the tamping should be done in a similar manner. Tamping of tracks should be well done at all times, no matter what tools are used, and in connection with tamping it is necessary that the tracks be raised to a true level.

There was no discussion of this report, although several members expressed their appreciation of it. It expressed the methods employed on many of the roads represented of doing the work with the various classes of ballast. In connection with this subject the following paper by Mr. W. Shea, of the Chicago, Milwaukee & St. Paul, was read by the secretary:

#### BURNED CLAY BALLAST.

In detail the cost per yd. of ballast on cars is as follows:

Land, interest on track material, track labor and stripping	4	cents
Coal	13 $\frac{1}{2}$	cents
Burning	17 $\frac{1}{2}$	cents
Loading (by hand)	7	cents
Total, per cu. yd.	42	cents

The cost of ballast depends largely upon the cost of coal. In favorable season a ton of coal will burn about 4 cu. yd. of ballast using our gumbo soil. The weather has a great deal to do with amount of coal used to burn a yard of ballast. During a wet, bad season a ton of coal will not burn as much ballast as during a hot, dry season.

A good quality of fancy steam coal or slack and nut mixed should be used, as it makes a better fire and the heavy rains do not have the effect on the fire that they would if using slack coal.

The best burnt clay ballast I ever saw was made out of gumbo soil, but clays can be used. You can burn as many yards of ballast in a day on 2,000 ft. of fire in gumbo soil as you could on a 3,000-ft. fire in our clay. The gumbo, having more vegetable matter, will burn more quickly and cool off more rapidly than clay.

The cost of hauling and unloading burnt clay ballast is practically the same as gravel. The cost of putting it under the ties is about the same as good gravel ballast.

As to its efficiency as ballast compared with the efficiency of good

screened rock ballast, I consider good burnt clay ballast very efficient for maintaining track, and can maintain a better riding track on it cheaper than with rock ballast.

Screened rock ballast is stronger, without a doubt, than burnt clay ballast is, but the clay ballast is handled so much easier and quicker than the rock that on the whole I consider it a better ballast than rock for a line like ours, where we have ordinary traffic.

We have some track in the Medicine Creek bottoms in north Missouri that was ballasted 12 years ago, a part of it being ballasted with rock and the balance with burnt clay. We put from 8 to 10 in. of ballast under the ties in both cases. Our burnt clay track has always been in the best repair considering the amount of work done on the track. Conditions are about the same. The life of the clay ballast seems to be about as good as the rock.

On an ordinary traffic line, I would prefer burnt clay ballast to rock ballast, as I consider that track can be maintained in better condition for less money with clay ballast than with rock.

We have obtained the best results from burnt clay ballast by using it to cover worn-out stone ballast. We put from 6 to 8 inches of clay ballast on top of the stone and it makes an ideal track. With such a system of ballasting as burnt clay ballast on top of rock ballast there need be no limitation upon the service of your road.

After the clay ballast has been laid under the ties and you get a good rain on it, then there will not be any more dust than on a rock-ballasted road.

Weeds can be cleaned out of clay ballast for one-quarter the cost that they can out of rock. Ties can be renewed in clay ballast for 40 per cent less than in rock ballast.

The life of a tie in burned clay ballast is 10 per cent longer than in rock. I account for this on the ground that the clay is porous and dries out quicker, then draws the dampness out of the tie, not waiting for the common elements to dry the tie out after being wet.

In laying burnt clay ballast we tamp it with shovel blades, but our section gangs, where they are picking up low joints, etc., and do not lift the track over 1 in., tamp with tamping picks.

Some may imagine that by using picks you injure the ballast, but my experience (12 years with burnt clay ballast) has been that I could not see that they damage the ballast any, and we can keep a better surface on track by so tamping.

We dress and shoulder our burnt clay ballasted track the same as good gravel ballasted.

As far as I can learn burnt clay ballast has had very little effort made in the way of enlarging its use. The users have been confined to a small territory where the necessity for its use has been more instrumental in bringing it forward than any other one cause.

In the discussion of this paper the inquiry arose as to the life of ties with this ballast. No data on this point were at hand, but it was assumed that the life of the ties would be extended as the burned clay ballast dried out very quickly. In some cases the experience was unfavorable to this ballast, as with heavy pressures it was found to cut through and be kicked out at the bottom. The trouble in this case seemed to be that it dried only on the surface. Several of the members had had this experience and agreed that cinders would not act in the same way. It was thought that in some cases gumbo ballast would not shed water at all, but instead the water would settle in the interior of the mass. On one section of a road mentioned rock ballast had been used in which 60 per cent less ties were put in than on another section with gumbo ballast. The ties in the rock ballast were said to be in far better condition than the others. It was brought out, however, that these ties were of a different grade, one being oak and the other cedar. It was also thought that part of the trouble might have been due to the ballast being badly burned.

The Burlington road was the pioneer in burned clay ballast, having begun its use in 1880. There were 54,000 yards used the first season; about half of it was first class and the rest not so good. Heavy rolling stock, it was found, pounded it out badly. There was some difference of opinion as to the cost of maintenance of burned clay ballast. This depends somewhat on the traffic; in some cases it amounted to about half and in other cases to two-thirds of the maintenance cost of stone ballast. The nature of the sub-soil also has much to do with the behavior of the ballast. It was thought that if there was something beneath the burned clay from which water would drain this ballast would be all right. The opinion was also expressed that rock ballast could give no better

satisfaction than burned clay when it is on wet soils; for the latter case cinders are found preferable.

The next question taken up was the consideration of broken or square joints on which there were two committee reports. The first one, by Mr. L. Bradley, of the Santa Fe road, was read as follows:

#### BROKEN OR SQUARE JOINTS.

For 33 years and more I have handled square joints, and for the past six years have handled both broken and square joints, and am decidedly in favor of broken joints, for the following reason:

The broken joints are a great advantage in laying rail, either on old or new track, as it is not necessary to be particular to the inch, as it is in laying square joints. This saves both time and money, which is the first consideration in railroad work. I also find track easier held in line and surface, especially on ballasted track.

I find the broken joint a great advantage on single as well as double track, more especially on double track, on account of the steel creeping. With trains all running in one direction our rail is bound to creep, more or less, in spite of any remedy we have yet found. Where we have square joints we are compelled to drive our steel back and forth in order to keep the joints square and in riding shape. This is both expensive and troublesome. At the present time, on one of the branch lines of my division, I have 61-lb. rail laid in 1887 that has crept until the joints are out of square from 10 to 14 in. This steel will have to be driven back and joints squared up as soon as cool weather comes again.

It is evident that broken jointed track will not ride as well as square jointed when joints are very low, but I think this to be greatly in favor of the broken, for this being the case the surface of our track will never be allowed to run in as bad shape as it sometimes is where we have square joints.

There are many minor reasons that might be given why better results are obtained from broken than square joints. The greatest proof of all is that nearly all the best roads in the country are adopting the broken joint.

The second paper on this subject was by Mr. F. J. Allen, of the Burlington road, and was read as follows:

#### BROKEN OR SQUARE JOINTS.

This is a subject upon which I find very little information has been given, yet it is one of the most important subjects with which the men who are responsible for the many miles of railroad tracks in this country have to deal with. To a person not familiar with track work the question of which is the better way to lay rails, whether square or broken joints, may seem a very unimportant part of the work of the maintenance of way department, although it is one of the most important, not merely as to the question of having a first-class track, but also from an economical standpoint, as economy is one of the first principles that should be taught in every department of a railroad, as well as in every other business.

To obtain the best results everything connected with the maintenance of way department should be the best that can possibly be obtained; not only should the material be the best, but the men who do the work should be the best that can be employed, and all the work connected with the track should be done with the greatest care in the most thorough manner. This applies to the laying of rails as much as to any other part of the work.

In laying rails great care should be used in spacing the joints. as an uneven spacing has a tendency to make open joints at some places and at other points it will be very tight. This at times, becomes a serious question to the section men. Ties should be adzed properly so that the rail will have a true and even bearing on all the ties. All this is absolutely necessary to have a good track, regardless of the question whether the rails are laid square or broken joints.

On double tracks, or where the traffic is all in one direction, we think the rail laid broken joints has advantages over square joints in many ways. The tendency of rails to creep, where traffic is in one direction, is very great and as a general rule one rail will creep more than another. If laid broken joints this does not make very much difference, but if laid square joints it makes considerable trouble and expense, as it is necessary to have the joints square, or very nearly square, so that the joint ties will lay at right angles

to the rails, and at the same time be placed properly under the joints. This is necessary to permit the proper spiking in the slot of angle bars. If one rail creeps more than another, which is true in many instances, then the rail must be driven back in order to have a square joint. This is not necessary where rail is laid broken joints, as the joint will be in all cases nearly opposite the center of the solid rail, and it is not necessary for it to be exactly opposite; therefore it does not require any expense to drive it back.

On curves it is absolutely impossible to make perfectly square joints unless a large number of rails should be cut off enough to allow for the difference in length of the outer and inner rails on the curve. Practically this is impossible to do, and we do not think any company would allow it to be done, due to the expense, and if joints are not kept nearly square, then the joint ties cannot be laid at right angles to the track. In the case of broken joints the laying of rail around a curve is a very simple problem. New rails are usually 30 ft. long, although we get some shorter length rails cut on even feet. When laying on curves with broken joints, when the inside rail is 6 in. ahead of its proper position, we can use a rail 1 ft. shorter, which then makes the joint 6 in. back of its true position, and this can be continued for any length of curve.

At the present time, on all our tracks where the traffic is in one direction, we use an anchor splice on the solid rail opposite each joint. This anchor splice is a section of our angle bar and is 5 in. long, with holes drilled through it the same as on the angle bar. We drill the rail and put a pair of anchor splices on it the same as on angle bars. There are slots cut in it to allow spiking, the same as in angle bars. This is of great assistance in preventing rails from creeping, as it gives an anchor every 15 ft.

On broken joints we do not think the tendency is as great to have low joints, for the reason that the blow from passing wheels only act on one rail, while the opposite side is a solid rail, and in this case the joint ties receive only one-half the force that they get in case of square joints, and if we do not have as many low joints then the rails will certainly wear longer and keep in better shape. This would be in the line of economy, as the greater length of time we can keep the rails in the track without removing them the less expense we incur.

We also believe it is much easier to line track with broken joints than with square ones, as we have a solid rail on one side all the time. This is especially true on curves, as every maintenance of way man knows. We have all had the trouble known as joints "sticking out" where track was laid square joints, while with broken joints this does not occur. It may be claimed that where joints are low it is easier to get out of line where laid broken joints. If joints are allowed to get very low this may possibly be true, but I do not think there is nearly so much chance for low joints as where rail is laid square. Admitting this to be true, it is much easier and requires less labor to line it than with square joints, for the simple reason that the angle bars are bent a little and it is easier to straighten one pair with a solid rail on the opposite side which will spring back to a straight line than to straighten two pairs of angle bars. At the present time, on first-class roads, where very high speed is maintained, it is necessary that there should not be any low joints, and if you do not have them your track will not get out of line very easily.

We are also of the opinion that the cost of laying rails broken joints is less than with square joints. In the first case it is not absolutely necessary that the rails should be laid perfectly true in regard to having one joint exactly opposite the center of the opposite rail and there is considerable saving of time in squaring up joints. In the second case, laying rail square joints, it is necessary to be very careful to get joints square, and in many cases it requires much time to do it, and also adds materially to the expense of laying rails. You are all aware of the fact that rails are not all the same length. While the difference is small, yet in time it amounts to considerable if it happens that you get all the longer rails on one side.

On single track, where the traffic is about equally divided in each direction and an insufficient number of men are allowed, it may be a question which is the better way to lay rail, although in all cases I prefer the broken joints, as I believe the track can be kept in better shape, even with an insufficient number of men. The same reasons will apply on a double track railroad.

It may be claimed that on broken joints where they are low, that the side or rolling motion of a train is more injurious or disagree-

able than on square joints. We do not believe this is true, as a rolling motion is less injurious to the machinery and cars than a solid blow, such as occurs on low joints where the rail is laid with square joints.

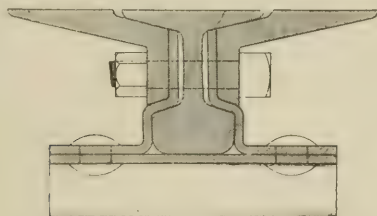
For the past ten years we have had rail laid both ways on our double tracks, and we find that where we have broken joints we have a better track at all times. We also find it true that it is easier and less expensive to keep the track laid broken joints in good shape than the square joints. From the experience we have had for the past ten years we are very much in favor of rail laid broken joints. We believe from our experience that we can make our rail wear longer and keep it in better shape at less expense than we can with rail laid square. Under such conditions we are continuing the practice, and do not see at the present time any reason why we should change to square joints. We are open to conviction, and when it can be demonstrated to our satisfaction that we can maintain a better track, and at less expense, then we will be willing to admit that we are wrong.

In the discussion which followed the reading of these papers the broken joints were generally favored. In using square joints it was quickly found that the creeping of the rails pulled the track out of line and gage. It was also necessary to anchor the rails with square joints, which was done by making a brace of angle iron, which was put opposite the joint. A number of the members agreed that the broken joint was 50 per cent better than the square joint.

A paper was then read by Mr. C. Buhner, of the Lake Shore & Michigan Southern, which described a steel tie of the author's invention. Mr. Buhner had constructed a number of these ties at his own expense and they were put in the track in May, 1901, where the service was hardest and fastest. The section foreman where these ties were placed stated that they had given much less trouble in keeping surface than the adjoining track with wooden ties. The company has recently ordered 3,000 of these ties to be placed this winter. Mr. Buhner's paper was read as follows:

#### STEEL TIES FROM THE OLD WORN-OUT STEEL RAILS.

May 1, 1901, 150 of the Buhner design steel ties were placed in the Lake Shore & Michigan Southern Ry. south main track, on a curve  $2\frac{1}{2}$  miles east of Sandusky, Ohio. These ties were constructed from old worn-out 65-lb. steel rails. A steel plate  $\frac{1}{4}$  in.  $\times$  8 in.  $\times$  8 $\frac{1}{2}$  ft. long was riveted onto the head of the rail and the rail inverted with the flange up for the track rail to rest on, the head down forming the base of the tie. Holes are drilled



BUHRER STEEL TIES FROM OLD RAILS DETAILS.

through the flange of the old rail to suit the gage of the track, and the track rails are held rigidly to the ties and to gage by bolts and clamps, which allow shimming of the track, if necessary, during the winter season; also allowing insulation for block signals.

Practical tests have demonstrated that the form and construction is all right, and this style of tie is holding the surface and line fully as good or better than track laid with wooden ties. These ties can be constructed reasonably cheap, so that railroad companies can afford to use them even at the present high price of steel. The steel tie should prove cheaper than the present wooden ties. While the first cost of the steel tie would be higher than the present price of wooden ties, the steel tie should, and will, outlast three or four sets of wooden ties and, after it becomes unsafe, the value of it as scrap would still be about half its first cost.

These ties were laid to replace wooden ties 7 to 9 in. thick, and as the steel tie is only  $4\frac{1}{2}$  in. deep it was necessary to form a new bed of 3 to 4 in. under each steel tie, by tamping. The work of tamping was carefully done and we experienced no trouble to keep the track to a true surface and line. In fact, less labor was spent in surfacing this section of track laid with steel ties than the adjoining track of similar length laid with wooden ties.

At least 30 per cent should be saved in maintenance with this class of steel tie, the reason for which can be readily understood. The steel ties will all be of uniform size and depth, and this means that it will take less time to dig out to tamp them, and that the tamping can be done more uniformly, thereby securing even and truer surface. The steel tie, being of longer life, will enable trackmen to avoid digging up the roadbed so frequently, which will materially assist in maintaining better surface at less cost. While I am unable to state from actual test how long the steel ties will last in track, I can state from actual and close observation from the steel ties placed in the L. S. & M. S. R. R. main track May 1, 1900, that these ties are as good today as on the day they were placed in track, and as far as indications show they will be as good ten years from now as they are today. Through our western country, where there is little rain and dry atmosphere it appears that this style of tie should last almost a life-time.

Close observation for the past ten years has demonstrated that our heavy-section rails have not been wearing as good as the lighter sections. The rail is flattening out at the joints and other points, and as we have been increasing our axle weight year after year it appears that we will be compelled to renew rails oftener than we have been doing heretofore, and this question has already been brought up by some of our most practical and experienced engineers: "What shall be done with the heavy-section rails when they become worn so as to be unsafe for fast speed?" I have demonstrated in practical use that these worn rails can be utilized by working the same into ties, at reasonable cost, which will give our roads a great many more years' service, and after they become unsafe as ties the value, as scrap, should be almost as much as the rail before being converted into ties.

The design of the tie is to roll out the head of the rail to form a flange about 8 in. wide for the base or bottom face. This will be done by re-heating the rail to a rolling heat and running it under a sharply constructed roll to split the head of the rail open (wedge-form) through the center of the head to the desired depth, and then follow with properly constructed rolls to spread the metal outwardly to the desired width. Rails badly flange worn can be utilized by fastening a steel plate onto the head. This can be done at a reasonable cost and the tie will answer fully as well. An illustration showing a section of the tie is given herewith.

The next paper read was by Mr. F. R. Coates, of the Chicago Great Western, on the use of 45-ft. rails. The paper is as follows:

#### USE OF FORTY-FIVE-FT. RAILS.

For several years past one of the principal topics of discussion at the various maintenance of way meetings has been the use of rails over 30 ft. long. Not only has the matter been discussed, but practical use of these rails has been made.

In looking over a table it will be noticed that 128 roads have reported on the lengths of rails used, and out of this number 34 have experimented with those over 30 ft., these long lengths varying from 31 to 62 ft. The majority of long rails, according to this statement, is apparently 33 ft. From the report of the above association it was found that the number of roads that have made this length a standard is represented by a mileage of 14,000 miles, being 10 per cent of the total mileage represented in the association.

In regard to the 60-ft. lengths the opinion is apparently divided as to the utility of using them. The personal experience of the writer has been that a shorter length is more economical to maintain and more economical in first cost.

Thirty-three feet has been recommended by this association and also the American Railway Engineering and Maintenance of Way Association as a standard. This is a decrease of 10 per cent in the number of joints used, and decreasing the joints is primarily the object of long steel.

Forty-five feet has been used, according to the table above men-



tioned, by six of these roads. The opinions of these six are equally divided as to the efficiency of this length of steel.

Before going any further into the subject your attention is called to a few facts from the manufacturers' standpoint, as given by Mr. Carhart of the Illinois Steel Co. at the Detroit meeting of this association, as follows:

"Whereas, one man will straighten a 30-ft. or a 33-ft. rail, when you come to handle a 60-ft. rail it takes about four men to handle it, and it is a very difficult matter, after a rail has been straightened, to say whether it is straight or not. You can take a 60-ft. rail and lay it on three or four bearings, resting evenly on these bearings, and with your hand you can throw in kinks or throw them out. You can make that rail look as crooked as a snake, and you can make it look as perfect in line and surface as you can get a 30-ft. rail. Now, as to the cost, you can judge for yourselves, where you nearly double the force; for no man can swing over and back a 60-ft. rail for any length of time. It requires additional men to turn a rail of these dimensions; and, as Mr. Foley says, it can be done, it is true, but I would not want to say, with my 15 years' experience in the mill, that I could tell when a 60-ft. rail was absolutely straight, simply because it may be due to the way it rests on its bearings, and the movement of the hand will throw it out. It is surprising to see how the deflections in a rail are exaggerated to the eye at a certain distance, but those who are accustomed, as all you men are, to watching the line and surface, know how large they appear when standing 45 or 50 ft. away from these little deflections. A thirty-second of an inch will look to you like an eighth of an inch, and of course, the only way we can straighten them is by the eye. We may take them out of the press and lay them on one side as nearly straight as we can judge. The movement of the rail will make it look straight or make it look crooked; give it a few more blows. Right in this connection I wish to call your attention to this: You can injure your steel more under the press by excessive work than in any other method. Every blow there carries your metal beyond its elastic limit and puts in a permanent set. Consequently the best rail you can get is a rail that has the least number of blows, and the only rail that we can give you today with modern appliances, and all the improved appliances, would be from 30 to 33-ft. rail. That would give you a very few number of blows, whereas your 60-ft. rail will require from three to four times the number of blows that your 30-ft. rail will have, and in the end it will not be anywhere near as straight as the 30-ft. rail. Excessive working may start an incipient check. You know steel is like glass. A crack, a check of a sixty-fourth of an inch, or a one hundred and twenty-eighth of an inch through the skin is sufficient to rupture that steel. I doubt if there is a gentleman here who has not had the experience in the case of a derailed truck, that the truck, on account of a broken flange, with every revolution of that wheel striking the flange of the rail will put an indentation in it. I once had occasion to see some rails which had been injured in that way. There were only three or four rails that had cracked flanges on account of this accident. They were all taken out that were cracked. The balance, some 60 odd, had indentations in the flange. In a few months' time I noticed a streak of rust running up on the flange. If an angle bar was placed on the rails, the rails did not break, but in a short time a fracture would develop and produce a broken rail. In a few weeks' time that fracture went entirely through and the rail was lost, and the result was that 60 odd rails had to be taken out of the tracks on account of that derailed truck. I cite that fact simply to show you the effect of an injurious blow on the rail. That injurious blow, if carried to excess, repeated hammering to get your rails straight, does more harm than good. So there is a limit to which you can go in the length of your rail, to have it straightened with the least number of blows and have the least injury done to the metal itself. Now, your American section is designed for two purposes: One is to have it well balanced and cool even on your hot bed; the other, incidentally, is that you get very few blows in your straightening press and that is the only section I know of today that can be straightened with so little work. The American standard rail calls for the least amount of work of any rail that has been brought out. You see, where we have to put on double and triple the force of men to handle those rails and then get them out and not know that they are straight and have to put them back, is a very expensive operation for the mills, one which eats up money very fast. Of course

there are other objections, which I will not stop to bring up at present."

The length of rail to be used is governed by the following conditions:

First—First cost.

Second—Transportation.

Third—Cost of handling.

Fourth—Maintenance.

The first consideration, which is the original cost, is affected by the value of the raw material and cost of manipulation at the mill. No matter what the length of rail is, the first of these items will be proportionate to the length. The expense of handling is accordingly increased the longer the rail. This statement is borne out and has no further dilation other than previously mentioned in Mr. Carhart's opinion, which precedes.

Referring to the second condition, which is the cost of transportation: It is an established fact that the economical carrying or transporting of rails is entirely dependent upon the maximum length of the car in which they are carried, which at present is about 40 ft. on a number and 34 ft. on the majority of roads in this country.

Thirdly—The cost per ton for handling long rails is slightly increased over 30-ft. lengths.

Fourthly—Cost of maintaining. This is dependent upon lining, surfacing, cost of anti-creeping devices, money expended in renewing rails with battered ends and maintaining the joints.

It is claimed by adherents of long rails that we must look at the amount of money saved in the joints. On the other hand, we must take into consideration the amount of money spent in maintaining these long rails. The first of these items, which is cost of lining, is higher the longer the steel. This is explained by the fact that long rails are kinked unless handled very carefully. The slightest inclination this way will cause the rolling stock passing over same to continually increase this tendency toward getting out of line. Also, unless particular attention is paid to anchoring and spacing ties and expansion long steel will kick out under extreme heat.

The same can be said of the second, which is cost of surfacing. On some gravel track the writer's attention has been called to long rail which has not been properly anchored working at the joints, owing to being very tight. In fact, there would be so much spring, owing to the length of the rail, that it would lift up at the joints, allowing sand to run under the ties at that point, thus rendering this portion of the track high and out of surface.

Taking up the next item of this heading, anti-creeping devices, we have to take into account the cost of additional joint, fastenings for long steel. In the original cost of fastenings these anchorages will increase the amount of same as much as though 30-ft. rails were used, but they will not wear out so quick as joint fastenings. In the writer's opinion the proper form of anchorage is to use old angle bars, drilling holes in the rails to correspond with the end holes in the angle bars, and have these spiked opposite to the joint, if the rail is laid broken; or if the rail is laid square, spike the anchor fastenings on the two rails at the centers opposite each other. This will prevent the ties which anchor the rails from slewing to any extent, the entire side of the tie resisting, and thus securing better anchorage.

We will now take up the question of battered rails which have to be replaced. Unless the utmost care is taken the expansion will run in bunches. In other words, at some points we will have extreme wide joints, and at others the rail will be tight. At the wide joints the rails will become battered and have to be replaced in time. In order to prevent this the greatest care should be exercised in the laying of long steel. On all grades the same should be made tight, as well as on all approaches to stations. In sags it should be left wide open, the same in front of stations. On level track judgment has to be used in regard to the condition of the grade each side of the level stretch.

Cost of maintaining the joints: This is considerably increased where long rails are used. In extreme cold weather bolts are frequently broken owing to the expansion which has to be permitted. In addition to this, referring to the previous paragraph, it will be noticed that the expansion, unless great care is used, will be bunched in some places. This will give wide joints; while the

rails are being battered, the joints are being pounded out of shape, and additional money is expended in order to keep them up. Owing to rail being tight the joints frequently get out of line.

Taking into consideration what has previously been said regarding the use of rails over 30 ft. long, we are brought face to face with the fact that the rail itself, if longer than 33 ft., costs more per ton, costs more to handle, costs more to maintain for the same number of tons, and is more expensive to line and surface. These deductions have been arrived at by the writer from experience with 100 miles of 60-ft. rails. The nearer we approach the 30-ft. lengths these conditions are minimized, with the exception of the original cost, which the mills, up to the present time, have not reduced.

In the 45-ft. rails 50 per cent more expansion should be used than in the 30. We would recommend  $\frac{3}{4}$  in. extreme. The number of joints are reduced 33 per cent over the thirties. Then we have the anchorage, which will cost practically the same as the joint fastenings, which have been saved.

Considering the entire question, we are of the opinion that the riding of the track where the rail is properly laid, careful attention having been given to handling the same, extreme caution having been exercised and the expansion properly attended to, that track with 45-ft. rails will ride better than with 30-ft. lengths.

Now the question is: Does the cost of maintaining the 45-ft. rails amount to less per mile than the cost of the 30-ft. rails? If so, to what extent? This is where the saving (if there is any) will be effected. The cost of lining and the cost of surfacing the 45-ft. rails is slightly in excess of the 30-ft. lengths. But there is a slight saving in maintenance, owing to a less number of joints than with the shorter lengths, although the cost per joint is slightly higher.

The writer has always been an advocate of this length of rail, and when the manufacturers will turn it out for the same cost per ton as 30 or 33-ft. lengths, it is his opinion that it will be adopted as a standard on American roads.

In the discussion of this paper, considerable difference of opinion was brought out as to the advisability of the use of long rails. The experience of the Pennsylvania road with 60-ft. rails had proved quite unsatisfactory. Line and surface were at some points maintained without extra expense, but on grades there was so much creeping that it made considerable trouble. Some rails were bunched tight together and then in zero weather openings were to be found of from  $\frac{3}{8}$  to  $\frac{7}{8}$  in. and the bolts would be bent by the tremendous stress. The 60-ft. rail was condemned on the Pennsylvania system and the 35-ft. rail has been ordered to a large extent. It was thought possible that the 45-ft. rail would also be tried. In another case, on 11 miles of 45-ft. rails, no trouble was found except in two instances in six years. These troubles were with battered ends where the ends were miter cut. On another division where six miles of 45-ft. rails were used the experience was the same, the only difficulty being imperfect straightening. There was no reduction in the maintenance pay roll but the company believed that it got a better track for the same money. The remaining discussion was of a desultory nature relating chiefly to expansion and contraction.

#### NO STRIKE IN PHILADELPHIA.

Efforts have lately been made to stir up discontent among the employees of the Union Traction Co., of Philadelphia, but after a recent all-night session, the employees unanimously decided against the proposition to strike, and voted to remain at work under the present satisfactory conditions.

#### COMPETITION IN INDIANA TRACTION LINES.

The Central Traction Co., of Indiana, is busily engaged in completing a survey of its line from Atlanta to Elwood, and work on the branch between Indianapolis and Noblesville is being rapidly pushed. The grading of this line between Arcadia and Atlanta is now well under way.

There have been a number of rumors current to the effect that this company was to be absorbed by the Union Traction Co. of Indiana. Mr. Horace Stilwell, vice-president of the Central Traction

Co., denies this rumor emphatically and states that the property will remain in control of its present owners. He states that the survey of the company's line from Indianapolis to Elwood is nine miles shorter than the route of the Union Traction Co., the greatest curve in the road is only of three degrees and the line is level throughout. Mr. Stilwell claims that his company can make nearly an hour better time between these points than the schedule of the Union Traction Co. The Central company's power house, which it is estimated will cost about \$300,000, is to be built in the city of Indianapolis, but its exact location has not yet been decided upon.

#### STREET SPRINKLING CAR.

The accompanying illustration shows a combined track and street sprinkling car recently built by the Studebaker Bros. Manufacturing Co., of South Bend, Ind.

In general appearance, the car enclosing the sprinkler resembles a large vestibule car, such as the electric railways use for baggage. It is equipped with motors, controllers, wiring and the necessary switches, ready for use. The pressure is obtained from two rotary pumps, each piped direct to the sprinkler heads, and driven by a separate motor. A system of levers at either end



TROLLEY CAR STREET SPRINKLER.

of the car gives the operator perfect control of the apparatus, enabling him to grade the spray from the finest mist for sweeping purposes to the heaviest spray for flushing the track or laying the dust. The right of way sprinkler and track flusher is a separate attachment, easy of access to the operator, the water supply depending upon the pressure from the sprinkler tank, to either sprinkle the right of way or flush the rails. Besides the uses enumerated, this sprinkler will be found convenient when it is desired to flush asphalt streets or similar pavements.

A test was made on the lines of the Indiana Railway Co. The street experimented upon was sprinkled on either side of the track, the distance covered varying at the will of the operator from 15 to 60 ft. on either side. The apparatus was at all times, even under the severest conditions, under perfect control of the operator, and its practicability was fully demonstrated.

We are advised that a similar sprinkler has been furnished to the electric railway at Colorado Springs, Col.

#### TROLLEY FROM PITTSBURG TO WHEELING, W. VA.

It is reported that an extensive traction project is being developed by a community of interests which will ultimately connect Pittsburg and Wheeling by a through system 90 miles long. For this purpose about 35 miles of new road will be required. For the entire project lines are either operating or under construction or charters and rights of way have been secured. The completion of the plan may require about three years. It is expected that immediate connection with Pittsburg will be effected by the extension of the United Traction Co.'s line along the Ohio valley to Rochester, where it will connect with the line of the Beaver Valley Traction Co. West of this the through line would require but comparatively short extensions of existing systems to complete the connection. A large amount of the work has been in securing rights of way over the unbuild portions of this route.

## SOME LARGE JEWETT CARS.

The Jewett Car Co., of Newark, O., is building some 60-ft. semi-convertible cars for the Columbus, London & Springfield Ry. and the Columbus, Buckeye Lake & Newark Traction Co. which are said to be the largest electric cars that have been built up to the present time. They are designed so as to make first class winter or summer cars and their general appearance is shown in the accompanying engraving. When arranged for winter service they have double sash as shown, the top one being stationary and the bottom arranged to raise about 16 in., so as to give sufficient ventilation and still not



JEWETT CAR FITTED WITH WINTER SASH.

obstruct the view of the passengers, which is some time the case with this style of window.

When the cars are arranged for summer service the curtains, which are of pantasote, can be pulled down past a suitable moulding at the guard rail so as to completely protect passengers from storms. This protection is accomplished by the curtain material, which is wide enough to extend into grooves in the side posts and by having cross bars in the curtains 10 to 12 in. apart.

The cars are finished in quartered oak throughout and are fitted with solid bronze trimmings. The seats are of the Wheeler type and are unusually long, so that in case of a large crowd three passengers can be comfortably seated on one seat, thus making the seating capacity of the car 108 passengers. The cars are vestibuled at each end, as shown, with double hung doors on each side of the vestibules. The step openings are fitted with double tread Stanwood steps. The bodies are mounted on Peckham M. C. B. type of trucks and are equipped with General Electric 75 h. p. motors and

given as about \$30,000 in all, and the incorporators state that the new roads have nothing to do with any of the existing traction lines.

Another company, called the Duquesne Heights Street Railway Co., has secured a charter to build three miles of traction line, the incorporators of both of these companies being the same parties which constitute the board of directors of the Pittsburg & Washington Street Railway Co. The tunnel and line to Washington involve an expenditure of about \$1,000,000 for construction. The route has been practically selected, but information in regard to it is being withheld until the plans of the company have been more fully matured.

## BERKSHIRE RAILWAY EXTENSION.

The Berkshire Street Railway Co. has applied for a franchise to extend its lines from Pittsfield, Mass., to the New York state line. The company expects to have its through line from Ches-



JEWETT CAR WITH SASH REMOVED FOR SUMMER.

Christensen air brakes. These cars are models of the latest design and equipment in street car building.

## ROME-NAPLES ELECTRIC LINE.

The project for an electric railway between Rome and Naples, Italy, which has been undertaken, is to be supported by the government. Power is to be furnished from the Tiber and Volturno Rivers, on which water power plants are to be located which it is expected will furnish 8,000 h. p. The company expects to operate 12 trains daily, each of which will have a capacity for 140 passengers. It is stated that the distance will be covered in three instead of six hours as at present.

shire to Great Barrington completed this fall, in which case cars will be run on a portion of the road before January 1st. The Berkshire company has entered into negotiations with the Albany & Hudson Railway & Power Co., which runs cars between Albany and Hudson to connect at the New York state line. This connection would give the Berkshire company through trolley connections with central New York.

The Albany & Hudson Railway & Power Co. is very desirous of meeting the Berkshire company at the state line. The former company has stated that it will have its road completed to the state line as soon as the western branch of the Berkshire line is finished.

The Chicago Union Traction Co. has received two new compressed air cars from Rome, N. Y.



## CHICAGO COMMITTEE ON LOCAL TRANSPORTATION.

The following paper contains suggested outlines of street railway franchise renewal ordinances for Chicago together with a description of some of the features of the case. The paper was prepared by Mr. Geo. C. Sikes, secretary of the committee, and the plans formulated are submitted as a basis for discussion and contain the provisions of policy that the committee believe should be incorporated in the new street railway franchise renewal ordinances:

1. In any negotiations that may be had with the existing companies, the desirability, from the operating point of view, of complete unification of management should be urged. As a minimum requirement with respect to unification of management, the companies receiving grants should be made to agree to use tracks and motive power jointly, when ordered to do so by the city council, at least to such an extent as may be necessary to secure the substitution of routes through the business district for the present down town terminals, such through routes to extend at least as far as 35th St. on the south and at least as far as Fullerton Ave. on the north. Joint use of tracks and power should also be required to such extent as may be necessary to have the present disconnected lines on such great thoroughfares as Halsted St., Ashland Ave. and Western Ave. spliced together, and to have cars operated over such thoroughfares from end to end, without the breaks that now exist. Companies should also be required to issue and receive transfers from one another, so that a passenger from one division of the city may ride through the business center and well into another division without paying an extra fare. A passenger from either of the other two divisions of the city should be able to ride for a single fare, on the north at least to Fullerton Ave., on the west at least to Western Ave., and on the south at least to 35th St. Where the companies cannot agree among themselves on the terms on which tracks and motive power shall be used jointly or upon the terms of an interchangeable transfer system as above provided, then in such case such terms shall be determined by the appellate court upon the petition of either party, after notice to and hearing of all parties in interest. If for any reason the city should deal singly instead of collectively with the companies whose franchises are soon to expire, then each of said companies, as to joint use of tracks and power and as to interchangeable transfer arrangements, shall agree to enter into arrangements for the joint use of tracks and power and for interchangeable transfer, whenever the city shall induce any or all other companies to agree to enter into like arrangements.

2. It should be a condition of every grant that the company receiving the same shall proceed at once to put its roadbed, plant and equipment into first-class modern condition and shall render first-class service for the full term of the grant. The company shall be subject to all general ordinances of the city of Chicago relating to street railways now in force or hereafter to be passed. All work of construction, reconstruction and repair shall be subject to the supervision and approval of the commissioner of public works. All electrical work shall be subject to the supervision and approval of the city electrician. The running time and headway of cars shall at all times be subject to regulation by the city council. Where a conductor cannot furnish a passenger a seat at the time of collecting his fare, then the fare collected by such conductor from such passenger shall be one cent less than the rate of fare that otherwise would be collected.

The grant will be for a period of 20 years. The city council, if it shall be of opinion that the grantee is not using the grant in the best interest of the public, shall have the right, at any time during the second ten years of the grant, to terminate the same, upon not less than six months' notice, and to take over the property of the grantee suitable to and used by it for street railway purposes, upon paying therefor the full value of the property for street railway purposes (which value shall be taken to be the cost of duplication less depreciation), with a 5 per cent additional thereon as compensation for the compulsory sale, but there shall be no allowance for franchise values or other consideration whatsoever. In case of failure to arrive at a decision of the matter by mutual agreement the value of the property to be taken over shall be determined by three competent persons, one to be chosen in such manner as the city council shall direct, one to be chosen by

the company, and the third to be chosen by the two thus selected. If, at the time when the city of Chicago may desire to terminate the grant and to take over the property of the grantee as above provided, the said city shall not have received from the legislature the grant of authority and power necessary to enable it to take over said property and utilize it, then the city council may terminate the grant as aforesaid, and may authorize any other corporation designated by it for such purpose to take over such property upon paying therefor its full value as aforesaid, with 5 per cent additional thereon, as above provided, such value, in case of difference, to be determined by three competent persons, one to be chosen by the buying and one by the selling company, and the third to be chosen by the two thus selected. At the expiration of the grant the grantee may be required to sell to the city or to any corporation designated for such purpose by the city council all of its property suitable to and used by it for street railway purposes, upon the payment of its full value as above provided, but without the said above allowance of 5 per cent additional. At the expiration of the grant, if the company shall desire and shall be denied a renewal, the city shall take over at its value as above the property of the company suitable to and used by it for street railway purposes, or shall make provision for its taking over by some other company designated by the city council for such purpose.

3. Every company accepting a grant must agree that all its licenses, franchises, or grants of permission and authority, from whatsoever source derived, to lay down, maintain and operate street railways in the city of Chicago, shall expire or become terminable at the same time and in like manner as may be provided in such grant for the expiration or termination of the licenses or permission and authority by such grant given. In case a grant is made to the Union Traction Co. or to any other company, overlying, subordinate or leasing companies, the provisions of this section must be consented to, not only by the Union Traction or other overlying company, but also by all of the constituent or underlying companies.

4. No company accepting a grant as herein contemplated shall directly or indirectly sell or transfer its grant, or consolidate with another company, or enter into leasing or operating agreements with another company, except with the approval of the city council.

5. Representatives of the city and representatives of the companies, in conference, shall agree upon the particular streets to be used, and all tracks unused or not required by public interests shall be removed from the street.

6. Where the public interests require the extension of any line of street railway or the construction of any new line, the company directed by the city council to construct such new line shall construct the same and operate said line as a part of its system. If the company shall object that the public interests do not really call for such new line, then the question as to whether the public interests do require said proposed new line shall be submitted for settlement to three competent persons to be chosen as in other like cases herein provided.

The city, in lieu of having the company construct such new line, may itself construct the roadbed, track, and necessary track equipment, and require the company to furnish power and to make the necessary power connections and to operate said line, paying for the use thereof a reasonable rental.

7. The cable form of motive power shall be abandoned. All cars shall be propelled by electricity. Within a district bounded by Fullerton Ave. on the north, Western Ave. on the west, and 35th St. on the south, no poles or overhead wires shall be used, but within such district current shall be supplied to cars by underground conductors. Outside of such district the overhead trolley may be used.

Or, in lieu of requiring the underground trolley, the city will construct a system of subways for the accommodation of street cars, the subway district not to be larger than an area bounded by Chicago Ave. on the north, Halsted St. on the west, and 16th St. on the south. The companies receiving grants to enter the subway district with street railways will, on the completion of the subways, take their tracks from the street surface and place them in the subways, and pay for the use of such subways a reasonable rental. If the subway plan is adopted, the overhead trolley will be permitted throughout.

If the city shall be unable to finance the project for city construction of subways, it will prepare plans for such a system of subways, and will give to the best bidder a franchise to construct the subways and to lease the same, and the companies receiving grants to enter the subway district with street railways will, on the completion of such subways, take their tracks from the street surface and place them in the subways and pay for the use of such subways a reasonable rental.

8. It should be a condition of the grant that no conductor or motorman be required or allowed to work more than 10 hours in any one day, except in emergencies, such working day of 10 hours to be completed in 12 consecutive hours. The wages of conductors and motormen of one year's service with the company shall not be less than 21 cents an hour; of two years' service, not less than 22 cents an hour; of three years' service, not less than 23 cents an hour; of four years' service, not less than 24 cents an hour; of five years' service, not less than 25 cents an hour. And where, in cases of emergency, conductors or motormen shall be required or allowed to work more than 10 hours in any one day, the rate of pay for the time in excess of 10 hours shall be 50 per cent higher than the rate of pay for the working day of 10 hours or less.

Every company accepting a grant shall establish a merit system for all conductors and motormen in its service, such merit system to be administered by a board constituted for that purpose. The tests for admission to the service of a company shall be subject to the supervision of such board, which board shall promulgate rules of conduct and discipline; all dismissals from service shall be subject to the approval of such board. The city shall have one representative on such board, such representative to be selected in such a manner as the city council may direct.

9. If it shall be found practicable to have streets occupied by car tracks swept by car sweepers or sprinkled for their entire width by car sprinklers or to have street sweepings, garbage or other refuse removed by street cars at night, every company accepting a grant may be required by the city council to procure the necessary equipment and to render for the city any of the services aforementioned. A company required by the city council to render any such service shall receive therefor a reasonable compensation, to be determined in case of difference by three competent persons, to be chosen as in other like cases herein provided.

10. The city shall have the right to place lights on all trolley poles that it may care to utilize for such purpose. The city shall also have the right to string city wires on such poles, but the stringing of such wires shall not interfere with the use of such poles by the company. All trolley poles shall be of neat and artistic appearance, and shall be equal in style, quality and appearance to the poles maintained by the city for electric light purposes.

11. The companies shall fill, grade, pave and keep in repair 16 ft. where there is a double track railway and 8 ft. where there is a single track.

12. Policemen and firemen in uniform shall be permitted to ride free.

13. The company shall make detailed annual reports to the city council, in accordance with forms to be prescribed by the city comptroller, giving full information on all such matters as may from time to time be specified by the city council. For the purpose of verifying such reports the books of the company shall at all times during business hours be subject to examination by the city comptroller or by some person duly authorized by the comptroller to make such examination.

14. The company owning or using the Van Buren St. tunnel must lower the same to such depths as the interests of navigation may require. The city, out of the compensation to be derived from this grant, will lower the Washington and La Salle St. tunnels and collect from the company or companies using such tunnels a reasonable rental based on the cost of lowering such tunnels. The companies using the tunnels must keep the same in good condition and repair.

15. The question as to the amount of the compensation to be exacted for this grant, or as to reductions of fare to be secured hereunder, shall be left open for negotiations between the city and the companies after all the other provisions to be inserted in the grant shall have been determined upon. If compensation is exacted such compensation shall be in the form of a percentage of the gross receipts to be paid monthly into the city treasury.

The provision common to existing ordinances for a license fee for cars will be omitted from the new ordinances.

16. The company shall save the city harmless from all suits, etc., growing out of the grant.

17. There shall be a provision for a fine or other penalty to be visited on the company for failure to comply in good faith with all the requirements of the ordinance.

### RAILWAY AGREEMENT AT WORCESTER, MASS.

The Worcester Consolidated Street Railway Co. and the Worcester & Blackstone Valley Street Railway Co., which have been having considerable trouble in regard to the latter road entering the city over the former's tracks, have reached an agreement whereby the suburban road will come into Worcester over the Consolidated company's tracks in Grafton St. This agreement does away with the necessity for another track in Grafton St., for which the suburban road had petitioned, and the franchise petitions for tracks in this and other locations in Worcester have been withdrawn.

The Worcester Consolidated Street Railway Co. issues half-rate tickets for the benefit of children attending school, and a certain class of adults also enjoy the benefits of the half rate fares. These are the people who attend the evening public schools and evening drawing schools. In the case of the adult pupils the special tickets have to be countersigned by the principal of the school and they are only good on cars between 6:30 and 9:30 p. m.

### WESTVILLE-DANVILLE LINE OPEN.

The 7-mile interurban electric railway between Westville and Danville, Ill., was opened October 20th, at which time a special car made the initial trip over the line, taking with it a party of invited guests and press representatives. The line is now open to the public and a regular schedule is to be put into effect as soon as the company acquires sufficient data as to the requirements of passengers along the route. Double truck cars will be operated that will accommodate 75 persons. The road is single track throughout with but slight grades, and there are but few curves and no dangerous crossings. The fare is 10 cts. each way. The road is run in connection with the Danville, Paxton & Northern Ry., by which it was built.

The officers of this company are Geo. D. Duncan, president; H. E. Daniels, vice-president; Edw. Wordner, secretary and treasurer; M. Connors, superintendent, and S. L. Nelson, general manager.

### RACINE OBJECTS TO GRAVEL CARS.

The Milwaukee Electric Railway & Light Co., whose lines extend through Racine, Wis., is threatened with suit by the latter city on account of running gravel cars and trains through the city streets. It is alleged by the city authorities that the running of these heavy trains over the bridges has damaged the supports and materially weakened the structures. These bridges cost the city \$80,000 a short time ago and it is feared that they will have to be rebuilt in a few years owing to being overloaded with the heavy gravel cars. If the running of these cars is not stopped by the company, injunction proceedings are to be resorted to.

### CONSOLIDATION AT SEATTLE.

The Yesler cable line and the Jackson St. electric line in Seattle, Wash., were turned over to the Seattle Railway Co. on October 22d by James S. Goldsmith, the receiver. The Seattle Railway Co. is a new corporation with a capital of \$500,000, which has just been organized. On the organization of the new company, of which Mr. Goldsmith is president, he at once conveyed the properties to the new corporation by deed. Mr. A. F. Haas, formerly receiver and superintendent of the lines, has been retained as superintendent for the new company. For a time at least the two lines will be operated as independent systems, but eventually they will be consolidated into one line.



# MECHANICAL DEPARTMENT

## SPECIAL CAR FOR MECHANICAL DEPARTMENT.

The accompanying illustrations show a unique special car designed and built at the company's shops by Mr. Thomas Farmer, superintendent of motive power of the Detroit United Railway Co., for the service of the mechanical department. When it is remembered that since the United railway has acquired control of all but one of the interurban electric roads entering Detroit: one readily appreciates the need for such a combination office and supply car as the one Mr. Farmer has built with particular reference to his work.

The car is 32 ft. long, the front half being closed and the rear half open. The width over stake pockets on the platform is 8 ft. 10 in. The car is mounted on two modified du Pont trucks each of which is equipped with two No. 38 B Westinghouse motors, geared for a maximum speed of 60 miles per hour. The trucks have a 5 ft. wheel base and are 16 ft. 2 in. between centers.

A good idea of the manner in which the car is fitted up is given by our interior view. In front are five large windows, which in summer are provided with screens; on either side of this observation end is a single cane seat blocked up above the floor so that when seated, one can get a good view of the track ahead. Camp chairs are provided in addition to the longitudinal benches and a considerable party can be accommodated if necessary. A pantasote curtain is arranged to draw down just back of the observation chairs cutting off the forward end of the car; this is used when current is on the electric headlight.

There are two sleeping berths, both uppers, the lower portions of which show in the interior view. Each berth is 6 ft. 9 in. long and 2 ft. 6 in. wide and provided with a front board to prevent accidents when turning sharp curves or on rough track. Box spring mattresses with hair top are provided for both berths. Bedding is stored in one of the upright cupboards and the other

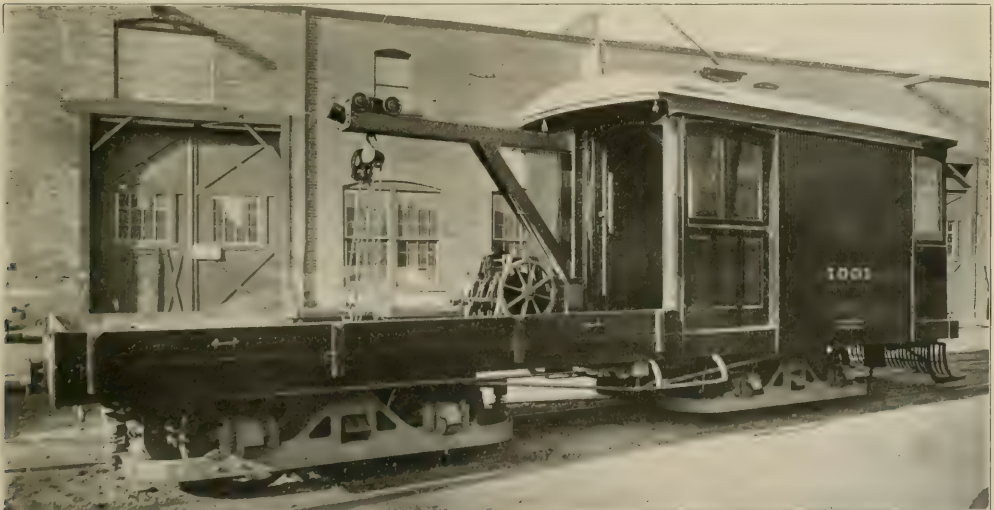
is a locker for the use of the crew. A stepladder for the berths serves as a motorman's stool and this with a desk for Mr. Farmer's use completes the cabin furnishings.

On the platform, just outside the door, is a crane of 8 ft. working radius and 2 tons capacity, which is used for handling heavy



INTERIOR OF CAR.

supplies, armatures, motors, etc., which it may be necessary to load and unload. Below the crane is a hand winch used in drawing wheels or trucks up on to the car. Just in front of the winch in the engraving will be noted three trucks which are used for armatures; in bad weather these are rolled inside.



SPECIAL CAR FOR MECHANICAL DEPARTMENT, DETROIT UNITED RY.



The platform floor has strap iron inlaid flush with the floor with grooves cut alongside so as to form two tracks onto which mounted car wheels or in emergency a whole truck can be rolled. The car carries jacks, frogs, bull rope, etc., so that it can be of assistance in case of derailment or other accident to regular cars.

On the front is an electric arc headlight. The ordinary headlights are carried on each end of the car roof (these are for city service, the arc being used on the interurban lines); under the



FRONT VIEW OF DETROIT SPECIAL CAR.

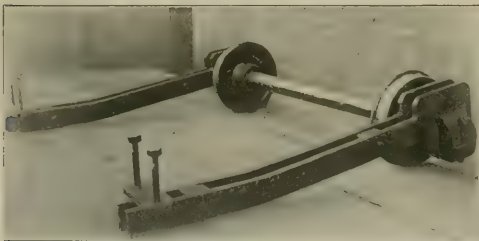
rear hood are incandescent lamps with red globes for tail lights, and on the rear end sill is carried an oil tail lamp. A trolley catcher is mounted on the end of the crane arm.

The car is used by Mr. Farmer when visiting the numerous power plants and car houses which are now under his jurisdiction, and for transferring supplies from the main shops to outlying shops and barns.

In carrying out the design every care has been taken to secure utility and comfort and the car is the most complete and serviceable that could well be imagined.

### BRINGING HOME A DISABLED CAR.

A number of expedients have been described in recent issues of the "Review," for bringing in a car disabled through the breaking of an axle or wheel. In Denver and other cities, a small four-wheel bogie truck is run under the damaged end and the car pushed or pulled to the barn with this truck taking the place of the



EMERGENCY TRUCK.

broken set of wheels. In Binghamton, N. Y., the two ends of a broken axle are temporarily repaired by bolting over them a collar made from the two halves of the hub of a split gear, with the rim and spokes removed. In New Bedford, Mass., a wrecking devise as illustrated herewith is kept on hand for emergencies of this kind. The wheels are 24 in. in diameter, and the two side frames are of malleable iron.

In placing the device under a damaged axle, the car is first jacked up and, if necessary, the broken axle or wheel is secured

by chains or otherwise, so that nothing will drag on the ground. The auxiliary wheels shown are then run under the car, bringing the side frames of the car truck between the guides over the bearing boxes of the auxiliary wheels.

The two U-bolts indicated in the cut are then put in place, with the bearing plates on top of the car truck frames, and the nuts screwed down, thus binding the car truck firmly to the auxiliary truck. The car can then proceed on the small auxiliary wheels. The device can be used under either a double or single truck.

### WHEEL RECORDS.

A prominent superintendent sends us the following record of wheel mileage taken on his road. The figures will be interesting to managers for comparison with their own records. We have no information as to the make and character of the wheels, except that they were purchased in contract lots from a first-class maker.

Cause of removal—	No. of wheels.	Average mileage.
Slid flat .....	122	19,156
Broken tread or flange .....	59	23,895
Broken wheel .....	34	16,327
Worn out .....	219	43,717
Total .....	477	31,655

The worn out wheels made the following mileage:

No. of wheels—	Distance Run, miles.	Average, miles.
23 .....	20,000 or less	8,804
15 .....	20,000 to 30,000	26,715
50 .....	30,000 to 40,000	34,616
63 .....	40,000 to 50,000	44,822
27 .....	50,000 to 60,000	53,443
27 .....	60,000 to 70,000	65,311
4 .....	70,000 to 80,000	74,522
4 .....	80,000 to 90,000	86,691
6 .....	90,000 to 100,000	94,177

The road on which these records were taken now buys its wheels at a contract price based on wheels making between 40,000 and 50,000 miles, and pays an increased price for each additional 10,000 miles actually run up to 100,000 miles.

### AN EFFECTIVE SLEET CUTTER.

The O. K. sleet cutter, shown in the accompanying illustration, for which Porter & Berg, of Chicago, are sole agents for the United States, differs materially from all other sleet cutting devices.

The cutter is made in two sizes, to fit 4-in. and 6-in. harps. It



TROLLEY SLEET CUTTER.

consists of a brass lug or contact piece which is riveted into a malleable iron elbow shank. The latter being fitted with a nut to hold it securely in place in the harp as shown in the illustration.

The brass contact lug is renewable and can be replaced when worn out at a small cost. This cutter is an emergency device, as it can be readily carried for emergency use on the car and can be adjusted by the motorman or conductor at almost a minute's notice. It has been given a thorough test in actual use during the sleet storms of last winter and has proven very effective and satisfactory.

## DEVICE FOR BABBITTING SPLIT BEARINGS.

It has now become the general custom, we believe, for street railway companies to rebabbit their bearing boxes at their own shops. These boxes are usually cast on arbors or in molds, but most roads have found it necessary to do more or less machine work on the babbitt castings before the boxes are ready to put in service. Several suggestions for pouring and boring split bearings were presented in the "Review" for June last, page 367.

In the illustrations herewith is displayed a device, lately put upon the market by the Frank Ridlon Co., of Boston, by means of which it is announced bearings can be rebabbitted, ready to go to the axles without further boring or machine work of any kind.

The device consists of an arbor mounted upon a stand. The iron shell of the bearing to be poured is placed over the arbor,

minutes to test an armature, and the water will not have time to become hot. Yours truly.

A. F. REXROTH,  
Harrisburg (Pa.) Traction Co.

## NEW CAR HOUSE AT UTICA.

Contracts were awarded on October 21st for the construction of a new car house for the Utica & Mohawk Valley Street Railroad Co. to be located in one corner of Utica Park. The new building is expected to be completed early in February. It is to be 225 x 80 ft., of fireproof construction, with brick side walls, fireproof doors and steel roof. In front there will be a series of combination swing and slide doors. The interior will be divided into equal compartments, each 40 ft. wide, and each compartment will contain three

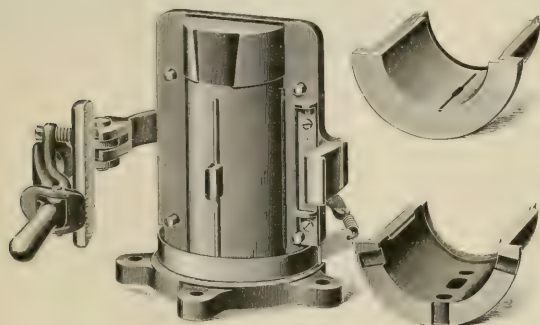


FIG. 1—OPEN.



FIG. 3—SHELL.

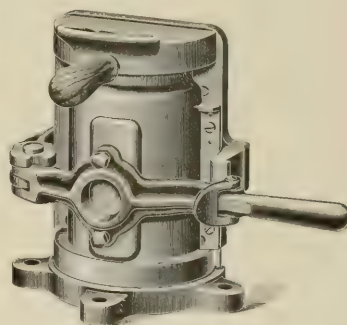


FIG. 2—SHELL IN PLACE.

with the shoulder at the bottom, and is held in place by a swinging arm, pivoted at the back of the stand. This arm swings around and is held by a catch during the act of pouring. As soon as the casting is hard, the arm is pulled forward, this motion also automatically throwing the box free from the arbor, and the operation is completed. Arbors and machines are made for all the regular styles of motor bearings, each pattern turning out boxes ready to run. Skilled labor is not necessary to operate the machine, and any man or boy who understands the handling of babbitt can pour the boxes as fast as the metal will cool. The arbors are so made that the oil-ways are formed when the metal is cast. Fig. 1 shows the device before the unbabbitted shell is put in. Fig. 2 shows the shell in place and the gate on top ready to receive the molten metal. It is named the Weld babbitting device, and is sold by the Ridlon company under letters patent.

## TESTING ARMATURES.

Editor "Review": It has been my desire for some time to find a sure method of testing armatures for a short circuit, and now I have it. It has been my experience and also that of others with whom I have talked, that oftentimes, in connecting armatures to commutators, a short circuit will be left that cannot be detected until the motor has gone into service, and the section of armature connected to the short-circuited bar has become hot and burns out.

To properly test an armature, pass a current of about 10 amperes at 500 volts through it, with the aid of a yoke with adjusting contacts, so as to make connection on same bar on which the brushes should set. Use a voltmeter with low reading dial so that 2 volts will read full 600. With the terminals from the voltmeter test the adjoining bars from one contact to the other, and when one space is tested, move the yoke to the other part of commutator, so as to test all bars. If bars are free from short circuit, they will read about 8 points on the voltmeter, but if a drop of two or more points occurs on any bar, you may look for a slight short circuit. If meter does not read any figure you will find a dead short circuit.

I use a coil of iron wire for my resistance, or where this kind is not at hand, a water resistance can be used as it only takes a few

tracks running lengthwise the entire distance of the house. Under one track a pit 60 ft. long will be built for carrying on the repair work under the cars.

## BUYING CAR WHEELS ON GUARANTEES.

There is a wide diversity of practice among street railway companies in the matter of buying their car wheels. Most companies now buy on a yearly or longer time contract, usually agreeing to take a certain number of wheels within a given period at a stated price per lb. or per wheel. But there seems to be no uniformity in the wording of the contract. Some managers prefer to buy on a high guaranteed mileage at a higher price, stipulating that the wheel makers shall replace all wheels not making the guarantee, while others buy on a lower mileage basis, and pay a graduated premium on all wheels making over certain specified mileages.

In answer to an inquiry, a manager of a 1,500-car road sends in the following statement:

"We buy our wheels under a written agreement, at a stated price per 100 lb. weight. We are allowed by the manufacturers a stated price per 100 lb. for all scrap wheels returned. The car-wheel companies replace all wheels broken in service, and guarantee that the average mileage of wheels furnished will not be less than 32,000 miles. The wheels used by us are made from our own drawings. Our agreement with the car-wheel companies is not an elaborate affair, but merely contains clauses covering these points. We feel that it is best to have some written agreement with the wheel companies, so as to have something to refer to, in case questions arise for settlement."

A reduction is noted in the total valuations placed upon the special franchises of corporations operating in the state of New York, the report of the state board of tax commissioners showing the valuations for 1901 to aggregate \$87,150,765, as against \$266,202,759 for 1900. The difference of \$189,051,994 has resulted from the operation of the crossings law of 1901, which eliminates from taxation for special franchise purposes the property occupied by all railroad crossings, excepting those of elevated roads, less than 250 ft. in width.

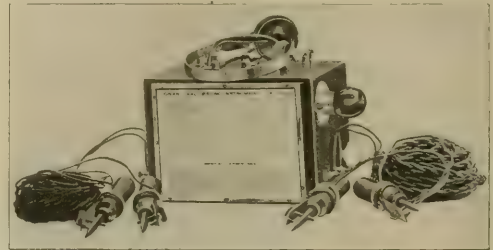
## FOUR MOTOR EQUIPMENT.

Apropos of the discussion that is still going on as to the relative economy of two and four motor equipments, we are enabled to publish a table of statistics secured from tests made at Milwaukee in 1900. We believe it is now generally granted, that other things being equal, a car under regular service conditions, equipped with four motors will consume from 10 to 50 per cent, and on the average of 25 per cent, more current than one with two motors. But the advocates of the four-motor equipment, who we believe are now in the majority, argue that this increase in power consumption is more than offset by other considerations; as, increased weight available for traction, higher speeds and faster schedules, more rapid acceleration, and reduction in cost of motor maintenance and repairs, due to the smaller heating effect of the four motors and the reduction of wear and tear on the equipment.

In discussing the question actual figures are not always produced, and there is some danger of drawing somewhat distorted and unreliable conclusions from estimated statistics. The figures exhibited in the table are well vouched for. They were secured by wattmeter tests on three cars of each type under the same track and weather conditions, the averages taken being shown in hours. The table forms a comparative statement of power consumed by the three different types of equipment; double-truck cars with four motors, double-truck cars with two motors, and single truck cars with two motors. The tests were taken under both city and suburban service conditions.

These particular figures are certainly not altogether favorable to the four motor equipment, for although the cost per car-hour for the two motors is given as 60 per cent of that for the four motors, the passengers carried and presumably the receipts for the two

difference of temperature between different motors alters the resistance of the winding and as there is no good way of determining the actual temperature, it is practically impossible to know whether the coil is perfect or not. If the test is postponed until the motor has cooled, oftentimes the short circuit has disappeared only to reappear and give trouble when the motor becomes heated in service.



CONANT COIL TESTING INSTRUMENT.

It was principally to obviate this difficulty that this new system of testing was devised.

The instrument with which the test is made is known as the Conant coil testing instrument, and it operates on the principle of comparing the magnetic strengths of the coils rather than their resistances. As well as being applicable to the detection of short circuited fields, it has another valuable feature, in that it enables motors to be correctly paired so as to get two of equal strength on the same

COMPARATIVE STATEMENT OF POWER CONSUMED BY THREE DIFFERENT TYPES OF EQUIPMENT.

Description of Cars and Motors.	Weight of Car Empty.			Kilowatt-Hours.			Passengers Carried.		
	Lb.	Per Cent.	Ratio Consumed as to Weight.	Consumed per Car-hour.	Cost per Car-hour at 2 cents per kw.	Ratio kw. hours consumed per car-hour.	Average per day.	Per car hour.	Per cent.
Double truck, 43-ft. cars, 4-G. E., 1,000 motors...	39,000	100.	100.	22.28	\$ .4456	100.	1075	57	100.
Double truck, 43-ft. cars, 2-G. E., 1,000 motors...	33,500	85.	68.	13.41	.2682	60.	1015	53	94.
Single truck, 32-ft. cars, 2-G. E., 800 motors....	21,000	62.	54.	7.30	.1460	33.	873	46	81.

types of equipment are practically the same. Even taking into consideration the question of relative cost of maintenance, for which figures are not available, it would seem that in this case the advantages of the faster schedules possible with the quadruple equipment are rather dearly bought. It should be added, however, that the Milwaukee company has adopted the four-motor equipment as standard, believing that the better service is worth all that it costs in increased power consumption.

## THE CONANT COIL TESTING INSTRUMENT.

BY ROGER W. CONANT, E. E., CAMBRIDGE, MASS.

One of the most troublesome matters in connection with street railway motors is the tendency to overload them, thus causing deterioration of the windings by reason of overheating. This eventually short-circuits the field. After the field has become weakened from this cause, other troubles such as sparking, overheating of the armature and flashing or bucking occur. These are continual sources of expense to the railway company and various ways of testing have been tried, looking to the detection of this trouble in the fields at its start, in order that steps may be taken to prevent further deterioration of the motor.

The invention here described applies to a new system of testing these motor coils, for short circuits and other defects. It has long been appreciated that the tests heretofore made, such as measuring the drop while passing a known current through the coils, is very unsatisfactory for several reasons, the principal one being that the

car, thus insuring that their work may not be unequally divided so as to cause trouble by overloading one of the motors.

The method of testing is as simple as it is novel. There are no multiplicity of troublesome connections to make, no simultaneous readings of ammeter and voltmeter or calculations requiring time and introducing considerable chance of error, no delicate instruments to be dropped or possibly burnt out during the tests.

The cut shows the instrument. Its indications are by means of a telephone receiver. The four terminals work in pairs, the pair at the right being designed to make contact with, say the standard or perfect coil, and the pair at the left to connect with the coil to be tested.

If the two coils are of equal magnetic strength, and connected with the instrument in operation, they balance and no sound is heard in the telephone. Should there be any inequality in the coils a sound will be heard which may be reduced to a minimum by the insertion of the movable core into the proper end of the case. The end at which the sound is diminished shows which is the weaker coil. The core is further provided with a scale extending longitudinally along it, so that the degree of insertion can be noted. In practice it is found that the same style of motors may be unequal to an amount requiring the insertion of the core to one and one-half degrees of the scale, but that any amount over this indicates a defect.

Resistance changes, unless extremely high, do not affect the instrument, so that a heated motor can be tested against a cold one and the test plugs can be connected at the car controller, thus avoiding the necessity of disturbing the car wiring. That is, when either the entire armature or all the fields are tested at once. After





Attention Scanner:  
Foldout in Book!

a motor is found to be defective the actual coil in which the trouble is located may be found by opposing each in turn to the similar coils in the standard motor.

It is not necessary to keep a standard motor set apart out of service, as the attendant may take one of any two that balance and find a third that balances with it, and use it as a standard. Three motors will never be defective to exactly the same amount.

The current is furnished by a small dry battery within the case of the instrument which also contains a spare battery adapted to be readily substituted for the first in case of its long continued use.

This instrument has been in operation on several roads for over a year and is found to be thoroughly practical and reliable.

### RAILWAY HEADLIGHT.

The Globe Manufacturing Co., of Cleveland, O., has published a new catalog relative to its products in the line of arc lamps, railway headlights and multiplex reflectors. The particular advantage of the Globe electric headlight which is made by this company lies in its automatic regulation. The illumination is produced by an arc light, and the feeding device for the carbons is so constructed that they are securely locked in their proper positions no matter how violently the headlight is shaken. These lamps are arranged to operate on railway circuits varying from 250 to 750 volts and they are adjusted for from 1 to 3 amperes.

Multiplex reflectors for these headlights are spun out of heavy gage brass, and they are constructed of a series of convex or concave corrugations of a size and radius varying with the amount and kind of light desired. The catalog also contains illustrations and descriptions of hood headlights with various styles of reflectors.

### PLANS TO CONNECT CLEVELAND AND CINCINNATI.

October 16th announcement was made of the purchase of the Canton-Akron Railway Co., by the Everett-Moore syndicate, and it has been stated that this purchase is the first step in the establishment of a through line from Cleveland to Cincinnati. This move will put the Everett-Moore syndicate in competition with the Pomeroy-Mandelbaum syndicate which controls the Cleveland, Elyria & Western Ry., which is also building a through line from Cleveland to Cincinnati. It is stated that the deal which has just taken place will give the syndicate the right of way, including some lines now under construction, for the entire distance between Cleveland and Cincinnati by way of Columbus. The deal was concluded with Tucker & Anthony because this firm controls the Columbus, Buckeye Lake & Newark Traction Co., which now has a line nearly completed between Newark and Columbus. From Canton to Newark the same firm has secured a franchise and nearly all of the right of way. It is also believed that the syndicate will secure through A. E. Appleyard & Co., the Columbus & Springfield Ry., the Dayton, Springfield & Urbana Ry., and the Dayton, Lebanon & Cincinnati Ry., the latter being a steam road which is being changed over for electric operation.

The ownership of this line would give the Everett-Moore syndicate a road passing through one of the richest sections in the state and besides the places already mentioned, it would touch a number of thriving centers, as New Philadelphia, Coshocton, Newark and other points of similar importance.

This route also has the advantage of being shorter than that of the Pomeroy-Mandelbaum syndicate, the total length of the line being about 235 miles.

### OHIO NOTES.

The Canton-Massillon Electric Railway Co.'s new line from Massillon to Navarre has been completed and traffic was commenced the first of the month.

The village council of Collinwood, a suburb of Cleveland, has extended the franchise of the Cleveland Electric Ry. to 1924. The stipulations are that the road must carry passengers from any point in Cleveland to Nottingham for one fare, and pave 17 ft. of the street through which the cars run.

The Columbus, London & Springfield road will at once begin the work of completing the Central Market road, one of its lines. Steel rails are to be laid at once on a number of the streets in the southeastern part of the city.

The Lake Shore Electric Railway Co. has begun the task of straightening out all the bad curves on its line which can be done without excessive cost. When this is done it will be quite a factor in permitting a higher speed, when through cars are put into service. The company is also planning additional freight depots and passenger stations.

The Columbus Railway Co. received the first consignment of closed cars ordered last summer, about the middle of this month. There are to be 20 new cars and five of them will be equipped with individual revolving seats which are rattan and back finished in cherry. This company is also installing four new boilers of 400 h. p. each, preparatory to reconstruction of the entire electrical system. Most of the old boilers were taken out some time ago to make room for the new ones, and this has made it difficult to provide current for heating the cars. The improvements in the electrical system will necessitate the expenditure of several hundred thousand dollars. The company is also making some very important changes in its tracks, and this work will continue for some time.

The new Columbus, Johnstown & New Albany Electric Ry. was opened to the public on November 8th. This line connects Columbus with Johnstown, an important village in Licking County, and will be about 20 miles in length when completed. It extends through a rich agricultural section that is not traversed by any other electric or steam road. That portion opened to traffic at present only extends to Rarig, a manufacturing suburb about four miles east of Columbus. The rate of fare to this point will be 15 cents for the round trip; commutation books for 14 single trips will be sold for \$1.00; 43 single trip tickets will be sold for \$3.00. Each of these coupon tickets will be good to any point in the city by special arrangement with the Columbus Railway Co. The opening of this road means much to that section of Franklin and Licking Counties through which it passes, and will be a great boom to the farmers and gardeners who will thus be placed in much closer touch with the markets. Mr. Thomas N. Courtright is the general contractor for the road.

In the suit brought by property holders along the national pike in Madison County, against the Columbus, London & Springfield Electric road, Judge Boyer, of the London Probate Court, has rendered a decision that is adverse to the railway. The case involved land lying between Lafayette and Summerford. The company endeavored to buy the land, but no price could be agreed upon and thereupon condemnation proceedings were instituted, and the case has been bitterly fought. Judge Boyer held that the condemnation of the land for the private right of way was not an actual necessity since the railroad had not made any effort to secure the majority of consents of the land owners or applied to the county commissioners for a franchise through the territory in question. These were the grounds contained in the demurrer of the defendants, which were sustained by the court. If this decision should stand it would block the plans of the railway to build an air line between Columbus and Springfield and would necessitate the completion of the link between London and Summerford, so that the cars could be sent around by way of London. The case will be appealed to the Common Pleas Court at once. It seems that the people of Madison County generally have been hostile to this road, and have thrown obstacles in the way of its completion whenever they could. However this may be, the management is succeeding admirably with the enterprise and when completed will be one of the finest roads in central Ohio.

### TWO SERIOUS ACCIDENTS.

A collision between a freight train on the Chicago Great Western Ry. and an electric car, in Kansas City, Kan., November 7th, resulted in injuries to six persons, two of whom may die.

Another accident occurred near Alexandria, Ind., on the same day, a Marion bound car on the interurban line from Anderson being wrecked while running at a high rate of speed. The car contained 24 passengers, five of whom are reported to have sustained serious injuries.



## PERSONAL.

MR. G. A. TAFT, of Colorado Springs, has been appointed general manager of the San Juan Railway & Electric Co., which was recently organized to build and operate an electric railway in Ouray County, and to furnish power for the mines in the San Juan district.

MR. L. J. HIRT, formerly assistant chief engineer of the Metropolitan Street Railway Co., of New York, and later connected with the New England Gas & Coke Co., sailed Nov. 4th, for Brazil to make an inspection of the work of the Sao Paulo Tramway Light & Power Co.

MR. WILLIAM E. MALONEY, formerly of Worcester, Mass., has been appointed superintendent of the Manchester (N. H.) Street Railway Co. On leaving Worcester, November 1st, Mr. Maloney was presented with a handsome testimonial of regard by some 300 motormen and conductors of the Worcester Consolidated Street Railway Co.

MR. JOHN W. McNAMARA has succeeded Mr. Robert C. Pruyn as president of the United Traction Co., of Albany, the latter having been made chairman of the board of directors. The office of second vice-president, formerly held by Mr. McNamara, has been abolished and the duties it entailed will hereafter be performed by the president.

HERR SIEBER, managing director of the Nurnberg-Further Strassenbahn Gesellschaft, and a prominent member of the Verein Deutscher Kleinbahn & Strassenbahn Verwaltungen, is making a tour of inspection of the principal electric railway systems in the United States. The itinerary will include Philadelphia, New York, Washington, Pittsburg, Chicago, Schenectady and Boston.

THE TOLEDO RAILWAYS & LIGHT CO., successor to the Toledo Traction Co., has the following officers: President, A. E. Lang; vice-president and general manager, L. E. Beilstein; auditor, C. O. Reed; claim agent, E. H. Eckert; electrical engineer and superintendent of lighting, E. J. Bechtel; superintendent of railways, J. F. Collins; superintendent of tracks, J. W. Rogers.

MR. ALLEN F. EDWARDS, general manager of the Detroit & Toledo Shore Line Railroad Co. and of the Toledo & Monroe Railway Co., is a graduate of Columbia University, where he took a degree in electrical engineering. His first work in the electric railway field was with the Yonkers (N. Y.) Railroad Co. of which he was appointed auditor in 1896; after being employed in different departments Pres. Albert L. Johnson appointed him superintendent. When the road was purchased by the Union Railway Co., of New York City, in 1898, Mr. Edwards remained in charge of operation as general superintendent. In 1899 he went to Petersburg, Va., as the representative of Baltimore and Richmond capitalists to assist in effecting the consolidation of the electric light, water power and street railway interests, and when this work had been carried to a successful completion he remained as general manager of the consolidated company. In January, 1901, Mr. Edwards went to Detroit to become general manager of the Toledo & Monroe Ry., then building by Messrs. Black and Mulkey. When in July last control of this property was acquired by the Everett-Moore, Syndicate he was also appointed general manager of the Detroit & Toledo Shore Line R. R., which in connection with the Toledo & Monroe Ry. makes a double track electric road connecting Detroit and Toledo. The headquarters of the company are in the Majestic Bldg., Detroit, although Mr. Edwards has to spend a considerable portion of his time at Monroe, the operating office being located in the power house.



ALLEN F. EDWARDS.

MR. G. J. SMITH, who has for several years been superintendent of rolling stock for the St. Louis & Suburban Railway Co., has recently severed that connection to become assistant superintendent with the St. Louis Car Co. Mr. Smith has had an extensive experience in street railway car work which peculiarly fits him for the position which he has just taken. He was born in Pennsylvania in 1864 and early showed a strong inclination for mechanical pursuits. After learning the trade of millwright, he went to Louisiana and engaged in the construction of sugar and rice mills; two years later he joined a surveying corps working in South America and Mexico, but because of the climate he was obliged to give up that work and return to the United States. In 1889 when the electric railway was attracting much attention



G. J. SMITH.

Mr. Smith saw the great possibilities in this field, and secured a position with the South Covington & Cincinnati Street Ry. After 18 months he was appointed master mechanic and remained with the company in that capacity until 1899, when he resigned to become superintendent of rolling stock for the St. Louis & Suburban.

MR. C. E. FLYNN, who has been for several years the general manager of the Easton Consolidated Electric Co., which embraces twelve subsidiary corporations, has just resigned that office to accept the appointment of general manager of the Wheeling Traction Co., of Wheeling, W. Va. Mr. Flynn assumed the duties of his new position in the early part of this month. He was formerly in Wheeling in the winter of 1887-88, at which time he installed the Van Depoele electric line, which was the first electric railway in that city.

MR. LUCIUS B. SHERMAN has been appointed Western manager of the Railroad Gazette and will have his headquarters at No. 1750 Monadnock Bldg., Chicago. Mr. Sherman is a native of Chicago and was educated at the Hyde Park high school and the old Chicago University. He has been connected with the advertising departments of several leading railroad trade journals and was recently Western manager for the Pocket List of Railroad Officials. This position he resigned to accept the Western management of the Railroad Gazette.

MR. W. KESLEY SCHOEPP, who since April 9, 1900, has filled the position of vice-president and general manager of the Consolidated Traction Co., of Pittsburg, was elected, on October 12th, to the presidency of the Cincinnati Traction Co., in which he is a prominent stockholder. Mr. Schoepf has been chairman of the executive committee of the Cincinnati company, which position will be filled by Mr. Hugh J. McGowan. The change will be effected about January 1st, when the acquisition of the Pittsburg lines by the Philadelphia Co. is expected to be complete and the directors of the Consolidated Traction Co. will take some action on Mr. Schoepf's resignation.

Mr. Schoepf was born in 1864 at Fort Delaware, where his father, Gen. Albin Schoepf, was then commandant. In 1883 he engaged on the preliminary engineering work of the South Penn R. R. Later he removed to Washington, D. C., where he was chief engineer of the Rock Creek Ry., now a part of the Capital Traction system. From 1892 till 1897 Mr. Schoepf was closely associated with W. L. Elkins, P. A. B. Widener and Thomas Dolan



W. K. SCHOEPP.

in the development of street railways in Washington. He effected the reorganization of the City & Suburban Ry., and engineered the reconstruction of the road, installing the conduit electric system. For three years he was receiver of the Eckington & Soldiers' Home Ry., the Belt R. R. and the Maryland & Washington Ry. On retiring from Washington he retained, and still retains, many of his financial interests in that city.

MR. ALBERT H. STANLEY, general superintendent of the Detroit United Ry., is one of the very considerable number of young men who are connected with the Everett-Moore interests and occupy positions of great responsibility.



ALBERT H. STANLEY.

Mr. Stanley is a native of Detroit and is but 26 years of age, and for over half his life has been in the service of the Detroit United Ry. and the predecessors of that company. When 13 years old he commenced work as office boy in one of the sub-offices; after three years at the sub-office he had been promoted to time-keeper, and was then given charge of making out the car schedules. Two years later he entered the auditing department, where he remained for about a year. Believing that the operating department offered a better field, Mr. Stanley then asked to be transferred and was given a temporary appointment as division superintendent; he took the new position with a firm determination to succeed and after two months the appointment was made permanent and he continued in that capacity until the increased demands upon the general superintendent required that an assistant be appointed, when Mr. Stanley was promoted to the new office. After he had held this position for a few months the general superintendent resigned and Mr. Stanley was promoted to his present position, the importance of which has been steadily and of late very rapidly increased by reason of the absorption by the United company of the various interurban lines entering Detroit.

MR. J. B. HANNA, who recently resigned as secretary and treasurer of the Cleveland City Railway Co. in order to devote his energies to the development of the Everett-Moore projects, has been offered, and it is believed will accept, the presidency of the proposed Central Illinois Ry., which the syndicate will build from Bloomington, Decatur and Springfield, Ill., to St. Louis. Grading for this line has been begun and it is expected to have the first division of the road in operation by July 4th. If Mr. Hanna accepts the office of president of the Central Illinois company he may decide to remove the general offices from Springfield, where they are at present located.

MR. STEWART S. NEFF, superintendent of elevated lines for the Boston Elevated Railway Co., has resigned his position. The day before Mr. Neff left the office, he was waited upon by a large delegation of employees, representing the train dispatchers, tower men, motormen and conductors of the elevated system, who presented him with a fine diamond ring as a token of their friendship and esteem. Mr. Neff in responding, thanked the men for their loyalty and added that he always tried to use his subordinates as men, rather than as machines, and had never regretted it. He said the opening of the road and the carrying of millions of passengers without injuring one, was appreciated by the management.

MR. W. M. BROWN has resigned his position as designer and builder of cars for the Twin City Rapid Transit Co., of Minneapolis. Mr. Brown has been with this company since 1892 when he installed the wood-working machinery in the car shops. When the Minnesota law requiring street cars to be vestibuled went into effect Mr. Brown and a Mr. Prout took the contract for 304 cars; of these 186 were completed in less than two months and the contract was then terminated at the request of the road, Mr. Brown taking charge of the mill shops of the Twin City company. The paint and motor shops

were soon afterwards placed in his charge and in November, 1895, he was appointed master mechanic, in which position he served for over three years. While with the Twin City company Mr. Brown designed and built all the cars used on the system and made his department a model of efficiency and economy.

MR. T. H. SYMINGTON, who was until recently superintendent of motive power of the Atlantic Coast Line R. R., and later president of T. H. Symington & Co., Baltimore, has accepted a position as representative of the Gold Car Heating Co. of New York and Chicago. Pending the completion of his journal box tests on about 40 railroads, Mr. Symington will devote his entire attention to the interests of the Gold Car Heating Co. Mr. Symington is a graduate of John Hopkins University and took the degree of mechanical engineer from Lehigh University; he has had a number of years practical experience in the shops and mechanical department of the Baltimore & Ohio R. R., which he left to become assistant superintendent and general sales agent of the Richmond Locomotive Works. During the past four years Mr. Symington has been superintendent of motive power of the Atlantic Coast Line R. R. His extensive experience and large railroad acquaintance eminently fits him for continued success in his new field.

MR. GODFREY MORGAN, general manager of the Niagara Gorge Railroad Co., is a native of New York City and was educated in the public schools and College of the City of New York. After leaving college he was apprenticed to an electric organ manufacturer, and subsequently entered the electric lighting business, starting with the Edison Illuminating Co., of New York City. He next entered the students' course of the General Electric Co., then the Edison Machine Works, at Schenectady, and after graduating from that course was put in charge of the stationary and railway motor testing department. After his experience with the General Electric Co., Mr. Morgan desired to go into practical railroad operation, and for that purpose left the General Electric Co., accepting a position in the south. After some months in the south he went to Amsterdam, N. Y., in a minor position in the car shops. Within a year after accepting this position Mr. Morgan was appointed general manager of the entire plant, consisting at that time of a combination electric railway, incandescent and street arc lighting plant.

After leaving Amsterdam Mr. Morgan entered the employ of Brgman & Co., and later the business department of the Electrical World. This latter business, however, was not at all in line with Mr. Morgan's experience and tastes, and he left it to go back into the railroad business, entering the employ of the General Electric Co., this time, however, with the Local Companies Committee under the late S. Dana Greene. For the General Electric Co. he had charge of the Buffalo, North Main Street and Tonawanda Ry. and later the Seneca Falls Lighting & Power Co., he having advised the scrapping of the Tonawanda railroad, as not being a paying property. This was on account of the ownership being held by the General Electric Co., who numbered among its largest customers competing companies, who naturally did not wish to see this property sufficiently improved to make it a paying investment.

Upon the recommendation of Mr. Greene, Mr. Morgan was appointed receiver of the Niagara Falls & Lewiston R. R. Co., which was sold out at receiver's sale, and Mr. Morgan succeeded to the management of the new company, where he has been for the past two years and a half. While the property was very badly run down, and the consensus of opinion of those who were most familiar with the property was that it never could be made a paying one, Mr. Morgan has succeeded in putting it in first-class mechanical shape in every way, and the evidence now is entirely in favor of its being one of the best paying railways in Western New York. The operation of this road is entirely unique on account of its position and has offered many difficult propositions to cope with. It is gratifying to Mr. Morgan to feel that the results fully justify the confidence which the board of directors have placed in his management of affairs.

The Greenfield (Mass.) & Turner's Falls Street Railway Co. has voted to issue bonds good for 100 trips over its line from Turner's Falls to Montague City, to be sold for \$3, thus giving a 3-cent fare to holders of the books. It is also under consideration to issue 100 trip books for \$4, good on any division of the system.



## OBITUARY.

MR. A. L. LAWTON, of Colorado Springs, died Oct. 27th, of pneumonia. Mr. Lawton was a prominent street railway man, and was a member of the insurance firm of Lawton & Fertig. He was a thirty-second degree Mason and formerly lived in Burlington, Wis. Mr. Lawton was quite prominent in Colorado affairs and was for twelve years a member of the state board of trustees of the deaf, mute and blind asylum.

MR. HENRY O. BRADLEY, the last active member of the old firm of Osgood Bradley & Sons, car manufacturers, Worcester, Mass., died recently at his home in that city, of pneumonia, after a week's illness. Mr. Bradley was 73 years of age, and a native of Worcester. He was a practical business man and for the past 20 years had devoted his energies, with conspicuous success, to advancing the industry founded by his father half a century ago. He was moreover a scholar, and had traveled extensively in European countries. Last year, despite his advanced age, he made one of the Conrad oriental party in the Holy Land, returning to Worcester, after an extensive journey, in the best of health. Mr. Bradley's death will be widely and sincerely deplored. He is survived by a son and daughter, both residents of Worcester.

MR. HENRY HART, for nearly 50 years a controlling stock holder in the Third Avenue R. R., New York City, died, November 7th, of old age, being in his 91st year. His death closes a career no less remarkable for its picturesqueness than for business sagacity and successful enterprise. Mr. Hart began as a pawn broker in the days when stages rumbled up and down Chatham St. and along Third Ave. When the street railway line was first projected he became a subscriber to the stock and dreamed of eventually owning the road entire. Year after year his earnings were invested in this stock exclusively, and in 1853 he found himself the controlling factor of the Third Avenue property. Mr. Hart remained at the head of the system until 1900, when the control of the road passed out of his hands. He was, however, re-elected a director of the company but three days before his death. Mr. Hart retained a fair portion of his once large fortune.

## EXHIBITION OF FARNHAM THIRD-RAIL SYSTEM.

On November 2d, a large party of steam and electric railway men visited the experimental line installed at Clyde, Ill., by the Rapid Traction Construction Co., to demonstrate the working of the Farnham sectional-feeder third rail electric system. The installation at Clyde is on a side track of the C. B. & Q. railroad, and the guests were taken out in a special train over that road. The inventor is Mr. E. W. Farnham, superintendent of transportation of the C., B. & Q.

Current for operating the car is taken from an iron conductor (which in the installation at Clyde is 3-6 x 2 1-2 in., and divided into sections about 480 ft. long) by means of shoes fixed to the car trucks, the track serving as the return branch of the circuit. The contact bar and an insulated copper feeder are carried at the side of the track and protected from the elements and from personal contact by an inverted wooden trough, open at the bottom, the contact shoes of the car being carried on arms which project up under the trough.

Between the ends of adjacent long sections of the contact bar is a bar about 8 ft. long suspended on knife edges and capable of a longitudinal motion of about 1 in., with a switch at each end. When a car passes the contact shoe strikes a lug on the nearest end of this short strip, and the resulting motion causes two small carbon rods in the switch to come into contact. This permits a small current to pass through a fine winding on a resistance coil and thence to the contact strip on the next section and thence to ground. Almost instantly after the closing of this "leakage" circuit the main circuit is closed through two larger carbon contacts, the current passing through a large winding of the coil. By this time the car is on the long, energized section, and the current passes through the controller and the motors and returns through the track rails in the usual manner. When the current is shut off by the controller the circuit is retained by the leakage current

passing through a series of incandescent lamps or a heater on the car. The 8-ft. movable strip is shorter than the distance between the two contact shoes on the car so that one shoe is always in contact with a live section. When the car leaves the section at the farther end, all current is cut off and the strip returns to its position by gravity.

When the car passes in the opposite direction the switch at the other end of the swinging strip is operated and the section in front of the car is thrown into circuit in a similar manner.

The construction is, of course, not necessarily as described; the contact bars may be made of copper, and can be carried in an underground conduit.

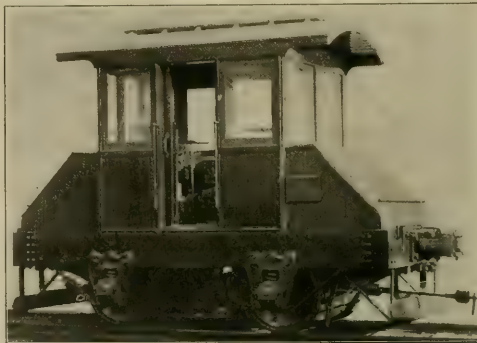
The car in operation at Clyde is a double truck interurban car, equipped with four Westinghouse motors, and during the test was operated at high speeds without mishap of any kind.

The Rapid Transit Construction Co. has been incorporated to make and install this system on railways and to construct and own such roads. The secretary of the company is Mr. B. R. Noble, with offices at 948-950 Marquette Bldg., Chicago.

## AN INTERESTING LOCOMOTIVE.

The accompanying engraving represents a large and powerful electric locomotive recently completed by the J. G. Brill Co., for the South Side Railway & Development Co., of Petersburg, Va., and was intended for hauling and shifting heavy freight cars. The length over the end sills is 14 ft. and the width 6 ft. 7 in. The side sills are of 15-in. channels weighing 47 lb. per yard; the end sills are very heavy oak timber. These sills carry a pair of jaws on each side in which are placed the usual oil boxes with journal springs on top. Through the center of the frame two heavy sills are introduced to take the strain of drawing and buffing. Each end is fitted with a draw bar for street railway cars, but above this is an M. C. B. standard coupler for the purpose of making a connection with steam freight cars. Each end is fitted with steps of the pattern used on switching engines. The cab contains the brake wheels, controllers, and all apparatus necessary for handling the machine. There are two G. E. 76 motors.

Some idea of the work the machine can do may be gained from the fact that the contract called for sufficient adhesion and power



BRILL LOCOMOTIVE FOR PETERSBURG.

in the motors to draw at least two 60,000-lb. coal cars on a 2½ per cent grade, at from 6 to 10 miles per hour. This requires a draw bar pull of somewhat over 5,850 lb. This will enable the machine to handle four or five nine-bench trail cars.

Westinghouse air brake compressor and controlling apparatus are placed in one corner of the cab, the tank occupies the opposite corner.

There are two sand boxes and two pedal alarm gongs. The sloping boxes at each end of the machine contain the resistances and ballast at one end, and the compressors and sandbox at the other. The locomotive is fitted with brakes hung between the wheels and operated by hand wheels inside the cab. The total weight is over 30,000 lb.



### AUTOMATIC ELECTRIC TRACK SWITCH.

The extra expense involved in keeping switchmen at busy junction points to throw the switch tongue in the proper direction has created a demand for a track switch that can be operated from the front platform of an approaching car at the will of the motorman. Even where the traffic does not justify the keeping of switchmen, and the switch is thrown by the conductor, or by the motorman from the platform with the aid of a switch iron, the delay and annoyance make highly desirable some form of mechanically controlled switch that can be actuated without stopping cars.

The New York Switch & Crossing Co., of Hoboken, N. J., as early as 1896 placed a successful automatic track switch on the market. Since that time improvements in details of construction

in this position; as soon as car has passed off the insulated section the armature D drops by its own weight, and the switch is set ready to be thrown the other way on the approach of the next car. The wedge-shaped point is pivoted at its bottom in the armature, and the movement of the shifting bar G throws the wedge point to either side, as the case may be. With this switch it is best to have a sewer connection or some other way of drainage, although water merely passing through the box will not injure the mechanism.

All tongue switches made by the New York Switch & Crossing Co. are fitted with what is known as the "heel pin" tightening device, illustrated in Fig. 3. By this means the tongue will not work loose, as the weight of the three cast iron fillers shown as forming one-half of the bearing for the switch pin tend to constantly keep the pin tight, but without any binding effect.

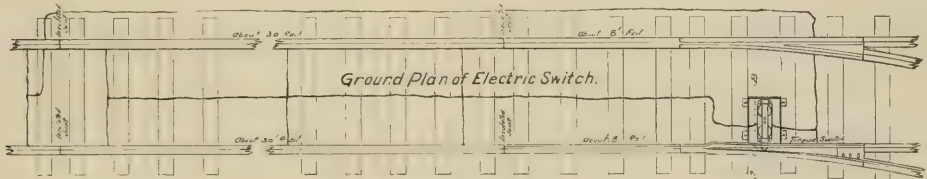


FIG. 1. GENERAL PLAN OF SWITCH.

have been made as they were suggested by experience and now this company claims to have an automatically actuated electric track switch, thoroughly reliable in its operation, and one that requires no attention whatever to maintain it in working order.

The chief details of the device will be seen in the drawings. An electromagnet is used to move the switch point in either direction. The magnet is placed in a covered iron box set in the ground at the side of the tongue, and a section of track preceding the switch box is completely insulated from the return current, the regular return circuit shunting around the insulated section by means of an auxiliary wire.

While the car is on this insulated track, the motorman can throw the switch point as often as he pleases by repeatedly putting the current on and off. If, as the car approaches, the motorman finds the switch set for the track he wishes to take, he shuts off power and coasts over the insulated section. If the switch is not properly set he runs with power on and the switch turns at once.

Fig. 1 is a plain view showing the switch and insulated rails, with paving and earth removed to the ties.

Fig. 2 shows a transverse section through box and switch tongue, A B, Fig. 1. When car passes on to insulated rails with power on,

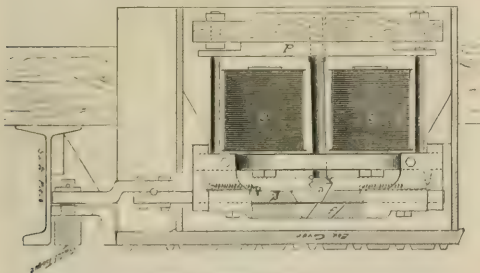


FIG. 2. SECTION ON A B.

the current passes through rails to the magnet in the box, which throws the tongue. This view also shows the working parts with the current off, but in position to throw the tongue to the left, or for the curved track when power is applied; the circuit passes to magnet C C, drawing armature D up. This forces the wedge-shaped point into the V-shape opening, F, which will force the shifting bar G to move to the left, and as long as the current is on the mechanism will remain

Mr. W. C. Wood, president and manager of the Switch & Crossing company, has been engaged in supplying necessities for street railways ever since the horse car days. He was with the firm of Lewis & Fowler for a number of years and before that sold street railway rails. He states that his company's automatic switch has

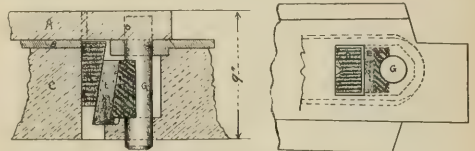


FIG. 3. HEEL PIN TIGHTENING DEVICE.

been placed in 40 or 50 different places, and the management is in receipt of many extremely complimentary letters from street railway men testifying to the satisfaction given by the device.

### BUTTE STREET RAILWAY CLUB ROOMS.

At the instance of Senator W. A. Clark, owner of the Butte City Ry., handsome club rooms have been fitted up for the employes by Mr. Wharton, general manager of the company. Previous to the equipment of these club rooms, there was no place for the men to wait at the time when the shifts of crews on the cars took place, but now the new club rooms relieve the men of the necessity of standing in the cold pending their assignment to duty. Mr. Wharton procured two large rooms in the building at the corner of Park and Main Sts., and fitted them up as club rooms. The floors are covered with linoleum, handsome pictures adorn the walls and tables, chair and lounges are provided, with checker boards, chess boards and other games, there is all that is necessary to constitute a complete club room. A large assortment of literature covers the tables and the street railway men have been invited to take possession of the rooms and to bring their wives or friends during the day or evening. No restrictions have been placed upon the man in the enjoyment of this gift of Senator Clark, as the employes have been selected with great care and discretion, and it is taken for granted that they will act as gentlemen and not abuse the privileges offered. This is greatly appreciated by the men and serves to strengthen the good feeling existing between them and the officers of the company.

## NEW CONTINUOUS WATER SOFTENING PROCESS.

By courtesy of Mr. A. Sorge, Jr., we are enabled to publish a description of what is known as the Sorge-Cochrane continuous system of treating water to make it fit for feeding boilers or other uses where the formation of scale is objectionable. Though the process is far past the experimental stage, and we understand is

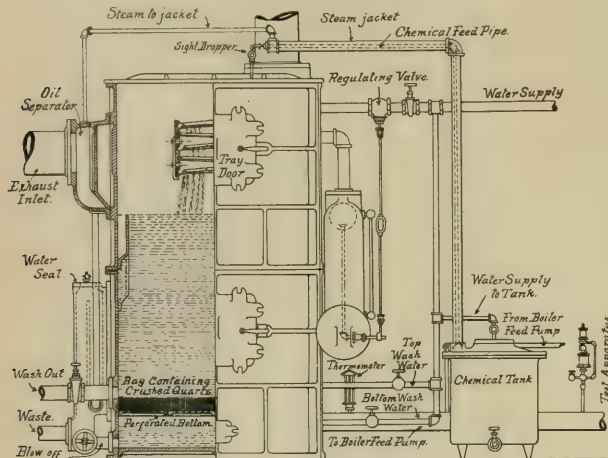
a saturated one, that is saturated at the time it is formed; this is done by making the soda ash tank of such size that the water is some 10 hours in passing through it. The soda solution tank is at the temperature of the room, which is cold as compared with the heater. Soda ash being much more soluble in hot than in cold water, the pipes carrying the soda solution are jacketed and all incrustation in them prevented.

For testing, advantage is taken of the fact that phenol-phthalein will color red water containing an alkali and does not affect acid or neutral water. A glass cup is so connected that it can be filled with the treated water, and then a single drop of a solution of phenol-phthalein is dropped into it from a smaller glass cup above. If this treated water is sufficiently alkaline to show a slight pinkish discoloration when the test solution is added it shows that enough of the soda is being fed to the heater.

The line drawing shows a section of a Cochrane heater fitted with the Sorge apparatus, while the half-tone engraving gives an idea of the exterior appearance. (This engraving was made from a photograph of the 300-h. p. apparatus exhibited at Milwaukee; the heater is about 7 ft. high.)

The feed water is introduced at the top, through a valve automatically controlled by a float contained in the pear-shaped box at the side of the heater. Exhaust steam is introduced, through an oil separator, in sufficient amount to heat the water, which is broken into drops by passing over trays in the upper part of the heater. The soda ash solution is fed into the water (through a sight drop feed) before it reaches the trays; the regulating valve for this is in the pipe supplying cold water to the soda ash tank. After being thus treated and heated the water drops to the bottom of the heater and filters through a bed of quartz crushed to the size of rice and contained in bags of burlap of convenient size for handling. The excess of steam that may be supplied to the heater and the carbonic acid driven off escape through a pipe at the top.

At convenient intervals the heater is opened and the precipitated salts removed. Should the deposits be so heavy, due to forc-



SECTIONAL VIEW OF HEATER SHOWING INSTALLATION.

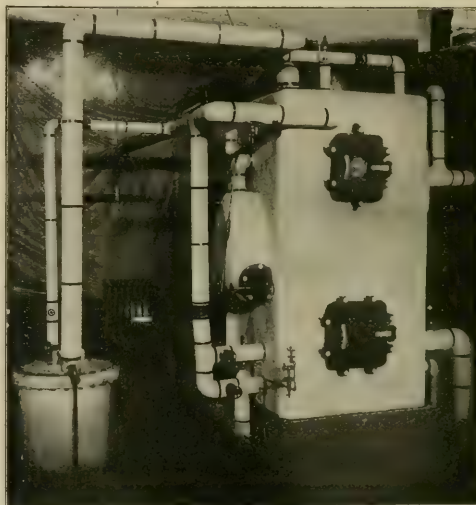
now in use in connection with some 200,000 h. p. of boilers, the apparatus was first publicly exhibited at the Milwaukee Industrial Exposition held in September last.

The scale-forming and other undesirable constituents of the waters used for feeding boilers may in general be divided into three classes: 1. Those forming soft scale such as magnesium and calcium bicarbonates. 2. Those forming hard scale, such as calcium sulphate. 3. Those which cause corrosion, as free acids or magnesium chloride, which in the boiler combines with carbonates present to form neutral salts leaving hydrochloric acid free to attack the metal of the boiler.

The bicarbonates are easily dealt with, since on the application of heat half the carbonic acid is driven off from the calcium carbonate leaving the monocarbonate which is insoluble, and the magnesium carbonate comes down either as a hydrated oxide or monocarbonate also insoluble. The hard scale forming ingredients are taken care of by introducing soda ash which reacts with the sulphates forming sodium sulphate and monocarbonates of calcium and magnesium. Mr. Sorge states that experiments made by him showed this reaction to be almost instantaneous when the water was at a temperature of 200° F.; and that the precipitation of the resulting carbonates was very rapid, ten minutes only being required to obtain a precipitation as complete as that given in as many hours when the temperature of the water is 110°. Therefore it is considered highly important in this process that the temperature of the water be as high as is practicable to attain with exhaust steam.

The reaction of the soda ash with free acids or magnesium chloride is equally rapid and the result gives the quickly precipitated monocarbonates or soluble sodium salts which are neutral. The advantage of precipitating the carbonates by means of heat only instead of introducing hydrate of lime for the purpose as in the Clark process is apparent, while the rapidity of the precipitation permits a much smaller purifying apparatus for a given boiler plant.

Two essentials of a continuous process which shall be satisfactory in operation, are a practically uniform strength of chemical reagent and ready means of testing such as can be applied by the boiler room force. In the Sorge-Cochrane apparatus the uniformity of the reagents is secured by making the solution of soda ash



GENERAL VIEW OF INSTALLATION.

ing the boilers or to change in the water, as to greatly retard the process of filtration, the filter bed can be sufficiently cleaned by admitting water above it through the "rough wash out" pipe indicated and opening the blow-off valve on the other side of the heater.

By reference to the drawing the functions of the various pipes will be readily seen.

Messrs. A. Sorge, jr., & Co., Chicago, are general western agents for the manufacturer, the Harrison Safety Boiler Works, of Philadelphia, and this firm designs the apparatus in each case to suit given conditions. The system is patented and is arranged for use with the Cochrane heaters.

This system has been installed at the power plants of the Mill Creek Valley Street Ry., Cincinnati; the Findlay (O.) Street Ry.; the Lima (O.) Railway & Light Co.; the Indianapolis & Greenfield Rapid Transit Co., and other street railways.

### MONTHLY OUTING OF THE NEW ENGLAND STREET RAILWAY CLUB.

The last regular monthly outing of the New England Street Railway Club was held at Worcester, Mass., on October 31st. The members from Boston were taken to Worcester in special cars attached to the noon train from the South Terminal Station, and were met at the Worcester depot by special cars furnished through the courtesy of the Worcester Consolidated Street Railway Co. From the station the party was taken to the extensive steel and wire works of the American Steel & Wire Co., formerly the Washburn & Moen plant, where guides were in attendance to show the members through the various departments. The afternoon was most enjoyably spent in witnessing the fascinating operations of moulding, pouring, tempering, drawing and forging the hot steel ingots. After the trip through the works the special cars were again boarded, and the party returned to the Bay State Hotel, where an excellent dinner was served in one of the private dining rooms. Mr. H. E. Bradford, president of the club, acted as toastmaster and gave a brief account of the growth of the organization and the work it has done. The club started with but 30 members and now has over 320 names on its membership roll. He also outlined the plans for the coming winter, which include social and business meetings of unusual interest and value. At one meeting it is expected the governors of all the New England states will be present and address the members. Another feature will be a series of lectures and talks by men prominent in street railway affairs. All these privileges will be available to those who have paid the regular membership fee of \$3.00 per year. The regular annual meeting will be held the last Thursday in January.

Mr. Bradford called on other guests present for short addresses and the meeting was reluctantly brought to a close in time to permit the Boston delegates to catch the late train home.

The officers of the New England Street Railway Club are: President, H. E. Bradford, Worcester; vice-president, E. C. Spring, Newton; secretary and treasurer, J. H. Neal, 101 Milk St., Boston.

### GREEN ECONOMIZERS.

The Green Fuel Economizer Co., of Matteawan, New York, has issued a handsomely illustrated catalog in regard to its products. The first work of this company was done in 1845, when Mr. Green made his earliest experiments in this class of apparatus. An idea of the extent to which these economizers have been introduced is afforded by the fact that since the company commenced business it has supplied apparatus to over 250,000 boilers.

These economizers consist of a series of sets of cast iron tubes connected by top and bottom headers which are encased in a brick chamber. The gases are led to the economizer by the ordinary flue from the boilers to the chimney, and feed water is forced into the tubes where it is heated by the chimney gases. Each tube is provided with a geared scraper which travels continuously up and down at a slow speed and keeps the external surface clean and free from soot which would, if present, retard the conduction of heat. The advantages claimed for this economizer are as follows: Heating the feed water to a higher temperature than can be obtained by other means; a large volume of water always in the receiver near the temperature of ebullition; utilizing the heat from escaping gases which is otherwise wasted; prolonging the life of boilers by the high temperature of feed water. Much of the sediment in the feed

water is deposited in the economizer, where it can be readily blown off.

The catalog contains a number of excellent illustrations of plants where these economizers have been installed, and also contains excellent testimonials from numerous users of this apparatus.

### WESTERN NOTES.

The Albany Street Car Co. was incorporated at Albany, Ore., on October 9th, with a capital of \$60,000, by J. R. Wyatt, N. V. Murray and J. H. Roberts.

Twelve carloads of steel rails have been received by the Redlands (Cal.) Street Railway Co. to be used in the extension of the company's line to the Country Club.

Two surveying parties are in the field locating a line for the new electric railway from Monrovia to Los Angeles, Cal. This line will run through the Baldwin, Chapman and Rose ranches, striking the Pasadena short line.

On October 15th the Auburn Capital Electric Railway Co. completed laying its rails by the driving of two gold spikes at the end of the road. Superintendent Moore announces that the equipping of the road will be pushed to an early completion.

A territorial charter was granted on Nov. 2d to the Oklahoma & Indian Territory Electric Railway Co. with the principal place of business at Norman, Okla. The capital stock is \$1,500,000. The estimated length of the line is 175 miles with South McAlester, I. T., and Lawton, Okla., as the termini.

Mr. C. A. Taft, of Colorado Springs, with a number of eastern capitalists will construct a large power plant in Ouray County, Col., at a cost of \$300,000. It is the intention of the company to connect the heavy producing mines in the San Juan district. A road was surveyed through this country some ten years ago and at some points grading was commenced but for reason was abandoned.

The Portland City & Oregon Railway Co. is considering an offer made by the citizens of Selwood, Ore., for two acres of land and a bonus, to build its new car sheds at that place. The present sheds and shops are situated at Milwaukie, and there are various reasons given for their removal, among which is that the company needs more land and that most of the employees of the road live at Selwood.

A syndicate of eastern capitalists has purchased the block opposite the city hall in Denver, Col., and will erect upon it a depot for a suburban electric line which will run through West Denver across the valley to the foot hills and connect with the towns west of the city, probably including Golden and Idaho Springs. Besides running cars along the principal streets of West Denver, the syndicate will probably conduct several places of amusement in that section of the city. It is stated that the work will be commenced on the road within the next thirty days, and that cars will run as far as West Denver within a year. The syndicate will not in any way conflict with the other railroads.

The Seattle Electric Co. will soon begin the construction of a \$15,000 car barn. The building will be of brick, similar in details to the existing structures, and will have a frontage of 60 ft. and a depth of 120 feet. The site is now occupied by frame structures, which will be immediately removed. The new barn is intended to house at least twenty cars. The carpenter shop, paint shop and wood working shop will be removed from the headquarters building to the new structure. The space which they have occupied will be given up to the use of the trainmen, as their present quarters, a small frame house, is to be torn down. The new rooms of the trainmen will be much larger than the old ones, and will be fitted up in much better style, and with the addition of many more conveniences.

The Union Traction Co., of Philadelphia, will erect a temporary power plant on the Philadelphia, Newtown & New York R. R., near Wyoming street, in Philadelphia, to supply power for the Frankfort & Falls line which will soon be put in operation.

The United Traction Co., Albany, N. Y., reports for the quarter ending September 30th gross earnings of \$382,976, as against \$363,649 for the corresponding period last year; operating expenses, \$283,970, as against \$237,276; net earnings, \$144,007, as against \$128,373, and gross income, \$145,248, as against \$129,338.



## CANADIAN NOTES.

A syndicate of Buffalo capitalists has purchased the Peterboro & Ashburnham Electric Ry., which is six miles in length, for the sum of \$150,000.

Parliament has granted the application of the Hull Electric Co., asking for power to run cars over the lines of the Ottawa, Northern & Western Ry.

Mr. H. N. Green, of Montreal, has been retained as consulting engineer, by the projectors of the proposed Huron County electric belt line, at Goderich, Ont.

At the annual meeting of the Toronto Suburban Ry., the old board of directors was re-elected, and the question of the extending to Cooksville favorably reported on.

The Longueuil council is considering a proposition made by the president of the Montreal Bridge Co., on behalf of that company, for the construction of an electric railway system in Longueuil.

The Montreal Street Railway Co. has a staff of 150 men at work on the new Beaver Hall Hill line, and it is expected that they will have the cars in operation over this route within three weeks.

Mr. V. T. Rogers, of Ottawa, and Mr. R. Miller, of Montreal, are seeking for incorporation as the Canadian Power Co., with the rights to supply light and power in Montreal. The capital stock will be \$25,000.

The power plant of the Stave Lake Power Company at Stave Lake, B. C., will be installed by Stone & Webster, electrical engineers, of Boston, Mass. The power will be transmitted direct to this city and to New Westminster.

Mr. W. D. Matthews, a prominent member of the Toronto Board of Trade, and a director of the Canadian Pacific Ry., is authority for the statement that a line of electric railway will be constructed between Toronto and Detroit, Mich., in the near future.

The Radial Electric Ry. has completed arrangements with the Brantford Electric Street Ry., whereby it is permitted to use the tracks of the latter company, and negotiations are now under way looking to the construction of lines to Galt, Paris and St. George.

The Ampere Electric Manufacturing Co. has been incorporated in Montreal with a capital stock of \$50,000, the charter gives the company power to generate and sell electric power, and to manufacture and sell electric apparatus. R. E. T. Pringle, F. H. Leonard, jr., and E. E. Cary are the incorporators.

The annual report of the Montreal Park & Island Ry. Co. for the year ending Aug. 31, 1901, shows the gross revenue to have been \$128,677, the operating expenses \$100,096, leaving a balance of \$28,561. Interest on bonds amounted to \$61,500, wiping out the apparent profit and showing a net deficit of \$31,918.

The South Essex Electric Railway Co. will at once commence the construction of the road for which it has a Provincial charter. The city of Windsor has granted the privilege of running lines on certain streets, and work will be proceeded with without further delay. Contractors can obtain full information from the city clerk, Windsor, Ont.

Toronto capitalists have reached out again, and this time have wakened things up in Spain. Mr. J. E. Thompson on behalf of a syndicate composed largely of Toronto men, has obtained a concession from the Spanish Government for the construction of an electric trolley line at Malaga, in Andalusia. No development work has yet been done on the concession.

Mr. F. W. Martin, superintendent of the Hamilton Electric Light & Cataract Power Co., has been appointed manager of the Lincoln Light & Power Co., and has resigned his former position. Mr. Martin was the recipient of an address from his fellow workers, who also presented him with a handsome gold watch and chain as a token of the regard in which he was held.

After the Board Meeting of the Canadian General Electric Co., here a few days ago, a portrait of Mr. W. R. Brock, M. P., was unveiled, and hung in the board room. Mr. Brock has occupied the position of President of the company, since its inception eleven years ago, and the success which has attended the undertaking, speaks volumes for the able manner in which it has been conducted.

Mr. S. Sotomayor, of Chile, South America, has been in Toronto for some few days, on his return from Niagara, where he has been inspecting the utilization of water for electrical purposes. Mr. Sotomayor is interested in this subject, and will endeavor to apply his knowledge on his return to Chile, where, according to the

gentleman's statement, there has been very little effort made to employ the many available water powers.

Messrs. Clarke Bros., of New York and Thos. Meaney, of Toronto, are about to develop a water power on the St. Marguerite River, near the village of Seven Islands, in the province of Quebec. It is the intention to construct a large pulp mill, and to employ electricity for the operation of the machinery and for a short railway. The company agrees to expend \$500,000 within two years. Henry Holgate of Toronto, is the consulting engineer.

The Montreal Street Ry. is encouraging its motormen and conductors in carrying out their arduous duties satisfactorily, by granting a monthly bonus. The amount is divided between four motormen and a like number of conductors, only those who can show a record of being free from accident and of good conduct, being allowed to participate. Those eligible to participate, draw for the award, the amount being limited to \$10 to any one man.

Instead of a steam road between Sydney and Glace Bay, over the old Sydney and Louisburg roadbed, as originally proposed, it is now the intention to construct a modern electric railway, similar to the suburban system of the New York, New Haven & Hartford. This road, according to Mr. Shields, Manager of the Dominion Coal Co., will be installed early in the spring, and cars and system will be modelled on the lines of the big American roads in every respect.

Quebec and the electric street railway company are at loggerheads over the latter's refusal to build a line up Champlain St. The company says the street is too narrow for a line of street cars, which would have to run over the water pipes, and that the cost would be large and is uncalled for. This line is called for according to the company's contract with the city, to be built when demanded, and the city authorities have brought suit against the company to force it to construct the line.

The town of St. Louis has granted the Montreal Street Ry. a franchise for thirty years, with right to build surface lines on all streets, fares, transfers and tickets to be the same as in the city. The company agrees to remove all snow from its tracks and contribute \$1,650 annually to the cost of removing it from the streets. The Montreal Street Ry. having secured the Park & Island system, is in a position to start running cars under the franchise without delay.

A system of radial electric railways connecting Dawson with the surrounding mining districts, following the new government wagon roads along Bonanza Creek, is projected. Mr. E. C. Hawkins, who has recently resigned his position as general manager of the White Pass & Yukon Railway Co., is prime mover in the enterprise, and expresses himself as confident that such a system will be profitable. The roads will carry freight as well as passengers, thus doing away with the present team service.

A serious accident occurred in the Queen St. Subway, Toronto, recently. The trolley pole on a west bound car broke as the car was ascending the steep grade, leaving the car stalled on the hill. The car following, to which was attached a trailer, undertook to push the disabled car up the hill, but when near the top, the wheels slipped on the greasy rails, and the little train backed down the grade, and was crashed into by a heavy motor car, which completely telescoped the trailer. Several people were injured, fortunately none very seriously.

The receipts of the Toronto Railway Co. for the past year were over \$1,500,000, and at a recent meeting of the directors of the company, a dividend of 1¼ per cent was declared for the current quarter. This is equivalent to 5 per cent per annum, or 1 per cent more than formerly paid, and is the highest yet reached by this company. The placing of the stock upon a 5 per cent basis is a very important step. The capital of the company is \$6,000,000, with a bond issue of \$3,000,000 bearing interest at 5 per cent. The present earnings of the company are extremely good, and the rapid extension of the city north and west makes it quite certain that the earnings will increase.

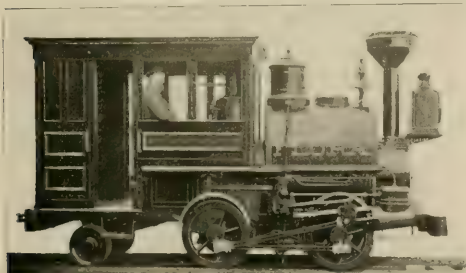
The building of the Cascades (B. C.) Water, Power & Light Co's. plant on the Kettle River near Cascades, is progressing rapidly. A dam, 400 ft. long, built of timber crib work, filled with rock, has been constructed, which raises the water 36 ft. above its natural level, and gives a working head of 156 ft. at low level. The water is conveyed from the dam to the power house by two open rock cuts, with a total length of over 700 ft., and a tunnel of about 400

ft. The turbines will be of the horizontal type, two wheels in each case, and the generators, supplied by the Westinghouse Company, will be of the three-phase alternating type. Step-up transformers will be used to raise the current for transmission.

At a recent meeting of the board of directors of the Montreal Street Railway Co., the report for the year ending Sept. 30, 1901, was submitted. During the year the company's earnings amounted to \$1,888,967, and the miscellaneous receipts were \$117,112. In dividends, the street railway paid out the sum of \$551,700 in 1901, as compared with \$512,500 in 1900. There was transferred to the contingent account the sum of \$50,000, the same as that transferred in 1900. The income of the Montreal Street Railway Co., over and above expenses and fixed charges, exclusive of dividends, amounted to \$649,251. The earnings on the capital for 1901 were 11.80 per cent, as compared with 12.40 per cent a year ago, the capital having been increased \$1,000,000 during the past year.

### STEAM LOCOMOTIVE IN ELECTRIC RAILWAY CONSTRUCTION WORK.

Another evidence of the tendency to approach certain steam railroad conditions in interurban electric railway engineering is found in the increasing use of steam dummies or locomotives in construction work. On a number of recently built long distance electric roads finished or now building, steam locomotives weighing from 8 to 15 tons, have been utilized with excellent results for hauling construction cars, and trains of dump or flat cars containing earth, rock, machinery, tools, etc. In this way track work and pole erecting can go on entirely independent of progress made by the wire stringing crew or power house contractors. When construction work is finished the locomotive can be used in emer-



LIGHT LOCOMOTIVE FOR CONSTRUCTION WORK.

gencies on suburban lines for hauling excursion and picnic trains, and in the event of a serious break-down in the power house, one would prove a very desirable aid in maintaining a temporary service.

The engraving illustrates a Porter saddle-tank type of locomotive, designed especially for this use, and sold new or second hand, by Dallett & Co., of Philadelphia. The principal dimensions are: total weight, 11 tons; cylinders, 8 x 12 in.; four driving wheels, 30 in. in diameter; rigid base, 4 ft.; total base 9 ft. The engine has extra powerful hand brakes, two 14-in. head lights and couplers for both standard cars and logging cars. In addition to the saddle-tank type of construction locomotive, Dallett & Co. sell another type having the engine enclosed in a cab, with the tank in the rear.

The Lake Street Elevated Railroad Co., Chicago, on October 17th began the construction of a third track, to be used for the express service between Oak Park, Austin and Chicago.

The Exeter (N. H.) Hampton & Amesbury Street Railway Co. reports gross receipts for the fiscal year at \$105,298.50; expenses, \$68,183.92; amount paid in dividends, \$12,250; interest, \$13,125, and surplus, \$11,739.58. The increase in receipts over last year is \$30,000. The total mileage is reported at 383,629 miles. Passengers carried number 1,191,468.

### ANNUAL REPORT, HOLYOKE STREET RAILWAY CO.

The annual report of the Holyoke Street Railway Co. for the fiscal year ending Sept. 30, 1901, has been issued. It shows the gross earnings from operation for the year were \$303,665; operating expenses, \$204,193; net income, \$99,472. The charges upon income accruing during the year were as follows: Interest, \$16,560; taxes, \$24,067; dividends, \$48,000; rental of Mt. Tom Railroad, \$6,000; operating Mountain Park, \$2,437. The balance to the credit of profit and loss is \$75,579. The amount of track operated amounts to about 40 miles, and there was a little more than two miles of new track built during the year. The equipment of the road include 42 box cars, 65 open cars, 7 snow plows, and 191 motors.

### NEW WORK AT RICHMOND, VA.

Work on the building of the Richmond & Petersburg Electric Ry. is being pushed forward as rapidly as possible, but progress is now being impeded by the non-arrival of some of the special steel work. The officers of the road are confident that the line will be completed on or shortly after December 1st. The question of rates and schedules has not yet been taken up, but it is understood that the cars will be operated on fast schedules, and that the ticket rates will be low enough to successfully compete with the steam roads operating between these points. Six of the ten cars for use on this line have been delivered, and the company purposes to have ample power to operate them at a rate of from 25 to 30 miles an hour.

### EXTENSIONS TO THE NEW YORK SUBWAY.

The Rapid Transit Commissioners of New York City recently passed favorably upon plans to extend the underground railroad along Lenox Ave., from 143rd St. to 149th St., where a terminal will be built. An additional station will be erected at 145th St. There has also been purchased a tract of land, two blocks square, at 148th St., running from Lenox to Seventh Ave., which will be utilized for car storage and housing purposes.

### THREE ATTEMPTED STRIKES.

The motormen and conductors employed by the New Orleans & Carrollton Railroad Co. struck, October 26th, to have one of their number, who had been discharged for engaging in a disorderly altercation on his car, reinstated. The strike was successful to the extent of tying up the line for two hours on the morning of the first day. Substitutes were procured, and the cars were operated on schedule time pending a settlement of the difficulty. If the motorman who is under arrest for riotous conduct be acquitted in the police court, the company agrees that he shall be reinstated; if he be convicted, his discharge shall stand. This proposition has been accepted as satisfactory to both sides.

The striking employees of the United Traction Co. of Reading, Pa., on October 15th swore out warrants for the arrest of 70 motormen and conductors for operating the company's cars on Sunday. Bail was entered in each case, a total of \$14,000, by President Rigg, and the announcement was made that the company will continue to operate its cars on Sundays even if its employees are to be arrested every Monday, until a final decision by the highest court shall be given. No violence has been reported and the service has not been seriously interrupted.

The linemen employed by the Chicago & Joliet Electric Ry. Co. went out on strike October 26th because the company declined to reinstate an electrician who had been discharged for assaulting a non-union man. A settlement was reached and the linemen returned to work in less than two days. The man whose dismissal had precipitated the strike was not reinstated.

The Twin City Rapid Transit Co.'s report of the business transacted in September shows gross earnings of \$308,393; operating expenses \$123,131, net \$185,262; interest and dividends, \$75,378, and surplus, \$109,884. The increase in gross earnings over the corresponding month last year is shown to be \$36,741.



### AN ELECTRIC COAL ROAD.

Our illustration shows a decided novelty in electric railway trains, as there are no other electric roads in the country with so extensive an equipment for handling freight. This view was taken near the power house of the St. Louis & Illinois Suburban Ry., on that portion of the system formerly known as the St. Louis & Belleville Electric Ry., formerly known as the Day line, and which was described in the "Review" for December, 1899, page 841.

The company now owns four 50-ton locomotives, each equipped with four G. E. 160-h. p. motors, and 400 coal cars of 80,000 lb. capacity each, and 600 more similar cars will be added.

The company is now operating two coal mines, using electric

used in the construction of the body and the sills will be sheathed with  $\frac{3}{8}$  in. steel plate. The floor of the car will be double, the upper one being of parquet flooring of handsome design arranged for rugs. At one end of the car is the parlor, which on one side contains a hand carved mahogany bed lounge and on the other side a row of mahogany easy chairs. Beyond these there are two double open berths, next to which is the buffet and kitchen.

Further along comes the state room out of which opens a private bath room, and at the other end of the car is located the smoking room, which is furnished in the same manner as the parlor. The entrance to the smoking room is by means of swinging doors leading both into the hallway and the bath room. The furniture throughout will be of heavy carved mahogany, and all the compartments



COAL TRAIN ON THE ST. LOUIS & ILLINOIS SUBURBAN RY.

current from the trolley wire for the mine machinery, and will soon open several new mines.

The officers of the company are: G. J. Kobusch, president; C. M. Clark, of Philadelphia, vice-president; J. M. Bramlette, general manager.

### PRIVATE CAR FOR EVERETT-MOORE SYNDICATE.

The accompanying illustration shows the plan of a magnificent private car which is being built by the J. G. Brill Co. for the use of members of the Everett-Moore syndicate in traveling over their long railway system. The contract for this car calls for its comple-

will be hung with heavy draperies to match the decorations of the car. Among the other appointments of this car may be mentioned pneumatic gongs, whistles, sand boxes, electric heaters for both heating and cooking, tea and coffee urns, folding wash stands, disappearing ice boxes and tool boxes, and a constant supply of electricity, gas and hot and cold water.

### NEW YORK SUBWAY ACCIDENT.

A section of the rapid transit subway under construction at 166th St. and Eleventh Ave., caved in on the morning of October 18th. A number of workmen underneath were buried in the debris. McCabe Bros., the contractors, say that they are unable to explain

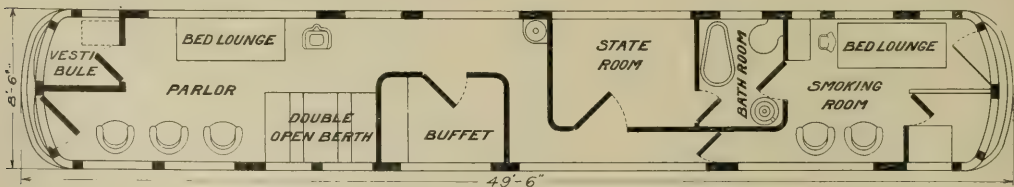


DIAGRAM OF PRIVATE CAR FOR THE EVERETT-MOORE SYNDICATE.

tion by February 1st. The car will contain every accommodation for travelers, as it is to be fitted up both as a sleeper and dining car, besides containing every comfort for day travel.

It will be 49 ft. 6 in. long, 8 ft. 6 in. wide and 12 ft. high. The outside finish will be of dark olive color with brass trimmings. The car will contain 18 windows of the best French plate glass, and there will be an oval shaped window for the bath room and curved front windows for the observation compartments in the front and rear of the car. All of the windows extend to within 12 in. of the floor. The body of the car will extend to the bumpers, entrance being made to it by means of movable steps, which are concealed by a movable floor when the car door is closed. Steel will be largely

the disaster, although it is supposed to be due to faulty propping and shoring. The collapse is the more difficult to explain as the tunnel appeared on inspection to have been cut through solid rock and to have been very firm. The cave-in did not extend to the surface.

The Montreal (Que.) Terminal Railway Co. has petitioned for an entrance into Montreal, the proposed line to connect with its line to Bout de l'Île, to which latter place a reduced fare of 25 cents will be charged. The company offers to sell ten tickets for 25 cents while its cars are within the city limits, and to keep the snow off the streets through which its line shall pass.



**HALF FARES.**

The Steubenville, Mingo & Ohio Valley Traction Co. has completed its extension to Brilliant, O.

Rapid progress is being made in the construction of the electric railway between Providence, R. I., and Danielson, Conn.

The Detroit United Railway Co. will build an addition to its Jefferson avenue car house. The structure will be 48x180 ft. and will cost \$2,000.

The Elgin, Aurora (Ill.) & Southern Traction Co., operating lines in the Fox River Valley, has voluntarily advanced the wages of its employes nearly 20 per cent.

The Consolidated Railway & Power Co., Salt Lake City, put a new rule into effect October 14th prohibiting employes from lunching in the company's cars.

Hawks & Angus, Detroit, have under construction an electric line from Jackson to Chelsea. From Jackson, branches will be built to Lansing and Coldwater.

The Mineola, Hempstead & Freeport Traction Co. has decided to locate its general offices and power house in Hempstead, instead of in Freeport as was at first projected.

The projected electric railway between Lake Champlain and Lake Placid, in New York, is now said to be a certainty. The line will pass through Keeseville and Ausable Forks.

The Holyoke (Mass.) Street Railway Co. will establish the white post system in Holyoke, cars stopping for passengers only at such places as shall be indicated by white posts.

Ties are being distributed for the electric railway between Ottawa, Ill., and Marseilles. The work of erecting the company's bridge at the latter city is progressing rapidly.

The Greenfield (Mass.) & Turner's Falls Street Railway Co. is considering a request from the Amherst & Sunderland Railway Co. to extend its line from Montague to Sunderland.

A belt wheel on an engine at the Racine plant of the Milwaukee Electric Railway & Light Co. broke and wrecked an engine, dynamo and electric switch boards valued at \$25,000, November 4th.

The Brooklyn Heights Railroad recently received from the Miller-Knoblock Electric Manufacturing Co., of South Bend, Ind., a 500-volt direct current commutator that weighed over a ton.

The first car was run over the new interurban line of the Hawks-Angus syndicate between Ann Arbor and Chelsea, Mich., October 23d. Cars will make trips over this division every two hours.

The Lake Shore Electric Railway Co., Cleveland, has elected the following officers: B. Mahler, president; J. B. Hanna and W. H. Price, vice-presidents; C. H. Stewart, treasurer, and F. W. Coen, secretary.

The Northwestern Elevated Railroad Co., Chicago, and the Chicago, Milwaukee & St. Paul Ry. are considering the terms of a contract whereby the former will handle the Evanston business of the latter.

The Little Miami Traction Co. has changed its title to the Springfield & Xenia Traction Co., as better indicating the route of the proposed line. Recent reports state that the road will be extended to Cincinnati.

The Richmond (Va.) Traction Co. has left the question whether nine or twelve hours shall constitute a working day to be decided by its employes. The majority of the men are inclined to favor shorter hours.

The Niagara Falls & Suspension Bridge Railway Co. has paid to the city treasurer of Niagara Falls the sum of \$2,292.69, being 3 per cent of the gross earnings of the road for the year ending September 30th.

Cleveland capitalists project an interurban electric railway from Wabash, Ind., to Rochester, a distance of 34 miles. It is announced that construction work will be begun this fall, and that the road will cost \$750,000.

The Troy (N. Y.) & New England Railway Co. will extend its line in the spring to Pittsfield, Mass., a distance of 35 miles. The proposed extension will afford connections with the Albany & Hudson Ry. near Bath.

An ordinance granting the Citizens' Rapid Transit Co., of Richmond, Va., a franchise in that city and the exclusive use of tracks on the projected viaduct over Marshall St., has been recommended to the council for adoption.

The new Beaver Hall Hill extension of the Montreal (Que.) Street Ry. is nearing completion. The line will obviate the necessity of transferring passengers from West End lines to those reaching the center of the city.

The Utica & Mohawk Valley Electric R. R. which runs through an important dairying district, will establish stations at suitable points en route for milk collection for the benefit of farmers whose dairies are not directly accessible.

Ground has been broken for the Rochester (N. Y.) & Eastern Electric Ry., in which John Winters and A. L. Parker, of Detroit, Mich., are chiefly interested. The Detroit Construction Co. has the contract for building the road.

The Toronto (Ont.) Railway Co. has appealed an assessment of \$700,000 on its rolling stock. The cars have heretofore been treated as personal property by the assessment authorities, but were this year assessed as realty.

The Mississippi Valley Transit Co. has completed its interurban line, and is operating cars between East St. Louis, Collinsville and Edwardsville, Ill., on regular schedule. The first car was run into Edwardsville over this line, October 28th.

A new corporation of Albany, known as the Capital Street Railway Co., will build 1½ miles of track along Delaware Ave. from Madison Ave. to 2d St., in Albany. It is proposed to eventually extend the line eight miles to Slingerlands.

The Los Angeles (Cal.) Railway Co. has purchased a site containing 28 acres on which the proposed new power house, car shops and electrical shops will be erected. The general offices of the company will remain at their present location.

The Hawks-Angus interests have undertaken the preliminary work for an electric railway to connect Lansing, Mich., and Coldwater; this line will intersect the Detroit, Ann Arbor, Ypsilanti & Jackson Ry., and prove a valuable feeder for it.

A rather complex difficulty has arisen in San Francisco, involving the right of street railway companies to refuse half fare tickets tendered by children on their way to parochial or private schools on days when there is vacation in public schools.

The United Traction Co., of Reading, Pa., projects a continuous electric railway from Wilmington, Del., to Harrisburg, Pa., via Reading. A portion of the road between Reading and Boyertown, 20 miles, is completed and will soon be put in operation.

The Lake Street Elevated Railroad Co., Chicago, will soon enter Harlem with a surface line, and will run trains from that suburb through to the loop for a 5-cent fare. The line will be extended to connect with the Suburban R. R. by way of Harlem Ave.

Under the direction of C. Gorden Reed, superintendent, the rolling stock has been repaired and newly painted, and the old car houses of the Kingston Ry. have been renovated.

The Hartford (Conn.) Street Railway Co. has submitted its report for the year ending June 30, 1901, showing gross earnings of \$737,871.17; operating expenses, \$483,814.17; net earnings, \$254,057.00; interest, \$107,862.13, and dividends, \$60,000. During the year the total number of passengers carried was 17,958,489; the number of tons of freight paying revenue was 46,021.

The Berkley (Va.) Street Railway Co. is making rapid progress on the extension of its lines to Norfolk, the work being supervised by ex-Governor Brown, of Maryland, president of the Berkley company. Preparations are being made to enter Portsmouth from Berkley with a view to running cars to Pig Point, where connections will be afforded by ferry with Newport News.

The Brooklyn Rapid Transit Co., whose stock has heretofore been dealt in as unlisted security, has applied to have its \$45,000,000 of stock regularly listed on the exchange. The information in regard to the property as given to the Stock Exchange will be more specific and complete, and the company's application to be listed has resulted in a more favorable sentiment regarding this stock.

The International Traction Co., Buffalo, has issued the following report for the quarter ended September 30th: gross receipts, \$1,802,277.23; operating expenses, \$760,697.43; net earnings from operations, \$1,041,579.80; miscellaneous earnings, \$74,275.21; total earnings, \$1,115,855.01; fixed charges, \$307,206.07, and surplus, \$808,648.94. The number of passengers carried approximates 36,000,000.

An electric car figured at a fashionable wedding in Oshkosh, Wis., recently, after a plan which might be generally adopted with success. A special car was chartered to convey the guests from the home of the groom to the bride's suburban residence, where the marriage took place, after which a return trip was made by the entire party. The car was appropriately decorated. Motorman and conductor were in correct evening dress.

The question whether the air in the tunnels of the underground railway in Paris is sufficiently pure to be breathed without bad results has been submitted to experts for investigation. Their report states that the atmosphere in the tunnel contains the right quantity of oxygen, and is entirely free from carbonic acid gas. The tunnel has been jestingly recommended as a health resort, and the fears of the Parisians are allayed.

The Elgin, Aurora (Ill.) & Southern Traction Co. which recently acquired the local electric lines in Elgin, has petitioned the council of that city to extend its franchises to run for 20 years, proposing in consideration of the extension, to illuminate the city and sprinkle all the streets on which it runs its cars. The company is making a number of costly improvements along its right of way between Aurora and Carpentersville.

An exchange of securities has been effected whereby the Everett-Moore syndicate will take over the local street railway system of Akron, O., and the Canton-Massillon Ry. It is understood that the road will be operated as a part of the Northern Ohio Traction system, in connection with the Massillon extension of the latter, and the recently purchased Canton-Akron Ry. By this arrangement, but one road between Canton and Akron will be built.

The Everett-Moore syndicate is reported to be negotiating for a terminal in Indianapolis, with a view to giving direct connection between Indianapolis, Toledo, Detroit and Cleveland. It is said to be the purpose of the syndicate to extend its line in the north-eastern part of Indiana to connect with the lines of the Union Traction Co. or the Central Traction Co., which expects to have cars in operation from Kokomo into Indianapolis by next July.

The report of Charles Henrotin, receiver of the Chicago Electric Traction Co., as filed in the United States Circuit Court October

30th, shows the treasury of the company to contain \$11,173 as a surplus for the operation of the road for the quarter ended September 30th. The surplus demonstrates the practical results of the expenditure of \$250,000 to substitute the overhead trolley for the old storage battery system on Chicago Electric Traction lines.

It is announced that cars will be in operation between Toledo and Findlay, O., over the Toledo, Bowling Green & Southern Traction Co.'s new lines by December 10th. So soon as the main line shall be completed, work will be begun on the proposed extension from Jersey City to Fostoria. George B. Kerper, president of the company, is quoted as stating that the line will be maintained under independent management, all rumors to the contrary.

It is announced that the promoters of an electric line between Rochester, Corning and Elmira have secured rights of way, financed their project, and will shortly begin the construction of the proposed passenger and freight line. The road will be 120 miles long, and is expected to cost \$3,500,000. Power stations will be located at from 20 to 25 miles apart. Arrangements have not been made for operating cars into Rochester, but it is believed an entrance will be effected from the west side of the river.

A number of changes will be made in the operation of the electric line between El Paso, Tex., and Juarez, Mexico, which has already been purchased by a Pittsburg syndicate. Heretofore the fare from El Paso to Juarez has been 10 cents in American coin; and from Juarez to El Paso, 10 cents in Mexican coin, which is worth but half as much. Five cents in American money will now be charged in either direction. In connection with the interurban system the purchasers will operate two pleasure parks.

A syndicate of St. Louis, Chicago and New York capitalists is reported to have revived the project for an electric line from St. Louis to Springfield, to afford, eventually, a direct electric railway route to Chicago. The first step toward the consummation of the project was their recent purchase of the electric line over the Eads Bridge, St. Louis. It is now announced that bonds to the amount of \$450,000, and \$500,000 in stock will be issued so soon as the promoters shall have perfected their organization.

The West Michigan Traction Co. has secured docks and warehouses in Milwaukee where it will locate an important shipping station for handling the product of the Michigan fruit belt. So soon as navigation opens three steamboats, now under construction, will be put in commission. They are designed to run from Benton Harbor to Milwaukee in five hours, and will carry package freight and merchandise as well as fruit shipments. The steamer Moore made the first run over this line, October 29th.

The Lackawanna & Wyoming Valley Transit Co., which was incorporated in the spring to build an electric railway system to connect Scranton, Pa., and Carbondale, Pittston and Wilkesbarre, has acquired 97 acres of land vacated by the Lackawanna Iron & Steel Co. as a site on which to erect its projected passenger and freight depots, construction shops and power plants. The Rapid Transit company's system is estimated to cost \$5,000,000. U. S. Senator Quay, W. Connell, C. C. Mattes and F. F. Penman are interested.

The Consolidated Traction Co., Pittsburg, has issued the following report: Gross earnings from operation for September, 1901, \$264,969.31, as against \$247,810.23 for September, 1900; operating expenses, \$126,041.15, as against \$104,939.29; net earnings from operation, \$138,928.16 as against \$142,870.94. The total net earnings and other income for September, 1901, are reported at \$167,652.06, as against \$170,954.84 for September, 1900; total deductions from income, \$63,873.20, as against \$63,477.46; total income, \$103,778.86, as against \$107,477.38; fixed charges, \$86,143.34, as against \$86,496.33; net income (surplus), \$17,635.52, as against \$20,981.05. Gross earnings from operation for the first six months of the fiscal year are reported at \$1,570,320.40, as against \$1,475,666.17 for the corresponding period of the previous year; net earnings from operation, \$818,086.38, as against \$786,220.98; total net earnings and other income, \$900,313.08, as against \$955,993.50, and net income (surplus), \$91,105.09, as against \$65,310.78.



### ROYAL CAR.

The first electric car to be provided for the exclusive use of European royalty has been furnished by the Ottawa Electric Railway Co. for the use of the Duke and Duchess of Cornwall and York. This trolley car, named "The Duchess of Cornwall and York" after her royal highness, recently made a trial run through the city of Ottawa and out to Britannia on the Bay, and on this experimental trip its performance was entirely satisfactory.

The brake and the motor equipment are entirely of Westinghouse manufacture. Four railway motors of 50-h. p. each drive the car



CAR FOR DUKE OF YORK AND PARTY.

at a speed of 50 miles per hour and at this high speed the motion is entirely controlled by automatic air brakes.

The car is 50 ft. in length, straight sides and vestibuled at both ends, with full monitor roof of the Pullman pattern. The color of the car is also Pullman standard with the British coat of arms conspicuously displayed on its front and rear. The interior is finished in antique polished oak, with a handsomely decorated ceiling of three-ply bird's-eye maple veneer. At either end of the car and set in frames are two large British plate mirrors that greatly en-



INTERIOR OF CAR.

hance the beauty of the interior decoration. Rich bronze trimmings—the hat racks, hooks, etc., are of solid bronze—heighten the luxuriousness of this royal car, which at night is resplendent with the illumination of five beautifully clustered groups of incandescent lamps. A rich royal blue velvet carpet covers the floor and from the windows hang highly ornamental curtains of the latest pattern. For the comfort of the occupants, large easy chairs beautifully upholstered in olive-green plush are provided.

The Duke and Duchess of Cornwall and York are not, however, the first royal personages to possess an exclusive electric car. This distinction belongs to an Oriental sovereign, the Emperor of Ko-

rea, who but recently had a trolley car built for his private use, all of which is perhaps a rather curious commentary on European progressiveness and Oriental conservatism. This car likewise was equipped by the Westinghouse company.

The royal party stopped at Niagara-on-the-Lake, Ontario, over Sunday, Oct. 13th, and went up to view the falls of Niagara that afternoon. The visitors were met by Hon. W. Caryl Ely, president of the Buffalo Railway Co., and were his guests while at Niagara. The party boarded Mr. Ely's handsome private car and enjoyed the beauties of a trip over the Niagara gorge. Mr. Ely acted as escort for the party from the rapids to the falls. The Duke of York expressed his enjoyment of his trolley ride to Mr. Ely, and later sent him an autograph picture of himself as a further evidence of his appreciation of the trip. Superintendent Rothery, of the Niagara Falls Park & River Ry., received a similar favor from the duke.

### NEW CONSTRUCTION COMPANY.

Mr. Clement C. Smith, who for the past five years has been with the Falk Co. as second vice-president and general manager of the construction and special work departments, has severed his connection and organized the Columbia Construction Co., which will engage in the promotion, construction and operation of electric railways and do general electric railway contracting. The field which the new company will enter includes that in which Mr. Smith has had such success but will be wider and include the financing of properties.

Mr. Smith frequently discussed his plans for the organization of the new company with his associates in the Falk Co., and leaves the latter with best wishes for success in the new venture. The Columbia Construction Co. does not expect to engage in any manufacturing business, and will therefore need no plant. The general office is located in the Colby & Abbot Bldg., Milwaukee, and branch offices will be established at various points according to distribution of the work. The company is now building the interurban line from Oshkosh to Omro, Wis., and has an office in Oshkosh. The officers are: President and general manager, Clement C. Smith; vice-president, George P. Miller; secretary and treasurer, W. H. Miller.

Mr. Smith was born in Cleveland, O., Oct. 27, 1866, and on completing a course in civil engineering began work as a rodman in St. Paul, Minn., in March, 1887. Promotion was rapid and in July he was made an assistant engineer for the St. Paul, Minneapolis & Manitoba Ry. (now the Great Northern) on construction work in Montana. Later he was a member of the firm of Carr & Smith, engaged in civil engineering and surveying in Minnesota and Wisconsin. Apr. 1, 1890, Mr. Smith became engineer of construction for the Minneapolis Street Ry.; later he was with the Milwaukee Street Ry. in a similar capacity, resigning in 1893 to take charge of the construction and equipment of the La Crosse (Wis.) Street Ry., which was converted for electricity. In 1894 he became chief engineer for the Chicago City Ry. and built over 60 miles of track for it.



C. C. SMITH.

In February, 1895, Mr. Smith established the Milwaukee Trackwork Co. and began the manufacture of switches, frogs and street railway special work. Sept. 1, 1896, this company was consolidated with the Falk Manufacturing Co., Mr. Smith becoming chief engineer and manager of the construction and special work departments. When the company was reorganized, in 1899, as the Falk Co., Mr. Smith was made second vice-president. While with this company he made plans and specifications for and built a number of electric railways, that company taking general contracts for construction. Among these were nearly entire system of Winnebago Traction Co., Oshkosh, Wis., including 17 miles interurban line, which was operated by the alternating power system with rotary converters, and about 40 miles of track for the Metropolitan Street



Railway Co., Kansas City. During this period he personally made contracts and carried out the construction of work costing nearly one million dollars.

Mr. George P. Miller is of the law firm of Miller, Noyes & Miller of Milwaukee, who are attorneys for Milwaukee Electric Railway & Light Co., for the Wisconsin Telephone Co., Milwaukee Trust Co., Wisconsin Trust Co., First National Bank and other large institutions in that city. Mr. Miller is also a director in several companies, including the First National Bank, and is president of the T. A. Chapman Co., which is the principal dry goods house of Milwaukee. Miller, Noyes & Miller have been attorneys for the Milwaukee street railway for the past fifteen years or more, and Mr. Miller is very familiar with all of the legal and financial questions and the determination of policies of street railway corporations. Mr. W. H. Miller is also interested in various Milwaukee corporations, and is general manager of the T. A. Chapman Co.

The organization of the Columbia company, is entirely independent of any existing corporations, and is in the field for business wherever it may be secured.

### PAN-AMERICAN AWARDS.

Among the awards made to exhibitors of the Pan-American Exposition are the following, which will be of particular interest to our readers:

#### GOLD MEDALS.

American Steel & Wire Co., Chicago, steel and finished steel products. Also for electric wires and cables.

John A. Roeblings' Sons Co., power transmission (wire rope). Also for wires and cables.

General Electric Co., Schenectady, N. Y., machinery and apparatus for generating and using electricity. Also for electric lighting apparatus and for electrical measuring instruments.

Standard Underground Cable Co., Pittsburg, Pa., electric wires and cables.

Pittsburg Reduction Co., aluminum.

Standard Paint Co., New York City, ruberoid roofing and flooring.

#### SILVER MEDALS.

H. W. Johns Manufacturing Co., New York City, exhibit showing evolution of asbestos.

American Blower Co., Detroit, Mich., fans and blowers.

Burt Manufacturing Co., Akron, O., oil filters.

Hazard Manufacturing Co., Wilkesbarre, Pa., wire rope. Also for insulated wire and cables.

Wheeler Condenser & Engineering Co., New York City, "Admiralty" surface condensers, with combined air and circulating pump.

American Vitriified Conduit Co., New York City, vitriified clay conduits.

Bullock Electric Manufacturing Co., Cincinnati, O., dynamos and motors.

Crocker-Wheeler Co., Ampere, N. J., dynamos and motors.

Electric Storage Battery Co., Philadelphia, methods and appliances for the distribution of electric energy. Also for storage batteries.

Eureka Tempered Copper Works, North East, Pa., tempered copper and cast copper.

Gould Storage Battery Co., New York City, storage battery.

Northern Electric Manufacturing Co., Madison, Wis., direct-current dynamos and motors.

Wagner Electric Manufacturing Co., St. Louis, Mo., single-phase motors and transformers.

Gold Car Heating Co., New York City, car-heating apparatus.

McGuire Manufacturing Co., Chicago, trucks and appliances for electric cars.

Standard Paint Co., New York City, P. & B. rubberine paints and varnish.

#### BRONZE MEDALS.

American Blower Co., Detroit, Mich., blower engine.

Monarch Manufacturing Co., Waterbury, Conn., safety engine stop valves.

Underfeed Stoker Company, of America, Chicago, Jones underfeed stoker.

Harold P. Brown, New York City, plastic amalgam joints.

Morris Electric Co., New York City, Morris rail bond and hydraulic splicing machine.

Standard Paint Co., New York City, P. & B. tape, insulating compound and armature and field-coil varnish. Also for P. & B. waterproof case lining and wrapping paper.

Continuous Rail Joint Company, of America, Newark, N. J., rail joints for steam and street railroads.

#### HONORABLE MENTION.

American District Steam Co., Lockport, N. Y., underground system of steam heating from central station.

Cling-Surface Manufacturing Co., Buffalo, Cling-Surface belt dressing.

Arnold Electric Power Station Co., Chicago, power station system and clutches, illustrated by models.

Sprague Electric Co., New York City, electric motors.

Stow Manufacturing Co., Binghamton, N. Y., multi-speed motor and flexible shaft.

### NEW ENGINE COMPANY.

One of the most important industrial enterprises recently undertaken in the Middle West is that of the Brown Corliss Engine Co., of Milwaukee, which is now building an extensive plant near Racine, Wis. The location chosen was Western Union Junction, on the Chicago, Milwaukee & Saint Paul, five miles west of Racine, and the name of the town has been changed to Corliss. This is an ideal site for a manufacturing town; taxes are low and excellent shipping facilities are available; it is only 63 miles from Chicago and 23 from Milwaukee.

The company has bought a large tract of land lying on four sides of the junction, a portion of this being laid out in lots which the company proposes to give to business enterprises. The company absolutely controls the railroad frontages for three quarters of a mile. At Corliss 25 houses for the occupation of employees have been built and the Schlitz Brewing Co. has commenced the construction of a hotel of some 75 rooms. The company has its plant nearly completed and will begin manufacturing early in the new year; it will build engines up to 10,000 h. p. capacity, and will employ from 500 to 1,000 men.

The active officers are: Walter S. Whiting, vice-president and treasurer, and Walter F. Brown, 2d vice-president and general manager. Both are very well known and the company has among its stockholders a number of very prominent business men. The present offices are in the Matthews Bldg., Milwaukee.

### STORAGE BATTERY PATENT SUITS.

The Electric Storage Battery Co. advises us that three bills have been filed by it in the United States Circuit Court for the Northern District of Ohio against Sipe & Sigler, the Cleveland Electric Railway Co. and the Cleveland & Chagrin Falls Railway Co., for infringement of the H. Ward Leonard so-called "Booster" patent, owned by the Electric Storage Battery Co. The outcome of these cases will be watched with keen interest by electric railway owners and builders throughout the United States, as they involve the right to use what is known as the "Booster" system, which is now regarded as absolutely necessary in the application of storage batteries to electric railways. Should the Electric Storage Battery Co. be successful in these cases, it will have complete control of the application of storage batteries to electric railways. It is understood that these suits in the Ohio district are preliminary to others to be brought in other jurisdictions.

A comparative statement of operations for the Brooklyn Rapid Transit system (inclusive of all constituent companies) for the month of September, 1901 and 1900, comprises the following data: Gross receipts for September, 1901, were \$1,090,228.81 as against \$1,019,464.89; expenses including taxes, \$740,545.52 as against \$628,666.31; net receipts, \$349,683.29, as against \$390,768.58. The number of miles operated (single track) was 489.3. The statement for the three months ending September 30th, shows gross receipts, \$3,433,600.52 as against \$3,226,458.07; expenses, including taxes, \$2,259,123.16 as against \$1,961,542.55; and net receipts, \$1,174,477.36 as against \$1,264,915.52.

### PLAN TO SECURE BUSINESS.

The Indiana Railway Co., which is preparing to build a track from South Bend to St. Joseph in the spring, has developed a new plan to secure freight business along its route. Several hundred prominent Chicago manufacturers have received circular letters from the railway company offering them free sites along the route of this road provided they will move there and erect factories. The railway company owns a large amount of territory contiguous to its line, and this offer is made in order to establish an extensive freight traffic.

### THE RIDGE ROAD PROJECT.

A party consisting of Richard Sutro, of the banking firm of Sutro Bros., of New York, with several of his partners and other projectors of the Niagara Falls & River Electric Ry., recently made a tour of inspection over the right-of-way with reference to closing the necessary financial arrangements for starting work on the road. Two entire days were devoted to this inspection by the party and considerable time was spent in interviewing residents and business men along the road who will be affected by the construction of the road.

It was found that a first class road could be constructed and operated with unusual facility, owing to the absence of grades and curves. The populous condition of the territory over which the line will pass also promises well for the new road. The stretch of country along this route contains an unusual number of houses of well-to-do people and well cultivated farms.

The construction of the road will not be commenced until early spring, owing partly to the long delay in the proceedings before the Railroad Commission, and partly to the difficulty of procuring sufficient rails at an earlier date.

The road is to be of standard construction and it is stated that the conditions of freight traffic which confront the company demand that the line shall be as perfect in its construction as any first class steam road.

### NEW CATALOG ON ELECTRIC HEATERS.

The Consolidated Car-Heating Co., of Albany, N. Y., has in the mails a well-arranged pamphlet which seems to be something more than the ordinary trade catalog. The descriptive matter referring to the company's various styles of electric heating equipments is a technical review of the subject of electric heating in general, and clearly points out all the theoretical as well as the practical requirements of modern street railways in this respect.

From the paragraph on "First Principles" we quote the following concise statement of familiar laws:

"The conversion of electrical energy to heat takes place in accordance with well known laws, and in known proportions. One British thermal unit of heat is equivalent to 1047.3 watts, and cannot be produced without the expenditure of that amount of energy. A resistance coil which will pass a certain amount of current may be made of a short length of wire of high resistance, or of a long wire of low resistance. If the resistances of the coils are equal, the same amount of current will flow through each, and each coil will give off the same amount of heat. Consequently a short coil of high-resistance wire having a small surface must necessarily operate at an excessively high temperature, in order to dissipate the same amount of heat as the longer coil of low-resistance wire having a much larger surface."

The company adds that in this principle lies the success of the "Consolidated" electric heaters, which have a large heating surface and operate at a moderate temperature.

Among the heaters especially described we note the pattern which was designed to meet the specifications of the Manhattan Railway Co., of New York City, for which the Consolidated company is furnishing 21,600 heaters for 1,200 cars. In this type the company's standard spiral cord construction is used, but there are three independent circuits through each heater. The coils are all alike, and regulation is secured by the operation of one, two or three currents, as required.

The Toledo & Lima Traction Co. has secured a franchise through the village of Deshler.

### NEW WHEEL PIT OF THE NIAGARA FALLS POWER CO.

The work on the second wheel pit of the Niagara Falls Power Co. is progressing rapidly. The pit has a length of 463 ft. 8 in. and a depth of 178½ ft., while its width is 18½ ft. The tunnel extension to the new pit has been excavated and brick lined throughout, and connection between the brick lining and the tunnel pit has been made. About the same problems were met in the construction of this pit as in the first one. From the top to the bottom there are four changes in the nature of the rock. The amount of water which flowed in through the seams in the rock was practically the same as in the first pit. This water was caught in a reservoir 60 ft. below the surface of the ground which was excavated around the sides of the pit, and from this reservoir it was pumped to the surface. The tunnel extension required for the new wheel pit has been driven. It runs from the first to the second pit, and is about 700 ft. long. This is lined with brick, and the connection of this lining with the new wheel pit has but recently been completed. A large portion of the steel skeleton of the new power station has been erected. Its length will be 560 ft. and its width 70 ft. The superstructure will be of limestone of a gray color. The capacity of the station will be 55,000 h. p., there being eleven units of 5,000 h. p. each.

The turbines in the new pit will be single wheels of the inward discharge type, which will work under a head of 145 ft. These differ somewhat from the turbines in the original pit, which were of the twin type and which work under a head of 136 ft. On one side of the power house a covered forebay has been constructed which is 460 ft. long by 40 ft. wide. The outer wall of this forebay runs along the inlet canal, and the water passes into it through 24 arches, which have been built so that their top line is under water. The outer wall of the forebay is designed to keep back floating ice, and having the forebay covered will be a protection to the men employed there. All the masonry has been completed on this work with the exception of these arches.

### NEW PUBLICATIONS.

THIRTEENTH ANNUAL REPORT, INTERSTATE COMMISSION. The annual report of the statistics of street railways in the United States for the year ending June 30, 1901, has just been published by the Interstate Commerce Commission. The contents of this report are similar to that of previous reports with the exception of two instances. One of the new features is that taxes paid by railways are compiled by states, and the amount paid per mile of line within each state, as well as the aggregate amount, is shown. The other new feature is the change in the computation of train mileage which in this issue follows the new rules adopted relative to mixed train mileage. The commission designs shortly to publish a ten-year book on American railways including statistical data relative to the condition and operation of railways since 1890, and for this reason the present report includes only the customary annual statements.

ELECTRIC RAILWAY HANDBOOK. By Albert B. Herrick. Price \$3.00. Published by the Street Railway Publishing Co., New York. In this volume the author has collected under one cover a large amount of data which is directly applicable to construction, adjustment and operation of electric railway systems. The book is fully illustrated, the cuts showing such appliances, structures and methods as have been adopted in practice by the street railways of the United States. The use of mathematics and formulas has been limited as far as possible to make the book useful to the great majority of practical workers, and the topics treated are generally reduced to their simplest terms, omitting data which would only be of use to the expert. The book is addressed largely to engineers and employes of street railways and the contents has been selected from the data collected by the author in the course of his engineering work.

ELECTRICAL TRADES DIRECTORY AND HANDBOOK. Published by the Electrician Printing & Publishing Co., London. The 20th edition of this book which is now in the course of preparation, will be ready for publication in January, 1902.



The book is a really reliable trade directory and is one of the best known works of its class. To every firm and individual mentioned in the directory, the publishers send each year, a slip for revision containing the entry for the previous year, and it is earnestly desired that these revisions shall be promptly returned in order that the book may be made thoroughly complete. This directory is well known throughout the electrical engineering and allied trades, and the work of compilation and correction is proceeded with up to within a few days of publication in order to embrace the numerous alterations in names of firms and addresses which occur at the commencement of each year. It is interesting to note that the proportion of alterations in the names of firms, addresses, etc., occurring in the month of January amounts to about 30 per cent of the entire list. The book is divided into six divisions, which are the British, Colonial, Continental Asiatic and African, Central and South American and the United States, each of which is alphabetically arranged and classified into trades and professions. The book also contains a biographical section embracing the names of all of the most prominent workers in the electrical field.

**POOR'S MANUAL OF RAILROADS OF THE UNITED STATES.** Thirty-fourth annual number. Published by H. V. & H. W. Poor, New York, 1,900 pp., 24 state maps and 47 railway maps. Price \$10.00. The edition of Poor's Manual for 1901 was issued September 23d, and is corrected to Sept. 15, 1901. The book contains statements of 3,691 corporations, etc., of which there are 1,844 steam railroad companies in the United States, 163 steam railroad companies in Canada, 19 steam railroad companies in Mexico, 1,132 street railway and traction companies in the United States and Canada, 166 industrial and miscellaneous corporations and 367 statements of debts of states, cities, etc., in the United States.

The first number of Poor's was published in 1868, and contained only 442 pages which were sufficient at that time to present statements covering the operations and financial conditions of all the railway companies in the United States. At that time the total length of the lines aggregated 39,250 miles. From year to year new features have been introduced resulting in a great expansion of the scope of the work, until now the annual number comprises over 1,900 pages.

The statements of the railroads, commanding the widest attention, necessarily occupy the largest and most important sections of the manual. Next in importance is the city and suburban system of railways which, within the past few years, has been practically revolutionized by the substitution of electric traction and which at the present time is undergoing a most extraordinary development. In the street railway department of the Manual, the statements of the street railroads are presented in the same form as that of the steam lines, and this department has been enlarged to cover all the street car and traction lines in the country. In addition to the statistics presented, it is the policy of the manual to give from time to time, an exhaustive analysis of affairs of important railroads, accompanied by carefully prepared historical statements. In regard to the street railways of the country the following, quoted from Poor's Manual, will be found of interest:

"In the department of electric and other tramways, first introduced in Poor's Directory of American Street Railways, but now incorporated in the Manual of Railways, there is an entirely new field which is being rapidly developed, and is one of the most important elements in extending the circulation and influence of the Manual. It is scarcely necessary to point out the activity recently displayed or soon to arise in this department of railroad development; nor that the Manual is speedily to assume the position of authority on the affairs of that system corresponding to its recognized character as the official organ of the steam railroads of America, upon which the reputation of the Manual has been built.

"The street railway systems of the country are now assuming such vast importance that their securities present to the investor and capitalist, equal, if not superior, to those of our steam railway companies. Being less subject to sharp competition and wholly free from 'rate wars' their securities are sure to increase

in attractiveness in ratio with the growth of the cities in which they are located."

An examination of this work will impress every one with the large amount of labor involved in the collection and preparation of the reports of the vast number of companies included. A most desirable improvement would be the establishment of a fiscal year, common to all the companies. The tendency of the majority is to adopt the 30th of June as the close of the fiscal year, but a number of important companies still adhere to the calendar year which prevents the earlier issue of the Manual. As considerable time always elapses after the close of the year before the reports are made public, it has so far been impossible to issue the Manual at dates earlier than those at which it usually appears. Another cause of delay is the submission to the officials of the various railroad companies of proofs of the statements prepared for publication. This submission for correction, however, gives a semi-official character to every statement published which greatly increases its value to the public as it assures complete accuracy. To the investor and the business man having relations with railways this book presents more information than can be procured in any other publication and its official character and accuracy are unchallenged.

**DUNCAN'S MANUAL** of tramways, omnibuses and electric railways, for 1901, has just been published. This is the 24th annual issue of this manual, which is published by T. J. Whiting & Sons, of London. It contains the statistics of all the tramway, omnibus and electric railway lines of the United Kingdom and the foreign and colonial companies that are registered in England. The book also contains abstracts of the accounts of all of the companies, and in the present edition the form of compiling has been altered so as to show the accounts for two years. Telephone numbers and telegraphic addresses have also been given in all cases where they were ascertainable. The chief features noted for this year are the continued acquisition and operation by municipalities of the tramways whose leases have expired as well as the starting of new systems by them, also the extension of the overhead system of electric traction.

**STURTEVANT ELECTRIC GENERATING SETS** is the title of catalog No. 117, published by the B. F. Sturtevant Co., of Boston, Mass. This company over 40 years ago established the first blower factory in this country, and a little over 10 years ago the rapid increase in the use of electricity opened the way for the electric fan direct connected to the motor. An electrical department was started at that time which now produces a full line of fan motors and direct connected engines and generators ranging from 2 to 250 h. p. in capacity. The company has a record of over 8,800 engines sold since it first entered this field. The catalog gives illustrations and descriptions of the company's numerous varieties of motors and generators, of both direct connected and belted types, and also of a large number of generating sets which are mounted upon single sub-bases.

**THE SPRAGUE MULTIPLE UNIT SYSTEM**, is the title of a large illustrated pamphlet published by the Sprague Electric Co., of New York. The pamphlet contains two well written articles, one by Mr. Frank J. Sprague, which describes and illustrates in great detail his multiple unit system which has of late gone into extensive use on roads where cars are operated in trains. The remainder of the pamphlet is devoted to a highly illustrated article by Mr. Francis H. Shepard on the "Operating Features of the Boston Elevated." This system has been successfully installed on the Chicago South Side Elevated road, the Brooklyn Elevated, the Versailles division of the Western Railroad of France and the Boston Elevated, the latter involving perhaps the most difficult service in the world.

**THE NEWSPAPER BLUE BOOK.** Published by Theodore Wiese, Chicago. This book contains a select list of the best newspapers in the United States for 1901-2, which are read and clipped by the United States Press Clipping Bureau, of Chicago, of which Mr. Wiese is the proprietor and manager. The work is classified by states, the best papers in each prominent city of the state being given. The book also contains a chapter in regard to the press



clipping service of the publishers, and an interesting account is given of the method in which the work is carried on.

**CHRISTENSEN AIR BRAKES** is the title of a highly artistic catalog published by the Christensen Engineering Co., of Milwaukee. The book opens with a series of engravings, showing the growth of the works from 1898 to 1899 and its still greater enlargement in 1901. A list of elevated and steam roads on which this system of brakes is in use as well as a large number of systems where it is employed is also given. The catalog contains no descriptive matter but tells its story by means of a series of beautifully executed engravings showing views of a number of roads on which the Christensen system has been operated.

**ELECTRICAL CATECHISM.** By Geo. D. Shepardson, M. E. Price \$2.00. Published by the American Electrician Co., New York. This book is a revision and enlargement of the electrical catechism which was commenced in *Electrical Industries* in 1895 and which has continued uninterruptedly through the succeeding volumes of that paper and its successor, the *American Electrician*. It is designed to answer the numerous questions that continually appear in regard to the various problems of electricity, and the writer has endeavored to present in simple, non-technical language the information often sought by electrical workmen in all branches. The book covers quite a large field including static electricity, laws of electrical circuits, batteries, magnetism, electrical measurements, dynamos, motors and principles of the alternating current. The book will be found useful in explaining many points to the non-technical reader.

**THE GENERAL ELECTRIC CO.** has recently issued the following publications: Bulletin No. 4265, "The Device Capacity of Railway Motors," Bulletin No. 4266, "Adjustable Shunt Field Coils for Thomson Recording Wattmeters." Reprint of a paper on "Arc Lighting at the Beginning of the Twentieth Century" read before the National Electric Light Association. "The General Electric Co. at the Pan-American Exposition." Bulletin No. 4264 on "Isolated Plant Switchboards," Supply Catalogs Nos. 7549 and 7550 on "Instruments" and "Parts of U. S. Trolleys." Price Lists Nos. 5086 and 5087 on "Arc Lamp Accessories" and "Thomson Recording Wattmeters." Flyers Nos. 2082 and 2084 on "Porcelain Tree Insulator" and "Series Alternating System Testimonials." Flyers Nos. 2085 and 2086 on "Porcelain Knobs and Clips" and "Clip Spring Switches." Price List No. 5089, "Enclosed Oil Break Switches Hand Operated." Catalog and Price List No. 7551, "Fuse Boxes, Blocks and Cut-Outs."

**THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO.** has issued its Circular No. 1054, superseding Circular No. 1016, describing the electro-magnetic traction system developed by this company. The circular contains numerous illustrations showing the details of the construction and general views of the roads installed at Indian Head, Md., for the United States Government, and at the Westinghouse Works.

The Kansas City-Leavenworth Railway Co. is preparing plans to bridge the Kaw River, and has petitioned for an entrance into the business center of Kansas City.

Preliminary surveys have been begun for an extension of the Chicago, Harvard & Geneva Lake Ry. from Walworth, Wis., to Montevideo Park, on the south shore of Delavan Lake, a distance of two miles. The extension is to be completed by early spring.

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## STREET RAILWAY PATENTS GRANTED DURING OCTOBER, 1901.

This list is furnished by T. Reed Clift, Patent Attorney, Washington, D. C., from whom copies of the patents named can be secured by sending ten cents.

No. 683,507, granted October 1st, to Reuben Shirreffs, of Boston, Mass. Apparatus for removing snow.

No. 683,534, October 1st, to Edwin A. Wakefield, of Pelham, Mass. Trolley.

No. 683,554, October 1st, to Isaac F. Cuttler, St. Helens, and H. S. King, South Molton, England. Apparatus for truing wheels of tram or like cars.

No. 683,654, October 1st, to Andrew J. Maine, Appleton, Wis. Car mover.

No. 683,710, October 1st, to William T. Shyrook, Allegheny, Pa. Brake for street cars.

No. 683,898, October 8th, to Charles H. Beardsley, Brooklyn, N. Y. Car brake.

No. 683,934, October 8th, Albert W. Ham, Lansingburg, N. Y. Track sanding attachment for double truck motor cars.

No. 684,178, October 8th, Phillip Boch, New York City. Car brake.

No. 684,278, October 8th, Milton Lytch, Rowland, N. C. Extension car step.

No. 684,327, October 8th, Daniel F. Watson, Oronogo, Mo. Freak railway.

No. 684,373, October 8th, Roy Inglis and Eugene Wilks, Jersey City, N. J. Trolley guard.

No. 684,478, October 15th, James A. Trimble, New York City, N. Y. Braking apparatus.

No. 684,558, October 15th, Calvin W. Tanner, Columbus, Tex. Switch operating device.

No. 684,595, October 15th, Benson Bidwell, Philadelphia, Pa. Electric railway.

No. 684,791, October 22d, Eugene R. Carichoff, East Orange, N. J. Electric resistance.

No. 684,964, October 22d, George W. Webb, St. Louis, Mo. Car fender.

No. 685,109, October 22d, Joseph P. Cornelius, St. Louis, Mo. Car Fender.

No. 685,200, October 22d, Ed. E. Burke, Anderson, Ind. Safety switch lock for street railways.

No. 685,393, October 29th, Perley P. Crafts, Boston, Mass. Electric brake.

No. 683,394. Same.

No. 685,395, October 29th, Andrew M. Cupples, Tyrone, Pa. Car fender.

No. 685,575, October 29th, Edward R. Coon, Burlington, Vt. Electric railway trolley.

No. 685,616, October 29th, Lowry S. Kirker, Wheeling, W. Va. Car fender.

The Homestead (Pa.) Street Ry., two miles in length, was opened to the public October 10th. One thousand passengers were carried on that day.

**THE  
MILLER-KNOBLOCK  
ELECTRIC  
MANUFACTURING COMPANY**

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**COMMUTATORS,  
ARMATURE COILS,  
REPAIRING,  
MAGNET WIRE.**

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**SOUTH BEND, INDIANA.**



PUBLISHED ON THE 15TH OF EACH MONTH.

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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. XI. DECEMBER 15, 1901. NO. 12

The publishers of the "Street Railway Review" have established a branch office at Cleveland, O., which will be in charge of Mr. George A. Barnes, with headquarters in the Electric Building.

On May 1st, next, the "Review" will remove to new quarters, the Windsor & Kenfield Publishing Co. having a long time lease on the property at Nos. 45 and 47 Plymouth Place (directly opposite the Old Colony Building), Chicago. This is a four-story building 50 by 100 ft. most desirably located in what has come to be the publishing district of the city. It will be altered and refitted to specially adapt it for our uses. It is the intention of the company, so soon as it shall be installed in the new location, to greatly enlarge its mechanical department, practically doubling the present equipment.

The lease provides that the company shall have the option of extending the term for 50 years and in this event it will erect a modern building.

In the recent paper on "The Position of the Engineer in Municipal Service," by Mr. Alexander Dow, the author admirably states the relations which should obtain, and cites the administration of the Detroit Lighting Commission in its early days as example of what excellent results can be accomplished when politics and the administration of a municipal department are divorced. Such a separation of business and politics cannot but be regarded as absolutely essentially to secure good results, and Mr. Dow states that he knows it was effected in Detroit and believes it can be done again. The history of the Detroit Lighting Commission as detailed by Mr. Dow shows that after a few years business and politics became mixed and the present condition of affairs in that city surely justifies the comment that Mr. Dow is too sanguine. It may be possible to separate politics from municipal enterprises but in the great majority of cases it is not practicable.

There is one exception, that of municipal fire departments; the fire departments of American cities are almost invariably well ad-

ministered. For this there are excellent reasons. If there is any attempt made by politicians to place incompetent men in the fire department or institute any policy which does not meet the approval of the fire underwriters of the city, there is an advance in insurance rates that touches every property owner at the most vulnerable point—his purse; the "reform" movement which results is short, sharp and decisive. In the other city departments misdeeds do not affect the general body of citizens so promptly and so generally; the result of poor management is a deficit to be met by taxation, a necessary evil which does not so strongly appeal to the individual.

As to the possibility of separating politics from the operation of a municipal street railway we are most skeptical. The advantages of organizing several thousand railway employes into a "machine" is too great to be overlooked by our enterprising party managers, and there is no "board of underwriters" to compel a business administration.

In the article on "The Interurban Railway as an Investment" contributed to the "Review" for September last by Mr. Guy Morrison Walker, the operating expenses and receipts of steam and electric roads serving the same territory were compared and the results plainly showed the great advantage possessed by the electric interurbans in their ability to carry at a profit a class of traffic considered as entailing a loss, or at least as very undesirable, by the steam roads. That this ability of electric railways to distance their steam competitors is not peculiar to America is evidenced by a number of instances cited by Mr. Emile Garcke, of the British Electric Traction Co., in a letter to the London Times. Mr. Garcke says in part:

"In the middle of March the Tynemouth Electric Traction Co. commenced to run on 3½ miles. This is an old steam concern, which has been taken over by the British Electric Traction Co., converted to electric traction, and extended. Within five months the electric cars have carried nearly one million passengers, as against less than 350,000 per annum formerly, and the ratio of working expenses to receipts has fallen by some 40 per cent. At the beginning of April two entirely new electric lines were started at Merthyr Tydfil (three miles) and at Poole (3¾ miles). Neither of them is as yet working under the most favorable conditions. Nevertheless, the cars at Merthyr have carried in a little over four months nearly 900,000 passengers, and those at Poole over 800,000, the earnings per car-mile and the working expenses being in both instances better than was anticipated. In May last the Gateshead tramways, an old steam line, commenced running electrically on about eight miles. This reconstructed and extended system has carried over 2,000,000 passengers in the first three months, as against 1¼ millions per annum under the old regime. I could mention many other similar results and some very much better, and, of course, these figures are nothing compared with the traffic on metropolitan tramways like those in the West of London, but I quote these particular instances as showing what can be done even in comparatively sparsely-populated districts. In 1900 the entire British Electric Co.'s systems carried some 75,000,000 passengers. For 1901 the total will be about 100,000,000. Quite apart from increase of population and extensions of line, this total will rapidly mount up as the habit of using the electric car becomes more and more pronounced, and traffic managers emancipate themselves more thoroughly from the traditions of the horse car. A comparison of these figures with the traffic of our steam railways, regard being had to the miles open, will give your readers some idea of how vast and how different is the traffic carried by electric cars."

Note the similarity in results—increased traffic and reduced ratio of operating expenses to receipts.

When it is considered that as yet comparatively few electric lines have undertaken to seriously encroach upon the freight business of their steam competitors, a traffic known to be profitable, the future of electric roads becomes doubly certain.

In the "Review" for August, 1900, page 422, we discussed the report of the New York Board of Railroad Commissioners, giving the results of the competitive tests of street car brakes made by the Commission in December, 1899. The report contained 66 diagrams, each with from two to four curves, reproduced from curves drawn by an automatic recording device, and alleged to show the distance run by the car before coming to rest and the time required, for each test. According to these curves the distance run by the car the first second after the recording apparatus came into action was generally greater and often more than twice



as great as would have been the case had no attempt been made to stop the car. In 13 cases, according to the curves, the car ran farther after the brake was applied than it could have gone in the same time at its stated initial velocity, and in over half of these it was on an up grade.

After a careful examination of these curves we reached the conclusion that "the time and the velocity records shown by the curves and tables are absolutely worthless." And further, "the fact that this is true of one portion of the apparatus, throws serious doubt on the other results obtained with it, and renders the table of the comparative sanding of the several brakes of no value."

Though an opportunity was given to those concerned in the preparation and publication of this report to explain the absurd results contained in it, no explanation was offered, so far as we know, until over a year later, when Mr. Charles R. Barnes, the electrical expert of the New York State Railroad Commission, who made the tests for the Board, presented a paper on "Brakes for Electric Street Surface Cars," before the New York State Street Railway Association. This paper, which was read at the Rochester meeting of the Association on Sept. 10, 1901, contained the following concerning the brake tests of the Commission:

"Three years ago the present Board of Railroad Commissioners, recognizing the rapid increase in the number and variety of accidents occurring on street surface railways, and studying the problem with a view of suggesting a remedy, decided that the brake systems then in general use were largely responsible for these accidents, and, with a view of stimulating improvement in the method of stopping cars, and to bring about the adoption of improved braking systems, arranged a public competitive test of brakes for street surface cars. The result of this test was published by the Commission in book form. It was not the intention of the Commission to enter into a scientific investigation of the question of stopping a car, but rather a practical comparative test of the appliances in use at this time for this purpose.

"The apparatus used to record the result of these tests was necessarily crude, there being at that time no fund available for the construction of a recording apparatus. The clock-work movement on the recorder which was used varied somewhat. This was due mainly to the shock or jar of the cars while in operation. The curves recorded by this instrument were faulty and received a number of criticisms, to which, in a degree, they were entitled, but the recording of the distance in which the various stops were made was perfect. A special pair of wheels in contact with the rails and bearing no part of the weight of the car, but with friction sufficient to avoid slipping, furnished the motor power for the movement of the recording apparatus. This was effected by sprocket chain and gears, in such a manner that the measurement of distances recorded on the machine from the signal to the point where the wheels ceased to revolve was absolute and perfect.

"The criticism on this report in the main was a fair one. The discrepancy in the time movement was discovered before the curves were reduced, but as the element of time did not enter into any of the computations and did not in any manner affect the results, Professor Thurston and myself thought it best to publish the curves in the report as they were reduced from the instrument sheets; and, while they were not perfect as far as the time element was concerned, they did show approximately the time in which the different stops were made."

It is to be regretted that this frank admission as to the defects of the recording apparatus was not made at an earlier date and had it been included in the original report greater weight could have been given to the records of distance which are claimed to be accurate. We think, however, that it is too much to say that the curves show even approximately the time in which the different stops were made.

The dispute between the Metropolitan Railway Co. and the Metropolitan District Railway Co. in regard to the kind of electric system to be used in changing over their lines from steam to electricity was the subject of a protracted hearing before a board of arbitrators which was provided for by a special parliamentary committee. The proceedings which covered eleven days sessions were heard by Mr. Lytleton, K. C. as arbitrator, with Mr. Thomas Parker and Mr. Horace F. Parshall as assessors. The case for the District company was conducted by Mr. Fletcher Moulton, who advocated

the use of the system of electric traction generally adopted in this country. He described the general arrangements of such a system, which consist of a high-pressure, three-phase generating plant, with three-phase transmission lines between the substations where, by means of rotary converters, the alternating current is changed into direct current at from 500 to 600 volts, at which pressure it is used on the cars. There was but little argument offered in defense of this system, that being considered unnecessary, as it is the one employed almost universally and its possibilities are generally understood. The greater part of the argument of the District company was devoted to various criticisms of the complete alternating system for traction work in general, and especially to the system proposed by Messrs. Ganz, although it afterwards developed that the system which was being criticised was very imperfectly understood by some of the engineers until Mr. O. T. Blathy, manager of the Ganz works, and Mr. Kando, assistant engineer of Messrs. Ganz, had explained in detail the system upon which tenders for equipping the roads had been submitted.

There was considerable expert testimony which went to show the difficulties and objections of a complete three-phase system for traction work. But it must be admitted that all of the points objected to by the witnesses had been considered and solved, at least on paper, by the engineers of the Ganz company before making their tender.

Among the points of the Ganz system especially criticized were the double overhead trolley wires, the side bearing trolleys which were designed to take off the current by means of rollers, and which are to be controlled by compressed air, the use of liquid rheostats in the car controlling system, also operated by compressed air, and the fact that polyphase motors operating in concatenation are incapable of working at a higher speed than that for which they were designed. Messrs. Blathy and Kando, however, met all the objections urged against their system by explanations which theoretically were satisfactory, and their testimony showed that they could get at least equally as good results as the continuous current advocates at somewhat less initial and less operating cost. The only point on which the engineers of the Ganz system were rather weak in their testimony was in regard to the experiments with and practicability of some of their plans. They were obliged to admit that while they had installed several plants using many similar features, that none of the roads so equipped were in any way comparable to the London underground systems and that the latter involved the designing and construction of a great many special features and new apparatus which were absolutely untried in practice. In fact Major Cardew, formerly electrical expert of the Board of Trade, who was a witness for the Ganz system, admitted that he considered it would be desirable before equipping the whole of the Inner Circle to equip a portion of it as an experiment, and that the Board of Trade would probably insist upon this in order that it might see whether the system would work satisfactorily and with safety to the public.

A study of the testimony brought out in this hearing goes to show that the engineers for Messrs. Ganz have undoubtedly developed an excellent system of electric traction, using three-phase current throughout, without the intervention of rotary converters, and there seems to be little doubt that this system will eventually attain success. At the same time, from a financial point of view, these London underground lines are not the proper place for experimenting any new system, however great its promise, until its practicability in every respect has been thoroughly demonstrated in actual service. While we do not desire to be misunderstood as opposing progress and improvement in the field of electric traction, financial considerations are so great in the case of these roads with their enormous traffic that prudence dictates that only a well tried system whose capabilities are thoroughly understood should be considered.

Experience has taught us that in the application of any new system to practical work, no matter how carefully the scheme may have been laid out in the drafting room, its practical application will develop necessary changes in details which could not possibly have been foreseen. This is practically the position of the Ganz system today, and we hope to see it speedily reduced to practice and perfected in detail, but in some place not involving the financial risk which would be incurred on the London underground systems.

Since the foregoing was written the cable dispatches have contained the announcement that a decision had been given in favor of Mr. Yerkes' plans.

## The New Bedford & Onset Street Railway.

The city of New Bedford, Mass., a thriving place of about 65,000 inhabitants, is well served by a prosperous street railway system, and has lately become the center for two modernly equipped interurban electric roads, serving the territory lying in the extreme southeastern portion of Massachusetts. These three roads are owned by independent companies but the stock of each is held by allied interests and the three properties are operated in harmony as to track rights, distribution of power, repairs and maintenance of cars, and other affairs of management.

The city company is known as the Union Street Railway Co.

ft. of special rails; 56,665 chestnut ties,  $6\frac{1}{2} \times 6\frac{1}{2}$  in. by 8 ft., spaced 20 in. center to center; 227,538 spikes; 8,346 "Crown" rail bonds; 4,173 Weber rail joints. In addition to the two "Crown" bonds at each joint the rails are cross bonded with No. 6 wire every 700 to 800 ft. There are 18 curves, crossings, cross-overs, etc., and 20 switches. All the special work was furnished by the Barbour-Stockwell Co., of Cambridgeport, Mass.

The overhead material used is as follows: 113,510 ft. of No. 00 trolley wire; 99,924 ft. of feeder wire; 77,137 ft. of stay wire; 13,154 ft. of span wire; 1,140 wooden poles; 165 iron poles; 44



MAP OF NEW BEDFORD & ONSET SYSTEM.  
Dartmouth & Westport Street Ry.—Union Street Ry.—New Bedford & Onset Street Ry.

It owns 31 miles of track in New Bedford and suburbs, and operates 39 cars in winter and 70 in summer.

One of the interurban companies, known as the Dartmouth & Westport Street Railway Co., operates a 19-mile single track road from New Bedford to Fall River. This is locally called the "Gee Whiz Line" and enjoys a very profitable through business formerly carried by a parallel steam road.

The New Bedford & Onset Street Ry. was opened to Wareham on Sept. 6, 1901, and the day after cars were run through to Onset.

brackets for iron poles; 471 brackets for wooden poles; 97 cross-arms for iron poles; 875 cross-arms for wooden poles. The overhead material was supplied by the General Electric Co.

In the country 35-ft. chestnut poles are used and in the towns iron poles. The wooden poles are set in broken stone, in some cases from  $1\frac{1}{2}$  to 3 cu. yd. of stone being placed about the base.

The different types of construction are divided as follows: 46,808 ft. of bracket, wooden poles; 4,328 ft. of bracket, iron poles; 28,905 ft. span, wooden poles; 6,458 ft. span, iron poles.



VIEW AT ONSET.

The total distance of 23 miles is made in 1 hour and 25 minutes. The fare is 25 cents each way or 5 cents from town to town.

There are, excluding track in the car barn, 16.136 miles (85,201 ft.) of single track; 2,973 miles (15,698 ft.) of second track; 1,896 miles (10,014 ft.) of siding, and .541 mile (2,857 ft.) of spur track, a total of 21.547 miles (113,770 ft.).

The following statistics as to material used will be of interest: 210,534 ft. of 70-lb. rails in 60-ft. lengths; 11,034 ft. of 75-lb. rails in 30-ft. lengths; 6,483 ft. of guard rails (bolted on work); 5,972

In addition to the ordinary work of removing and leveling the surface over the right of way, the following work was done by day labor: 24,323 yd. grubbing and subgrading; 63,055 yd. extra excavation; 9,253 yd. gravel (average haul about  $\frac{3}{4}$  mile); 7,931 yd. crushed stone (average haul about  $1\frac{1}{4}$  mile).

There are 6,580 lineal feet of macadam laid 5 in. deep in track between rails. The macadam was laid close up to each rail and left for the car wheels to cut their own grooves.

For about 18 miles the road is on a private right of way, the rest

being on the public highway. A few long cuts were necessary and considerable portion of the track work was in flooded ground, necessitating hauling gravel for the subgrade, and much ditching and draining. One large bog which was encountered had to be thoroughly drained.

In this work 5,819 ft. of 4- and 10-in. iron drain pipe was used. The pipe generally was laid 3 ft. deep, and the trench filled with

this, necessitating considerable masonry work and the building of new brick arches and forms, with concrete over arches, and tar concrete floor on top.

#### Power House.

The group of buildings comprising the power station and car barn is located at Wareham, Mass., five miles from Onset, the



CAR HOUSE AND POWER STATION, WAREHAM—NEW BEDFORD & ONSET STREET RY.

gravel or broken stone. There are 27 driveway culverts and cattle passes, built of iron pipe or stone. One culvert contains 60 ft. of 20-in. iron pipe, and 10 ft. of stone work.

In building there were 16,870 ft. of walls removed; 1,852 ft. of faced walls rebuilt; 517 ft. of balance wall rebuilt; 5,805 ft. of rough sea wall rebuilt.

There were also 1,950 ft. of state highway fence removed and 14,400 ft. of wire fence built.

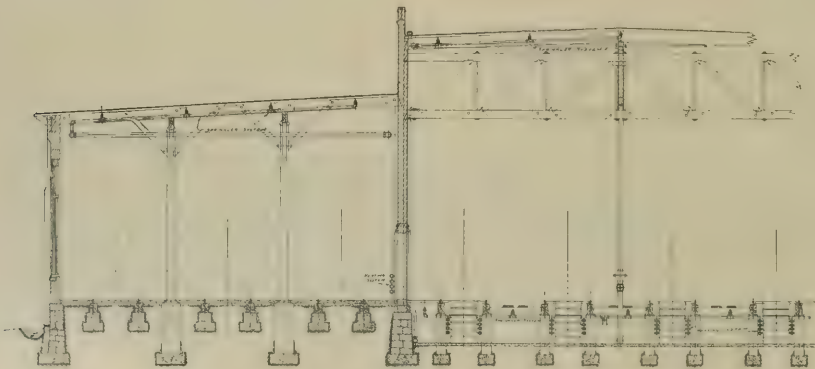
#### Street Improvements.

It was necessary to widen 36,157 ft. of streets and roads from 10 to 20 ft.; to lay new 12,893 ft. of macadam, and to repair or rebuild 1,770 ft. of macadam.

In addition there were special items which included the building

eastern terminal and 17 miles from New Bedford the western terminal. This power house is connected in multiple with the central power station at New Bedford, the latter plant feeding the line for a distance of eight miles from New Bedford. At the dividing point on the line where the feeders from the two stations join, an automatic switch is placed to avoid possible overloading of either station.

When the question of power for the Onset line was under consideration, it was decided that as much of the equipment at the old New Bedford station was inadequate to care for the increased requirements of the several lines of the New Bedford system, it was best to transfer two of the small high speed units from the old power house to the new plant at Wareham and purchase new and larger units for the older station. This has accordingly been done and these two units, with a new direct connected 400-h. p. unit now



CROSS SECTION OF CAR HOUSE.

of two bridges at Weweanit, one at Narrows and a wooden trestle bridge; also the abolition of a grade crossing with the New York, New Haven & Hartford R. R., involving considerable grading, and the placing of an iron span resting on stone foundations to carry the steam railroad tracks.

The street railway track crosses a herring weir provided for herring going up into the ponds to spawn. The company had to repair

comprise the equipment at the Wareham plant. There is also room for an additional belted engine and generator as indicated on the plan. The apparatus in this station comprises:

One 450-h. p. high speed compound condensing engine, with cylinders 17 and 28 in. by 18 in. stroke, belted to one 300-kw. General Electric generator.

One 350-h. p. high speed compound condensing engine, with cylin-



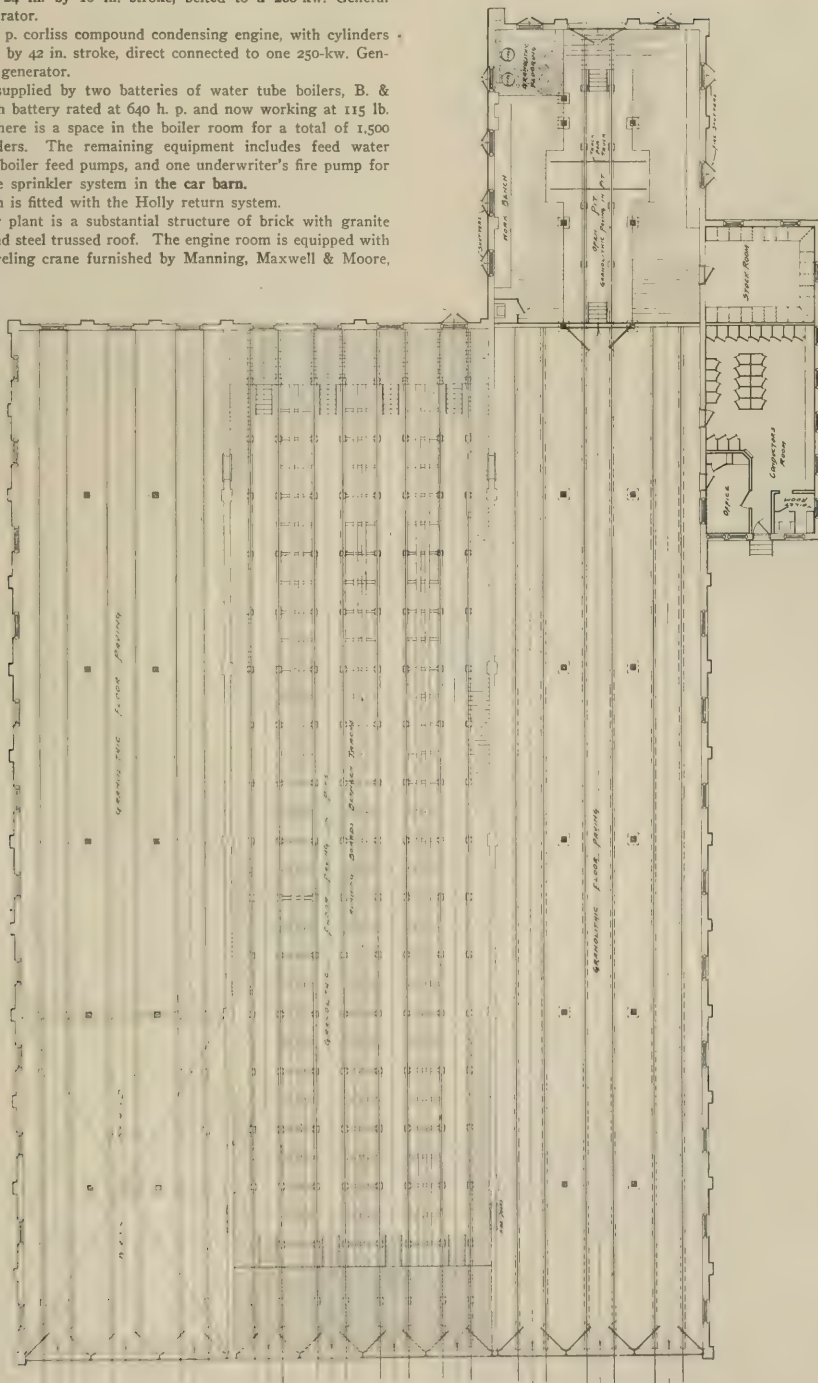
ders 14 and 24 in. by 16 in. stroke, belted to a 200-kw. General Electric generator.

One 400-h. p. corliss compound condensing engine, with cylinders 12 and 22 in. by 42 in. stroke, direct connected to one 250-kw. General Electric generator.

Steam is supplied by two batteries of water tube boilers, B. & W. type, each battery rated at 640 h. p. and now working at 115 lb. pressure. There is a space in the boiler room for a total of 1,500 h. p. of boilers. The remaining equipment includes feed water heaters, two boiler feed pumps, and one underwriter's fire pump for supplying the sprinkler system in the car barn.

The station is fitted with the Holly return system.

The power plant is a substantial structure of brick with granite trimmings and steel trussed roof. The engine room is equipped with a 15-ton traveling crane furnished by Manning, Maxwell & Moore,



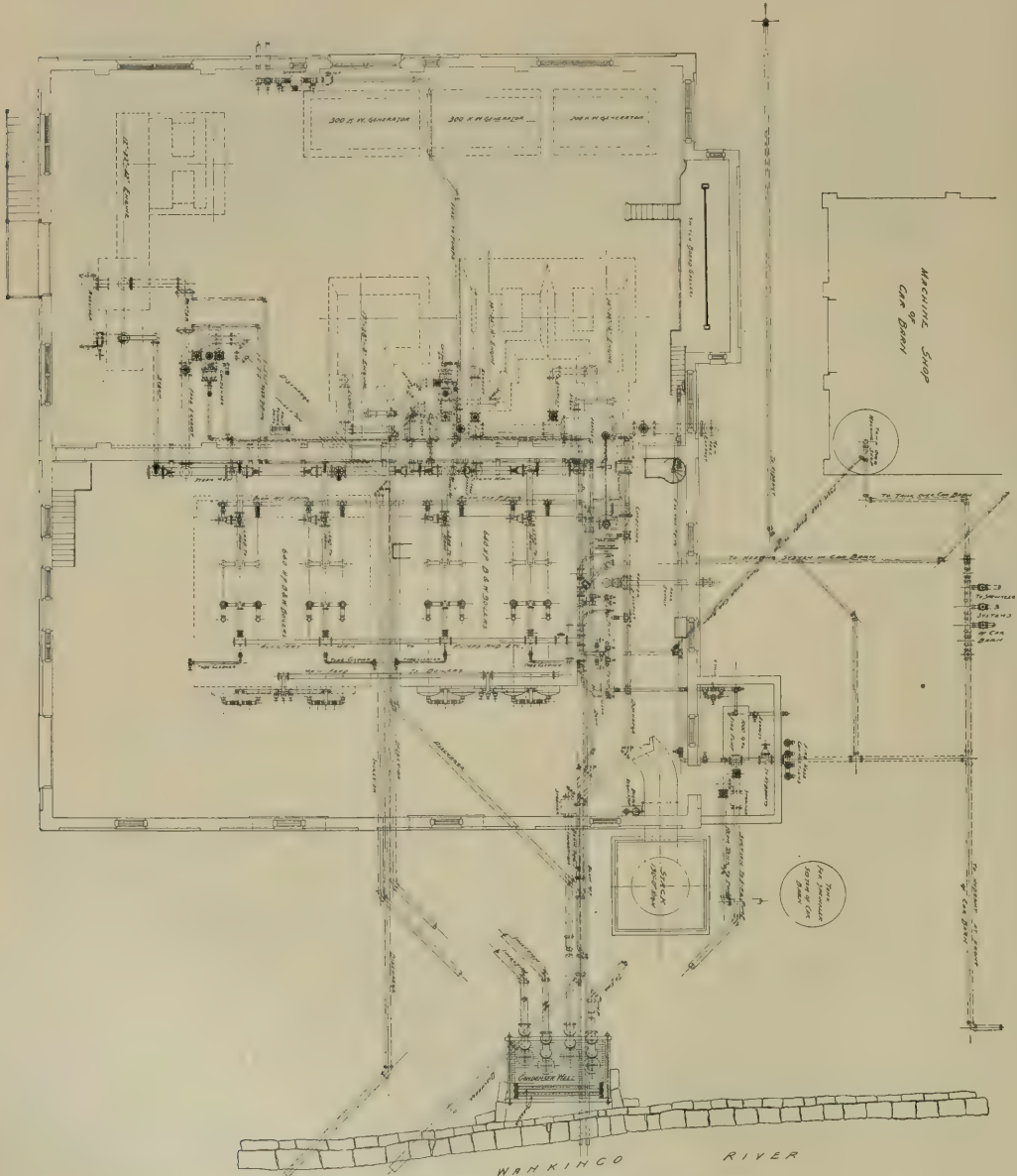
PLAN OF CAR HOUSE, WAREHAM.

which has proved very useful in the work of erecting engines and generators. The switchboard is at one end of the room on a raised gallery commanding a view of the entire engine room, and reached by easy steps as shown. A feature is the large windows extending from the ground nearly to the roof, and fitted with removable sash, making them practically doors that will be convenient when it is necessary to install new machinery. The building, including the entire area of the basement of the engine room, rests upon 7 ft. of portland cement concrete, which will make possible the replacement of the present engines by large direct connected units as soon as the traffic will justify the outlay.

The piping has been carefully designed for high economy and sta-

bility, and extra heavy fittings, valves, and pipes were used wherever high pressure steam is required. The usual number of main feed water heaters and one large auxiliary heater are arranged to heat the feed water with the exhaust steam from all engines and pumps, and the piping is so designed as to permit any heater to be by-passed or cut out if necessary, and the feed water can be led through any one or all of the heaters, or direct into the boilers if required.

A 1,000-gallon underwriter's fire pump is situated in the annex of the boiler room and supplies the hydrant system in the yard and the sprinkler system in the car barn, adjacent. The pump is arranged with suction from the condenser well, and draws water from a large tank in the yard which is supplied with water from the river.



PLAN OF POWER HOUSE, WAREHAM-NEW BEDFORD & ONSET STREET RY.

There is also a smaller tank on the roof of the car barn for insuring pressure at all times in the sprinkler pipes. The flow of water to the hydrants and the sprinklers is controlled by valves in the yard. The whole layout of this piping plan is indicated in the line drawing.

The chimney, which is 130 ft. high and 7 ft. in diameter at the base, was built by the Alphons Custodius Chimney Construction



INTERIOR OF WAREHAM POWER STATION.

Co., of New York, and is a special design used largely abroad and of late meeting with favor in this country.

This entire plant was designed by E. H. Kitfield, of Boston, and was built under his supervision by the J. W. Bishop Co., of Worcester, Mass.

#### Car Barn at Wareham.

The car house is a brick building adjoining the power house. The interior arrangement is clearly set forth in the accompanying illustrations. Owing to the extreme length the roof beams were trussed with rods, thus avoiding the use of many posts. As already mentioned the house is thoroughly protected with a sprinkler system in the roof, and in addition sprinkler pipes are carried under the floor between the pits in accordance with recommendations of the fire underwriters. Granolithic floor paving is placed in all pits and sub-



STANDARD INTERURBAN CAR—J. M. JONES' SONS.

cellars. The building contains 1800 ft. of track laid with 60 and 70-lb. rails.

#### Car and Car Equipment.

The rolling stock and equipment includes 12 Jones open cars, 6 Jones closed cars, 36 K6 controllers, 72 G. E. 67 and G. E. 1000 motors, 18 pairs of Peckham 14-B-3 trucks, 3 McGuire single trucks, 10 Christensen air brake equipments, "Consolidated" heaters, 24 Dewey headlights, 2 snow plows, 1 repair wagon and 2 flat cars.

The closed cars built by J. M. Jones' Sons, of West Troy, N. Y., are of the straight side type, with vestibuled platforms. The vestibules have hoods of steam passenger coach pattern, which is held to be much better construction, though more expensive, than the regulation street car bonnet, adding to the appearance of the cars, in addition to making them stronger and more serviceable. The cars are 31 ft. over the body, and including vestibules are 40 ft. long, and seat 44 passengers; the greatest width is 8 ft.

The interior finish is in quartered oak, the ceiling of three-ply

white quartered oak veneer, tastefully decorated. The cars have cross seats of the "walkover" pattern, made by Heywood Bros. & Wakefield Co., and upholstered in plush. The windows are plate glass with "Pantasote" curtains. Basket racks are provided for the convenience of passengers having bundles or wraps.

The cars have double sills and floors, and are strengthened with steel sill plates running the length of the car, the construction throughout being made to meet the demands of high speed service.

The exterior color is a light Quaker green, with lettering and decoration in gold.

In addition to the equipment mentioned, the cars are fitted with sand boxes and the Wilson trolley catcher furnished by the Frank Ridlon Co., Pfingst fenders, and Perry ventilators.

The car bodies are mounted on Peckham No. 14-B-3 double swivel trucks, with swing bolsters, having 33-in. wheels, and 4-ft. wheel base. Each car is equipped with four motors. The floors are covered with floor mats, but there are no floor traps, all inspection and repairs of motors being done from the outside or over pits. It is



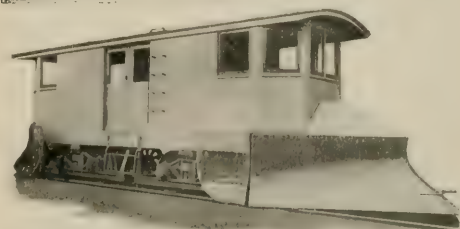
INTERIOR OF CAR.

the opinion of the management that trap doors in the floor are unsightly, are often the cause of accidents, and are by no means essential to the proper care of motors. All wiring on the cars is carried on the inside in wooden conduits near the floor, and there are no fuses, circuit breakers under the platform hoods taking their place.

A 8-spoke wheel weighing 480 lb. with  $2\frac{1}{2}$ -in. tread and  $\frac{3}{4}$ -in. flange is standard, these sizes having been determined somewhat by the nature of the city tracks over which the cars reach the center of the towns.

#### Eight Wheel Snow Plow.

Street railway men have begun to do with snow plows what they have already done with passenger cars, namely increase the length, weight, speed and tractive power. The New Bedford & Onset Street



8-WHEEL TAUNTON SNOW PLOW.

Ry. is one of the first roads to follow this tendency and the eight-wheel nose plow illustrated herewith is an excellent example of the progress made in snow plow design. It was built by the Taunton Locomotive Manufacturing Co., of Taunton, Mass.

With a four-wheel nose plow, the running gear may be, and usually is attached rigidly to the body of the plow. The double trucks



under this New Bedford plow are practically the Master Car Builder's standard, with axles  $4\frac{1}{4}$  in. in diameter, and wheels 33 in. in diameter with 4-in. treads. The length of the plow over all is 43 ft.; height, 11 ft.; width, 9 ft. 2 in.

The main sills and the frame are of hard pine,  $11 \times 4\frac{1}{2}$  in. The nose is made of steel plate heavily backed with sound white oak, and is so shaped as to lift, divide and throw the snow, doing away



PRIVATE RIGHT OF WAY—ONSET LINE.

with any tendency to pack the snow into compact masses. The nose is 3 ft. 11 in. high at the point.

The plow is equipped with hand brakes and nose lifting mechanism which can be operated by hand, but the builders recommend in every case the use of compressed air for both of these operations, and each plow is provided with two 8-in. cylinders so placed that if supplied with compressed air they lift the noses directly through a connection from the end of the piston rod. The noses when operated by air can be suspended at any height within the limit of lift, which is 10 in., and held in this position by a catch which works independently of the air lifting device. When the noses are lifted by the hand mechanism, which is composed of worm and gear, the noses can be held by this mechanism at any given point.

The size of the cab or house on the plow gives ample room for the installation of compressed air equipment, for a stove if this is found necessary, and for a large gang of men. Another recommendation is the facility with which the plow may be converted during the summer for use as an electric locomotive or freight car by removing the noses and attaching suitable draw bars. The weight of the plow without motors is about 14 tons. It is equipped with four G. E. 67 motors.

#### Telephone System.

All the company's offices, car barns, stations and other buildings are connected by a private telephone system. The Bell Telephone Co. installed the telephone system, strung the wire, etc., and leases the line to the street railway company for a term of years. Plug switches are placed at each turnout and all cars carry a telephone

box, enabling the car crew to communicate with the dispatcher's office at any switch.

#### Signal and Dispatching System.

There is now being installed on the road a new safety signal system, made by the Union Stop & Signal Co., of Fall River, Mass. This consists of a telephone line and signal wire extending the length of the road, with telephone stations in suitable boxes, at the turnouts, and connected with the dispatcher's office. In conjunction with these stations are placed call boxes and tell-tale instruments by which the dispatcher can set at any station a call signal for any crew on the line, and at the same time receive positive information that the signal has been actuated.

#### Personal.

Mr. H. H. Crafo, president of the Dartmouth & Westport Street Ry., the New Bedford & Onset Street Ry., and the Union Street Ry., of New Bedford, has made a special study of Massachusetts railroad law and enjoys the reputation of being one of the best posted experts in the state on railway legal and financial matters. His father was a prominent steam railroad man, having held a responsible official position with the Flint & Pere Marquette R. R. for a number of years.

Mr. E. E. Potter, general superintendent of the three street railway companies centering at New Bedford, began his railway career at Providence in 1885 with the Union Railroad Co. of that city, and at one time was engaged in construction work for the Gen



RAILROAD CROSSING—ONSET LINE.

Electric Co. Mr. Potter is a graduate of Brown University and of the Massachusetts Institute of Technology.

The other officers of the New Bedford companies are: Vice-president, T. B. Tripp; secretary, Clarence A. Cook; treasurer, Elton S. Wilde; chief engineer of power stations, A. S. Paine; general foreman car shops and repairs, J. S. Brown; division superintendents, D. S. Hall and E. J. Marble; amusement manager and claim agent, I. W. Phelps.

### POWER HOUSE AT NEW BEDFORD.

Power for the New Bedford city system, for eight miles out on the Onset line, and for a portion of the road to Fall River is furnished from one main station at New Bedford. This plant originally contained a number of small high-speed belted units, but as before stated, when the new line to Onset was proposed, it was decided to move two of these units to the power house at Wareham, and install new and more modern machinery at the New Bedford plant. To this end the old walls and foundations were torn out, and a much larger station built, practically enclosing the older one, this work going forward without interruption to the service. The completed station was placed in commission this month.

#### Engines.

The two new units each consist of a cross-compound condensing engine rated at 1,200 i. h. p., direct connected to an 800-kw. General

Electric generator mounted on the shaft adjacent to the fly wheel. The engines are of the corliss type built by the Filer & Stowell Co., of Milwaukee, Wis., and were ordered through Mr. T. W. Phillips, of Providence, R. I., eastern manager. They have high pressure cylinder 26 in. in diameter, low pressure cylinder 48 in. in diameter, with a common stroke of 48 in. Each engine operates at a speed of 100 r. p. m. and has a fly-wheel 18 ft. in diameter, of the square rim type, weighing 80,000 lb.

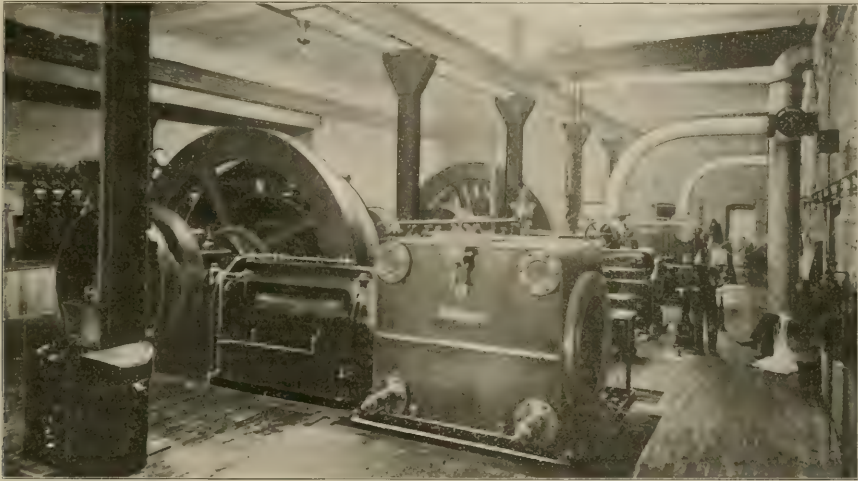
The cylinders have round corners and are completely covered with planished sheet steel, presenting a neat and pleasing appearance. The frames are of the heavy duty Tangye type with bored guides, and of massive construction throughout; the frame, pillow block and guides constitute one casting, having a foundation contact the entire length. The crank pit, which is also a part of the frame, has a cast iron bottom, forming a reservoir into which the waste

oil from working parts of the engine is conducted and drained away. The pillow blocks are provided with quarter shells, babbitted, and are so designed as to permit of the removal of the shells by raising the shaft one-eighth of an inch.

The cranks of each engine are of the disk form, counterbalanced, and forced on the shaft under pressure. The connecting rods are of

condensing, on either side may be run alone as simple condensing or simple non-condensing, thus furnishing six different methods of operating.

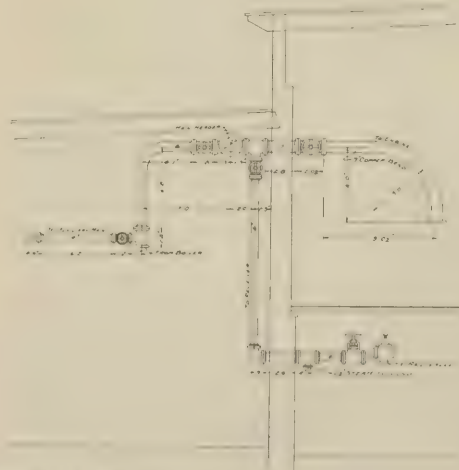
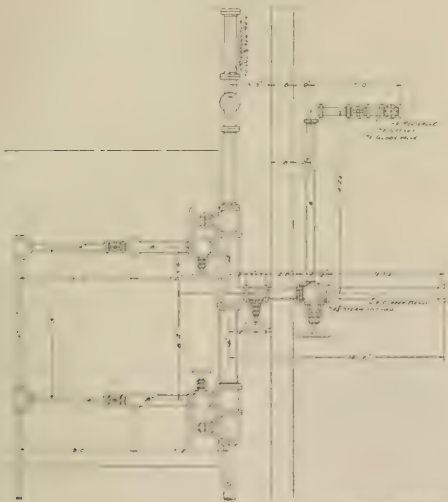
Two details of the engine design that are believed to be new in certain particulars are the application of water circulation around the bearings, and the gravity oiling arrangement.



INTERIOR OF ENGINE ROOM, NEW BEDFORD STATION—FILER & STOWELL ENGINES.

the solid end type, with phosphor bronze boxes, adjustable for wear. The valve gear is of the liberating type with short angles of travel and so designed as to bring all stresses as near as possible in the same plane. Both steam and exhaust valves are actuated by separate wrist plates and eccentrics, the wrist plate being provided with

As a precaution against possible heating of the main bearings, the side and bottom shells are cast with  $\frac{3}{4}$ -in. heavy wrought iron pipes for water circulation. The water for this service is taken direct from the city mains and the circulation is maintained by the city pressure. After performing its office by passing through the cir-



PLAN AND CROSS SECTION OF PIPING.

unhooking device to permit the working of all the valves by hand. With the engine is furnished a receiver of the horizontal type, connected to both high and low pressure cylinders by a system of piping and valves, which, together with the connections between the cylinders and the independent condensing apparatus, permit the engine to be operated as compound condensing or compound non-

condensing pipes in the shells, the water flows to a tank located in the basement of the power house, and from this it is fed directly into the boilers. To provide against there being at any time an insufficient supply of water passing through the circulating pipes in the pillow block shells to meet the boiler requirements, provision is made by means of a globular float in the tank, for automatically opening a

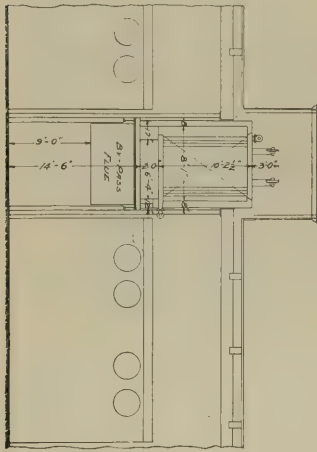
valve located in a separate pipe and admitting water to the tank direct from the city mains. It will therefore be noted that with the system as described, the water cooling the bearings is obtained practically without additional cost to the regular operating expenses.

The oiling system for the engine room is as follows: The oil is delivered into the station in the original packages, and is then pumped from the barrels into an elevated tank by a steam pump located in the basement. From the tank it flows through pipes to the various portions of the engine, and all drips are collected in a common reservoir and thence flows to a Turner filter and reservoir in the basement; from the filter it is again pumped to the tank above the engine room floor. The sight feed pipes located directly at the parts to be lubricated have each a tee and stop cock. In the event of any disarrangement of the oiling system, by shutting off the

lathe. The piping was installed complete by the New Bedford Boiler & Machine Co.

By the use of eccentric tees no pockets whatever are formed throughout the pipe system, and in the headers the inside bottom line of each section is brought to the same level. The bends to the engines are of copper, 9 in. in diameter, and the risers from the boilers are 8-in. wrought iron pipe. The arrangements are such that feed water can be taken either from the city main or from the well receiving the discharge from the auxiliaries.

Salt water is taken from the river for condensing purposes, the intake pipes going 6 ft. below mean low water. The ends of these pipes are protected by foot valves, and the water also passes through a strainer consisting of a perforated composition plate before it reaches the condensers. The main overflow pipe from the con-



GREEN ECONOMIZER—NEW BEDFORD STATION.

stop cock and screwing ordinary oil cups into the tees, the oiling of the engine is assured at all times.

The generators are wound for 750 volts, and the current goes to the feeders at about 650 volts. The switchboard carries double bus bars and any feeder can be thrown on to the high voltage bar. The longest transmission from the station is about 12 miles. From the feeders no taps are made within a distance of one mile from the station. All the motors on the interurban lines are wound for 650 volts and as the cars are provided with circuit breakers and magnetic blow out attachments, no trouble is experienced in employing the higher voltage.

In addition to these new units there are at this plant two of the small high-speed belted engines and generators of the type removed to the Wareham power house.

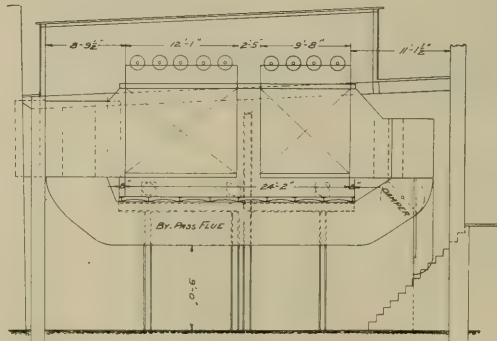
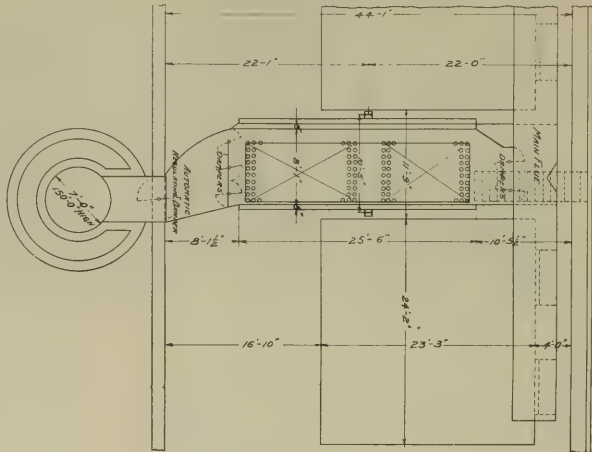
#### Piping.

The piping arrangement is shown in the drawings herewith. All piping and valves are extra heavy and all feed water piping is of brass, it having been determined that under the conditions of feed water and service at this plant, the longer life of the brass piping would more than offset the higher first cost.

The boiler stop valves are of a new pattern recently developed by the New Bedford Boiler & Machine Co., of New Bedford, Mass. The valve body is designed to avoid undue friction of steam, the area of steam passage in the smallest part being 20 per cent greater than the area of the pipe. The metal in the seat and disk is a nickel bronze of high tensile strength made after a secret formula.

The disk although loose, is secured to the stem by a sleeve that is screwed into the disk. The guide stem on the disk is provided with a square for convenience in disconnecting the sleeve. The sleeve forms a steam tight joint with the bonnet when the valve is wide open allowing the stuffing box to be repacked.

In placing flanges on the pipes, the piping was brought clear through the flange, and then peened on the inside and faced in a



condensers is cast iron bell and spigot pipe, and it is carried under the ground in a bed of portland cement, so that in case the pipe does deteriorate from the action of the salt water, a cement conduit will be left to carry the overflow.

The stack is of brick, with iron coping on top, put together with brass rods. The height is 151 ft. and the diameter of flue at base is 7 ft.

#### Fuel Economizer.

For utilizing the heat of the waste flue gases the New Bedford station is equipped with Green fuel economizers, supplied by the Green Fuel Economizer Co., of Matteawan, N. Y. The apparatus contains 4,720 sq. ft. of heating surface. It is erected on structural iron work at the side of the new boilers, with a by-pass flue underneath by which when necessary the gases may be passed direct to the stack without going through the economizer. The economizer tubes are fitted with the new Green triple bevel edge scrapers for



preventing accumulation of soot on the outside of the pipes. The scraper gear is driven by a small engine, which keeps the scrapers traveling from one end of the tubes to the other. The plant is not yet working at its full economical load, but the economizer has fully demonstrated its ability to effect a considerable saving in the station expenses. The gases enter the economizer at about 500 degrees and leave at about 300 degrees. The feed water enters from heater at 178 degrees and leaves the economizer at 242 degrees.

There are two batteries of B. & W. type boilers, each battery being rated at 620 h. p. There are also four 125 h. p. horizontal tubular boilers in the old boiler room, which can be connected to work with the others.

### A REVIEW OF THE EVERETT-MOORE RAILWAYS.

At the annual banquet of the Toledo Chamber of Commerce, held November 22nd, Mr. Albion E. Lang was one of the principal speakers and delivered a most interesting address on the subject of the railway system in that city and vicinity which is being built up by the Everett-Moore syndicate. His description of the system was a revelation to most of his hearers and was well punctuated with applause.

Mr. Lang said: "The newspapers are constantly filled with items pertaining to the electric railway syndicate and the properties it deals in. Some of these items are very much exaggerated and some are not confined strictly to the truth.

"I deem it proper at the outset to say something personal of the leaders of the syndicate. Both are essentially Ohio men. Mr. Everett is the son of Dr. Henry Everett and was associated with Cleveland's first electric railway. He built his first street railroad in Montreal, converting a horse line into an electric line. He was the first man in this country to introduce the workman's ticket and a three-cent car fare. From Montreal he went to Toronto and did the same thing, thence to London, Ont., to Detroit, and returning to Cleveland, identified himself with the Cleveland Electric Ry., of which he has been president during the past five years, and he is but a young man yet, 45 years old.

"His partner, Mr. Moore, came to Cleveland from Canal Dover and became cashier of the Dime Savings bank. He is one of the best equipped financial men I know, possessed of wonderfully quick perception and makes friends wherever he goes.

"Later on we will see more of these men in Toledo. They have been so busy buying up railroads that they have not yet had time to look after the operation of them.

"The syndicate absolutely controls 950 miles of interurban and suburban railway properties. It controls all except the Cleveland City Ry. line, of which Senator Hanna is principal owner, in Cleveland; all but one line in Detroit, and everything entering or in Toledo except the Toledo & Western, and Toledo, Bowling Green & Southern roads. It has an option on the Toledo & Maumee Valley and will come into complete possession of this property in two or three months.

"The Everett-Moore syndicate represents 75 to 100 men. When it sprang into existence investors were timid. So successful have the leaders been in their various enterprises that they now have all the financial interests of Cleveland back of them. Their greatest difficulty now is in keeping the men back of them from fighting to see how much percentage each shall get. But they allot each purchase proportionately among the members.

"Over 75 men outside of Toledo are financially interested in our electric railways. The roads the syndicate will acquire in the future aggregate 1,400 miles. Their lines are capitalized at present for \$47,000,000. These lines earned last year \$5,500,000. It is astonishing to note the growth attained by these lines without in any way injuring the steam lines.

#### Everett-Moore System.

"The system starts at Port Huron and extends to the Pennsylvania state line, 360 miles. The only missing links to an unbroken chain are a stretch of track needed between Monroe and Trenton, Mich., and at Berlin Heights, O. It is the largest aggregation of railways combined in the United States. Just note some of the thriving towns on the system: Akron, Painesville, Chagrin Falls, Bedford, Ravenna, Cleveland, Elyria, Oberlin, Norwalk, Monroe, Trenton, Detroit, Port Huron, St. Clair, Marine City, Algonac, Mt.

Clemens, Orchard Lake, Rochester, Flint Lake, Orion, Wyandotte, Toledo.

"The lines are not so largely capitalized as they would seem to be. The Lake Shore steam road stands for \$75,000 per mile and the Norwalk electric road for \$45,000. The average earnings of a steam road are \$1,000 per mile, and of the electric line \$3,800 per mile, and this last almost wholly on passenger traffic, with rates one-half less than the steam line.

"The effect of the electric railways upon the growth of this city can hardly be estimated, as they are yet in their infancy. The Hollenden hotel at Cleveland had to build two additional stories because of the growth of patronage due to increased travel into Cleveland over electric lines. Traveling men can now take the cars to small towns, transact business and return to city hotels for the night. What is true of Cleveland is true elsewhere.

"During the past year in Toledo 1,000,000 individuals patronized Toledo electric railways. In Detroit they carried 3,500,000. All told the lines accommodated 8,000,000. These figures do not touch the freight business. In Detroit last year the freight earnings alone were \$150,000. In Toledo thus far this year the freight earnings have been \$50,000. In our new freight depot, which has been open only 12 or 15 days, there is scarcely sufficient capacity.

"Whether electric roads will do a long haul business or not cannot be told now. I am informed by steam railway men that they have been relieved of business unprofitable to them—the short-haul freight—and none of the steam roads of the United States could live a year without their freight business.

"The economies to be effected in electric lines have been scarcely entered upon, but they will be vast. We have 14 power houses now and engineers figure we can reduce the number to 8. We are figuring on building in Ohio the largest electric power house in the world. It will be located in the coal belt and will utilize the refuse coal. Its energy will reach out 100 miles. Other houses will then be dismantled, retaining only central houses, one each in Cleveland, Toledo and Detroit. It will be a zone system, the big house feeding in a measure on the others. Economy in this way means reduced charges on passenger and freight traffic.

"A produce man here tells me his business has been doubled by the electric lines. Delay to small shipments by the steam roads has handicapped merchants. Land values on outside property are increasing without reducing values on inside realty. These are some of the benefits of the suburban roads. They take care of a new class of travel and also promote and increase travel.

"The population these railways reach from their northern to their southern terminus is 4,000,000 to 5,000,000 within a radius of 60 miles of each road.

#### New Work in Toledo.

"In Toledo there is much new work in progress. A Findlay line will be open in 30 days. I hope the two Bryan railway projects will consolidate. The new Fostoria line has arranged to enter the city over East Broadway.

"The advantages to Toledo of the electric roads are immense. The building of this new terminal steam railway, with its river front improvements, is a great thing. These two enterprises together indicate that investors regard Toledo as the most growing city in the United States.

"Over 20 years ago, when I first went into the street railway business, the earnings of the local lines were \$400,000 per year. In 1897, when we acquired the Robison lines, the total earnings were \$670,000. For ten months this year the earnings have been \$950,000. The growth here is almost beyond our comprehension. Fifteen years ago a ride of four miles here cost five cents. Today we ride 12 miles in Toledo for the same fare. In 1885 there wasn't a foot of double track. And such has been the progress in 16 years that today we have 40 miles of double track and 102 miles all told. Fifteen years ago we operated daily 35 cars and to-day we operate 120 cars. Our payrolls run up to \$36,000 per month. We employ 850 men, and in the summer season 1,000 men.

"We are figuring on abandoning a number of our smaller car houses and will erect at some point around here a large car house and shop. We are never going to buy another four-wheel car. Today we are running 38 eight-wheel cars.

"When we built our power house in 1895 we investigated the subject of how to handle coal mechanically. We wanted a combined stoker and smoke consumer. And we have now commenced to

install an arrangement that will do away with the smoke you see coming out of those two stacks.

"If Toledo secured the Ohio Centennial you would have seen down at the Lake Shore depot a large, magnificent terminal station. We are heartily ashamed of our street railway terminal, knowing that it is inadequate and gives travelers a bad impression of the city. But we are withholding our improvements in order to enable the Lake Shore & Michigan Southern to carry out its arrangements.

#### New Lake Shore Depot.

"The Lake Shore plans to raise the building, placing ticket offices and waiting rooms on the second floor, and extending the entire building out Knapp street toward Broadway. Passengers will then enter the depot from the street level and descend a stairway to the trains, similar to the arrangement at Columbus. It will be a handsome improvement.

"The Lake Shore people wish to have those streets up there vacated, so that their plans for a new depot can be carried to completion. They would have begun work this year, but for the fact that Pan-American arrangement occupied them. The building of a new bridge here and 16 miles of track on the Air Line absorbed all the money that could be devoted to Toledo.

"It would be a very appropriate thing for this chamber to send a request to the Lake Shore to hasten its contemplated improvements in Toledo. And while on that tack I suggest that you ask the council to pass an ordinance forbidding spitting in street cars and the halls of public buildings. These are some of the things the chamber can do without stepping on anybody's toes.

"After these Lake Shore improvements are made there won't be a city in the United States with a better street railway system and service than Toledo. I don't say this because I am at the head of it locally, but from observation.

"I invite all of you to visit our new power house. It is the best in the United States. I challenge anybody to show a better one. We don't carry a cent of insurance because the building is absolutely fire-proof. Nowhere else is represented the skilled labor and money invested in the Toledo plant."

### BEAVER VALLEY TRACTION CO.

The Beaver Valley Traction Co., of Beaver Falls, Pa., has made wonderful improvements in its property during the past year and an interesting statement of the condition and traffic of the road was recently presented by Mr. Buchanan, president of the company, at the first annual meeting of the stockholders since the consolidation of its component companies. During the spring and summer of 1900, the present company acquired by purchase the entire capital stock of the People's Electric Street Railway Co., the Central Electric Street Railway Co., Beaver Valley Street Railway Co., the College & Grand View Street Railway Co., and the charter and franchise of the Rochester & Monaca Electric Street Railway Co., which last had not then commenced construction. Many of these properties were in bad condition at the time of the consolidation and it was decided to expend about \$300,000 for improvements and extensions, which would put the property into first-class condition. The old power houses at Rochester and Beaver Falls were abandoned and the power plant for the whole system was concentrated in one new station. A number of the lines were double tracked throughout and the bridge between Rochester and Bridge-water was strengthened for trolley traffic at a cost of over \$10,000, thus completing the connection between these places. It was also determined to establish a park system and a tract of 24 acres upon the company's route was purchased and improved. A summer theater and dancing pavilion have been erected, the park has been thoroughly drained, a large number of trees planted, walks laid out and other improvements made. A park at Morado, previously owned by the company, has also been cleaned up and beautified and a new dancing pavilion constructed. The park has been enclosed with an ornamental fence.

The company's new power house is built of brick on a heavy stone foundation and is of strictly fireproof construction. The stack is of brick. It contains three Babcock & Wilcox boilers, two McEwen tandem compound engines direct connected to Thompson-Ryan generators of 300-k.w. capacity each, and a Buckeye engine direct connected to a G. E. 300-k.w. generator. The total engine capacity of the station is 1,100 h. p., which is double the amount

required to operate the company's lines under normal conditions. Connections were made with the Beaver river from which condensing water is drawn. Sixty thousand feet of copper feeders and 34,000 feet of aluminum feeders were purchased and installed during the year. The additional track construction required 60,000 ft. of 90-lb. and 73-lb. girder rails, 25,000 new ties, 2,000 Weber rail joints, etc. A large amount of 45-lb. girder rail has been replaced by 60-lb. T-rails.

### AN UNWARRANTED ATTACK.

The Rochester (N. Y.) Railway Co. and its officers have recently been misrepresented in a most shameful manner by the newspapers of that city, which have given currency to false reports as to the action of the company in regard to rules. The following extracts from editorials in the Rochester papers will show the substance and spirit of the attack.

One paper says: "The rule of the Rochester Railway Co. providing that a complaint by a patron against an employee to receive consideration must be accompanied by \$2 cash, the money to be returned to the patron when the complaint is sustained and given to the employee to recompense him for the loss of time he suffers through investigation when it is not, officials of the railway company to be the judges in the matter, is without doubt the most ridiculous regulation ever adopted by a corporation in this city."

Another thus comments: "Some street railway managers would have taken more drastic measures. We think the idea of imposing fines upon dissatisfied patrons is more humane than putting them in jail. Many of them have families to support, and imprisonment would be a severe hardship to them. But almost any man can afford to pay a fine of two dollars for being discontented."

Were it not for the harm done by misleading persons not informed as to the facts, these examples of editorial spleen would be simply amusing in the light of the following statement from Mr. T. J. Nicholl, vice-president and general manager of the Rochester Railway Co. In answer to an inquiry from us Mr. Nicholl wrote: "One thing is quite certain; we never promulgated any such rule. It is a fact that it was suggested at a meeting of our employees, and I promised to give the matter consideration; this I did and concluded that the rule would be impracticable."

### TRENTON-PRINCETON INTERURBAN.

Considerable objection has been heard to the attempt of the Trenton, Lawrenceville & Princeton Railroad Co. to enter the latter city by a trolley extension which is was proposed to build through Witherspoon St. into the heart of the city. The company operates a steam road for both passengers and freight which has its present terminus at Witherspoon St. at the city limits, and much of the objection to its extension comes from the members of the university of that town and was based on a misapprehension that the company expected to run its steam car and freight service within the city limits. Mr. Jilson J. Coleman, general manager of the railroad company, states that the company has no idea of carrying its steam service into the city limits. He stated that the fare between Trenton and Princeton will be 10 cents and added that the majority of property owners on Witherspoon St. had given their consent and that it was the intention of the company to pave the streets between the rails and for a distance of 18 in. each side of the track. Also that it was not the intention of the company to carry freight into the heart of Princeton, and that plans are now being prepared for a freight station at the present terminus of the road where it comes into Witherspoon St.

The company proposes to enter Princeton as the Princeton City Railway Co., whose charter does not permit the transportation of anything but passengers.

A new company known as the New Jersey & Pennsylvania Traction Co., recently filed articles of incorporation with the object of constructing a street railway in Trenton to connect with the road mentioned above. The plan originated with the late A. L. Johnson and the new company proposes to carry passengers within the city limits for a 3-cent fare. Mr. J. J. Coleman is president of this company and says that if the franchise for the road is granted an extensive system will be laid down which will reach all parts of the city, and that the company will operate on a basis of 3-cent fares and with free transfers between all connecting lines.

## A PORTABLE ACCELEROMETER FOR RAILWAY TESTING.\*

BY F. B. COREY, SCHENECTADY, N. Y.

The recent rapid development of high-speed transportation, especially that which involves the use of electricity as the motive power, is largely due to the attention given by railway engineers to the most minute details of locomotive and train performance. In order to obtain exact information concerning these details, most exhaustive tests are instituted, and for the proper carrying out of these tests new measuring instruments have been devised, both for indicating and recording the magnitude of the various functions involved. In all railway work, both steam and electric, the all important factor to be considered is speed, and it is often necessary to secure accurate data in regard to the rate at which the speed changes under various conditions of equipment and operation. To obtain the desired information from a continuous speed record is generally as unsatisfactory as it is laborious, and various devices have from time to time been tried in order to secure direct readings of acceleration and retardation of moving cars and trains.

The following seem to be the requirements to be met by a practical instrument of this class: It should have no delicate moving parts. It should be susceptible of accurate calibration, and this

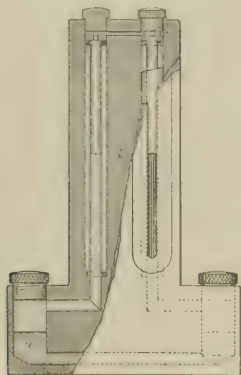


FIG. 1.

calibration should be permanent. The reading scale should be sufficiently extended to render the readings reasonably accurate. It should be practically "dead-beat" to record rapid fluctuations. It should not require for its operation any mechanical connection with the axle. It should be of such size that it may be readily carried about in small space. It should either be independent of grades or be capable of measuring the degree of inclination, so that its indications may be readily corrected.

In addition to these requirements, it is extremely desirable that the instrument be such that continuous records may be made, so that we may properly study the various changes of acceleration and retardation throughout any given period of time.

The instrument which I am about to describe seems to satisfy, in greater or less degree, each of the above requirements, and, although it has certain limitations, I believe it to be more generally satisfactory under the various conditions of practical testing than any instrument of the kind heretofore used.

The action of this instrument depends upon the inertia of a small mass of mercury contained in a horizontal passage, the ends of which are in communication with two short vertical columns of mercury. Thus, the flow induced in the horizontal passage produces a difference of level in the vertical columns, which difference of level is wholly dependent on the horizontal component of the acceleration in the plane which passes through the axes of the two vertical columns. Upon this difference of level, or rather, upon the change of level of either column from a given zero position,

must depend the indication of the instrument. In a small instrument, however, such as might be conveniently carried in the pocket, this change of level is very small. For instance, assuming a distance of 4 in. between the centers of the mercury columns, the change of level would be less than  $\frac{1}{8}$  in. for an acceleration of 4 miles per hour per second, which is about the maximum possible on steel rails. It is therefore evident that some method of multiplication must be used to secure a reading scale sufficiently extended for practical work. For this purpose, colored alcohol or other liquid of low specific gravity is introduced into the spaces above the mercury columns, to which spaces the reading tubes are connected. The reading tubes are of comparatively small diameter. Thus, the ratio of the cross-section of the mercury column to the cross-section of the reading tube becomes approximately the multiplier of the changes of mercury levels. The upper ends of the two reading tubes are connected so as to prevent evaporation and spilling of the liquids. The reading scale is provided with vertical adjustment to facilitate the proper location of the zero point.

Fig. 1 is a partial section, showing its construction. This particular instrument is made from hard rubber with glass reading tubes sealed in.

Since the acceleration of gravity (32.2 ft. per second, or 21.95 miles per hour per second) is produced by an accelerating force (resultant) of unity; that is, of 2,000 lb. per ton, it is evident that acceleration may often be best expressed in effective pounds accelerating force per ton weight of car or train. Hence we have two separate scales for reading in either unit desired, each of which units is readily convertible into the other.

If we represent any given horizontal acceleration as a fractional part of the acceleration of gravity, as  $g \div n$ , the angle which the surface of any liquid thus accelerated will make with the horizontal is that whose tangent is  $1 \div n$ . Therefore, in the calibration of this instrument, we have only to lay out a series of angles whose tangents are, say, .05, .10, .15, and .20, and place the instrument at the corresponding inclinations to determine the points on the reading scale corresponding to the effective accelerating forces of 100, 200, 300, and 400 lb. per ton respectively.

It is evident that if the accelerometer be set to the zero position when the car is either at rest or moving uniformly on either a level or gradient, the indications will be accurate only so long as the car remains on track of constant grade. When the grade changes, the accelerometer must be readjusted or the proper correction made. Usually either a stop or a period of constant speed running gives opportunity to reset the instrument or determine the correction. When this cannot be done at the time of testing, the accelerometer should be set at zero on a level track, and the car run over the road and brought to rest on all grades to be measured. It is evident that used in this way the instrument becomes a gradiometer, giving an indication of 20 lb. per ton for every one per cent of grade.

I referred to the desirability of an accelerometer by which continuous records could be made. In fact, without some such device, the accelerometer is used only in measuring maximum and minimum values. One of the instruments was mounted on a recording device originally used in connection with an ammeter. In this device the fluctuations of the instrument are followed by hand, the record being produced upon a continuous strip of coated paper which is caused to pass at uniform speed over a drum; the drum was driven by an ordinary phonograph motor. This method of producing record curves has been found to be entirely satisfactory.

Fig. 2 is a reproduction of a portion of the record strip of a run with a single car of approximately 40 tons weight, equipped with standard electric train-control apparatus, the part shown representing a short run (between stations) from start to stop. On the vertical scale 1 space represents 50 lb. per ton effective accelerating force, or .55 mile per hour per second acceleration, while on the horizontal scale 1 space represents a time period of 10 seconds.

The interpretation of this diagram is as follows: Beginning at A, the acceleration rises very rapidly, indicating 1.4 miles per hour per second after an elapsed time of 1.5 seconds. The acceleration rapidly falls off until the master controller is turned to the second notch, when it again rises, the maxima and minima depending largely upon the skill or wishes of the motorman. At C is seen an almost instantaneous drop in acceleration, the curve theoretically touching the base line. This occurs at the point of

\*Read at the New York meeting, December 1901, of the American Society of Mechanical Engineers.



transition from the series to the parallel motor combination. The error here is due more to inability to follow accurately the sudden fluctuations than to any fault in the operation of the instrument itself. At D the full parallel position is reached, when the acceleration rapidly falls off until, at E, it has dropped to about .14 mile per hour per second. At this point power was cut off and the acceleration immediately dropped to a negative value of about .13 mile per hour per second, equivalent to a retarding force of about 12 lb. per ton due to friction. The distance FG represents the time during which the car was allowed to coast freely. At G a service application of the air brakes was made, the retardation rapidly increasing until, at H, the full power of the brakes is applied. From H to J the gradual increase in retardation will be noted, due to the increase in the coefficient of friction with reduction of speed. At J, just before the car came to a full stop, and when the retarding force had reached a maximum of 125 lb. per ton, the brakes were partially released and the car was brought easily to rest.

There is, of course, an error in this instrument due to the difference in the ascending and descending meniscus surfaces. With columns of as large diameter as those used, however, this error would, under any circumstances, be small, and here it is almost entirely obviated by the slight but rapid vertical vibration of the moving car.

One of the most noticeable characteristics of this instrument is the accuracy with which it will follow rapid changes without excessive, and sometimes without perceptible, oscillation due to the inertia of the moving liquids. The best results are obtained

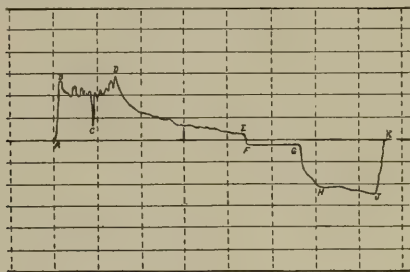


FIG. 2.

when the cross-section of the passage at the bottom of the mercury columns is so proportioned as to give the proper damping effect.

If any given acceleration be multiplied by the time during which it is maintained, the product is the resulting increment of speed. It is therefore evident that the integrated area between the acceleration curve and the datum line up to any given ordinate multiplied by a proper constant is the speed of the car at the corresponding instant. The constant, or the speed per unit of area, is equal to the scale of abscissas multiplied by the scale of ordinates. For example, in Fig. 2 the area included between the acceleration curve and the datum line up to the instant at which power was turned off is found to be 0.66 sq. in. Therefore the speed of this car at the instant corresponding to E on the curve was 20 (seconds) multiplied by 2.2 (miles per hour per second) multiplied by 0.66 = 29 miles per hour. If the speed is to be measured at any instant during retardation, the required area is the algebraic sum of the areas above and below the datum line up to the designated ordinate. Thus, by means of the planimeter, the instantaneous speed of the car may be measured directly from the accelerometer record.

Another useful application of the accelerometer is in the measurement of running friction under different conditions of operation. The accelerometer, as has been explained, gives directly the effective resultant accelerating force per unit of weight. If, therefore, we know the mass moved and the force applied at the axle or draw bar, we readily obtain the friction loss at any instant by comparison of this force with the indication of the accelerometer.

From the above, it will be seen that an instrument of the class described, although not strictly an instrument of precision, is of great practical value to the railway engineer, and it is to be hoped that improvements may be made in the near future that will still further enhance its value as a testing instrument.

## ACCOUNTANTS' OFFICIAL REPORT.

The official verbatim report of the fifth regular annual meeting of the Street Railway Accountants' Association, held at New York, Oct. 9-11, 1901, was mailed to the members of the Association last month. By reason of the fact that the Accountants' Association this year reserved the publication of the complete discussion it was quite important that the verbatim report be published promptly and the secretary, Mr. W. B. Brockway, is to be congratulated upon the celerity with which the work was done, the report being in the hands of members in less than six weeks after the meeting.

The report is a pamphlet of about 180 pages, handsomely printed and for a frontispiece has a steel engraving of the past president, Mr. W. F. Ham. The discussions of papers presented at the New York convention were quite full and very interesting, and as complete reports of these are accessible to members only, there can be little doubt that the membership of the association will be largely increased by reason of the policy adopted in this matter.

## A WORD ON ENGINEERING PERIODICALS.\*

Among the most valuable members of the engineering profession today are the moving spirits of the engineering press. Much matter of great value is regularly to be found in the current periodicals of a profession growing so rapidly and in so many directions as is mechanical engineering.

Books, monographs upon particular subjects, necessary as they are by their gathering within one cover all the required material of years and many places, and by their orderly classification, logical discussion, and evolving of principles; are, by very necessity of their production, always and inevitably behind the times. The reason for existence of the engineering press is to collect all recent valuable information,—news, if you please,—and present it weekly or monthly, less or more digested, to as large a circle of readers as possible. The American papers, representing special branches of the profession, far surpass in numbers and variety and excellence the like papers of the old world. Their general use proves that they have a most important place. With these may be grouped the published transactions of the many engineering societies and clubs. Unthinkingly or deliberately to neglect forming acquaintance with so great a source of engineering knowledge is not fitting for the student who has his own future to make in a country where ruts and old fashions are only for the failures.

Should one read, and preserve what he reads? To take knowledge into one's hand temporarily; and then not afterwards have that knowledge available for desired use, is as foolish as once to have seen a life preserver and not be able to find it at midnight collision. \* \* \*

Scepticism is the normal state of the scientific mind. It is ever looking for something better, not satisfied that the present is perfect. The motto of the honorary, intercollegiate, scientific Society of the Sigma Xi, "Companions in Zealous Research," is good engineering if "useful" be added. The reading of articles over the names of famous engineers, afterwards to find them severely criticised, is good for the confiding student who perhaps has supposed that all engineers and professors are agreed. It is just as well for him to learn not to believe all that is in print, unless there are good reasons presented.

Independent investigation is promised by reading the papers. A printed controversy stimulates anyone who loves a fight. Blessed be the man whose engineering eye is fired and mettle aroused by the prospect of a battle royal between men of fame. Perhaps he too can put in a lance, if extra spare hours or thesis subject will permit.

Ruts and out-of-date ideas may be the bane of school instruction. A student who reads the papers could not be given such instruction. It may not always be best for official instruction in principles to veer with every fresh breeze that arises, such may not be the trade wind; but a reading student body would ever be a magnificent incentive for best instruction. At all events, the carefully worked-over lectures of the class room should be supplemented by the student in his most recent information out of the papers.

\*From an address on "Engineering Periodicals and Card Index," before the Society of Mechanical Engineers, Sibley College, Cornell University, by Prof. H. Wade Hibbard.

## SCHOOL OF RAILWAY MECHANICAL ENGINEERING.

Sibley College of Mechanical Engineering of Cornell University, Ithaca, N. Y., some years ago established a school of railway mechanical engineering which has proved to fill a distinct want. As its name implies, the course is devoted chiefly to the lines of engineering work which apply especially to the construction and operation of railroads. This department is in charge of Mr. H. Wade Hibbard, professor of Mechanical Engineering of Railways. In addition to the regular class room work the course is supplemented by special vacation work each summer in locomotive repair shops, locomotive building shops and locomotive drafting room work.

## AN INTERESTING PICTURE.

In the "Review" for October was given an illustrated description of the new pavilion erected on Mt. Tom, near the city of Holyoke, Mass. Through the courtesy of Mr. W. S. Loomis, president, and Mr. W. R. Hill, secretary and treasurer, of the Holyoke Street Railway Co., we reproduce a photograph that will be of interest at this time. The view was taken in 1899 and shows the late President McKinley and his wife before the pavilion at the top of Mt. Tom.



McKINLEY AT MT. TOM.

On this trip President McKinley visited all the points of interest in the vicinity of the mountain, and expressed himself as greatly pleased and impressed, not only with the magnificent view from the summit, but also with the unique incline road which carries passengers from the base of Mt. Tom to the Summit House at the top. The pavilion shown in the background was the one destroyed by fire in 1900, and has since been replaced by the new substantial structure described in our October issue.

## SCRANTON STRIKE CONTINUES.

Another dynamite outrage occurred at Scranton, Pa., on the evening of November 13th, subsequent to the one mentioned in the "Review" for November. While a suburban car was passing down Spruce St. about 11 o'clock in the evening carrying eight passengers, the front wheel struck and exploded a stick of dynamite which had been placed on the track. The car wheel which struck the dynamite was broken and also about one half of the windows in the car. None of the passengers was injured. It is generally believed that the dynamite was placed on the track by some sympathizers of the strikers. Pursuant to an order from Washington, mail carriers have begun riding on the cars. The strikers have sent out appeals for financial assistance to all labor organizations in the neighborhood of Scranton.

The Toronto Railway Co. is considering a plan for taking power from Niagara Falls for the operation of its lines. It is said, however, that the change will not be effected within 18 months.

## THE BALLSTON TERMINAL RAILROAD.

The Ballston Terminal Railroad Co., which for some time, has been in the hands of Mr. F. H. Beach, receiver, is about to be absorbed by a new company which has recently been organized, the name of which has not been decided. Considerable extension of the old lines is to be made and the construction of the new part of the road is now under way. The accompanying diagram shows the route of the new line which will be about 30 miles in length. Its eastern terminus will be Saratoga Springs, and its general direction is westerly, extending as far as Gloversville, where it will connect with the railway at that place. Among the important points which this road will touch are Ballston Spa, West Milton, Galway, West Galway and Johnstown, besides branches to Amsterdam and Broadalbin. Lake Galway, which covers 800 acres and is surrounded by fine shady woods, is situated on the main line

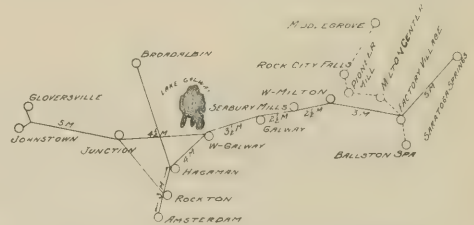


DIAGRAM OF THE BALLSTON TERMINAL SYSTEM.

of the road and will undoubtedly prove an attractive resort which will draw considerable patronage from the neighboring cities.

In addition to the interurban portion of this road new street railway lines are to be laid out in Ballston, on Washington and Milton Sts., which are the two principal thoroughfares. All rights of way for this new construction work have been secured and the building of the road is being pushed rapidly. The construction is to be double track throughout. The old road has been engaged in extensive freight handling which will continue to be one of the company's large sources of income. It handles practically all the freight of 10 paper mills which are situated upon its route.

## NEW OHIO INTERURBAN.

The Defiance, Ottawa, Kenton & Columbus Interurban Railway Co., which was incorporated in March, 1901, has secured contracts for a private right of way from Defiance, O., to Delaware, where it will connect with the Columbus, Delaware & Northern and enter Columbus over the tracks of the latter company. Franchises in all the towns have been secured and an agreement for the construction made with the General Electric Construction Co., of New York City.

The officers of the Interurban company are: President, Hon. John M. Sheets; vice-president, Hon. John W. Winn; secretary and treasurer, N. E. Matthews. The company's headquarters are at Ottawa, O.

## CRESCENT BRAKE SHOES.

The Crescent Brake Shoe Co., of Philadelphia, Pa., makes the "Crescent" sand pocket brake shoes which it is claimed will considerably outlast solid iron shoes under all weather conditions. The face of the shoes which bears upon the wheel contains a number of pockets which are filled with a composition the principal part of which is sand. This is brought into contact with the wheel, in combination with the iron, when the brake is applied. The advantages claimed for this design are: Very quick stops can be made without grabbing or locking of the brakes and much of the jolting usual in quick stopping of cars is eliminated; the composition insures the benefit of long life to the shoe which wears down the full depth of the pockets; the wheels are kept true, flat wheels being absolutely unknown where these brake shoes have been used; less power is necessary in the application of these brake shoes than with the ordinary solid shoes, thus reducing the strain on the brake gear correspondingly.



## CANADIAN NOTES.

A deputation of taxpayers of Scarborough Township have called upon the attorney-general to urge him to take steps to prevent the Toronto & Scarborough Electric Railway from running cars on Sunday. It is claimed that this company has never obtained permission to operate Sunday cars, and that under the law of 1897, which was designed to prevent the running of Sunday cars on roads which did not run them prior to April 1st, 1897, the company is violating the law in so doing. The attorney-general declared it to be a general principle of law that the citizens who had a grievance should put the law in motion, and disclaimed any responsibility on the part of the Government. It is likely that action will be taken against the company by the Lord's Day Alliance, and if successful, several other roads will have similar suits brought against them.

The Niagara, St. Catharines & Toronto Railway Co. will have an act before the Railway committee at Ottawa to confirm its purchase of the Niagara Falls, Wesley Park & Clifton tramway. This gives it control of all the network of tramways on the Niagara Peninsula, with the exception of the Niagara Falls Park & River R. R.

The Everett-Moore syndicate, which recently acquired the local street railway lines, will, it is said, at the next session of the Ontario Legislature, apply for a franchise to extend its lines from Ojibwa to Amherstburg and from Walkerville to Tecumseh, about 12 miles southeast of Windsor. The syndicate will also apply to have its charter amended so as to permit Sunday traffic on the extensions. The Legislature now refuses to grant charters with Sunday car privileges, but it is the intention to make an effort to obtain the right in this case.

Mr. F. H. Clergue, of Sault Ste. Marie, is projecting another water power canal, having in view the development of 20,000 h. p. electrically from the rapids of St. Mary's river. The St. Mary's Falls Power Co. has been organized for the purpose. The plans contemplate the construction of two parallel dykes on the bed of the rapids. These dykes will each be 3,100 ft. long. The fall of the water is about 18 ft., and the bed of the rapids being of solid rock will afford a firm foundation for the dykes and buildings.

The Niagara, St. Catharines & Toronto Ry. is building an addition to the power house at Merriton.

The surveyors at work on the proposed Toronto-Ottawa electric railway have made a report dealing with the proposed route. Further work on the survey will be resumed in the spring. A charter will be asked for at the coming session of the Ontario Legislature.

It is said that Mr. Van Dyke, of Grimsby, Ont., is negotiating for the purchase of the Belleville Street Ry., his intention being to extend it to Trenton.

The promoters of the South Essex Electric Ry., announce that it is their intention to erect a power house at Sandwich, Ont.

The town council of Port Arthur, Ont., has awarded the contracts for the Current River power developments. McFarlane & Co. will build the upper power dam. The Jenckes Machine Co., of Sherbrooke, Que., will supply the penstocks and turbines, and the Bullock Electric Co., of Cincinnati, O., the generators and electrical apparatus.

One of the earliest bills received for the consideration of the railway committee of the Ontario Legislature is that of the Hamilton & Toronto Electric Railway Co., which has been before the committee before, in a slightly different form. The company asks power to run between Toronto and Hamilton, through the intervening townships, and the obstacle to its adoption in the past has been the failure to come to an agreement with the township municipalities.

Messrs. Wm. Mackenzie and G. W. Thompson, of Winnipeg, have despatched H. L. Cooper, hydraulic engineer, to New York, to perfect plans for the installation of a plant for generating electric power at the confluence of the Winnipeg and Whitemouth Rivers for the supply of electric energy to be transmitted to Winnipeg. The plans call for the installation of a 10,000-h. p. plant, and are so drawn as to permit of this being very materially increased at any time.

The Dominion Coal Co. is to build an electric tramway from Sydney, N. S., to Glace Bay and the mines, in all about 15 miles. It is the intention to utilize same chiefly for passenger service.

The Consumers Electric Co., of Ottawa, is making good progress with the construction of the power house at the Chaudiere. It will

be 200 ft. long and 40 ft. in width. The plant will consist of two generators each of 2,000 h. p., and two exciters of 250-h. p. each. The water wheel plant will consist of eight turbines of 500 h. p. each, arranged in two units of four wheels each.

The Halifax Electric Tramway has secured a five year contract from the city council for street lighting.

It is said that the Quebec Railway, Light & Power Co. has agreed to lease 1,000 horse power from the Canadian Electric Light Co., of Levis, for about \$15,000 with the understanding that the latter company agrees not to make an installation in the city of Quebec.

Mr. J. S. Ashwith, an Alderman of Quebec, is about to commence the improvements to the water power of the Capital Power Co. at Dechenes, Que. The work will consist chiefly in cutting a large channel about 200 ft. long to a depth of about 7 ft. below the water. It is hoped by this means that about 3,000 h. p. can be added to the present capacity.

After a hard fight extending over a year, it looks as though the Montreal Terminal Railway Co. had gained its object, at least in part. The city council has practically decided to allow the company to construct one line into the center of the city, and the city surveyor has approved of the route suggested. While this is very much less than the company endeavored to obtain during the past year, it is certainly one point in the game, with a possibility of development in the future.

At the recent annual meeting of the Montreal Street Railway Co. the important subject of fire insurance was taken up by the presentation of a resolution by the chairman, asking that the sum of \$100,000 be set aside from the surplus, and each year thereafter a sum of \$10,000 to \$15,000, the whole to be placed out at interest for the payment of any losses which might occur through fire. Mr. Wanklyn, the manager of the company, explained that up to a few years ago the company got its insurance for one per cent, whereas now, in spite of modern appliances and a night staff, insurance on the same basis would cost 1½ per cent. The resolution was adopted, and hereafter the company will carry its own insurance.

Commencing December 1st, no smoking is allowed on the cars of the Montreal Street Ry. Heretofore smokers have been allowed to stand on the rear platforms of closed cars, but this privilege has been abolished, and the man who wants to smoke must walk. The rule has been very generally observed, and seems to meet with approval from a large majority of the public.

The directors of the Ottawa Northern & Western Railway have decided to increase the capital stock of the company to \$10,000,000 to meet the expenditure incurred by the recent purchase of the Hull Electric Ry., the Inter-Provincial and the Pontiac & Pacific Ry.

The Montreal Street Railway Co. has made application for a permit to construct a building costing \$32,000. This will be an extension to the present power house, and will contain the machinery in connection with the water power to be supplied by the Chambly Power Co.

The return of winter again brings up the question of what proportion of the cost of carting snow from the streets on which the Montreal Street Ry. has lines, is to be borne by the company. This has been in dispute for several years, and it will now be settled by the courts. Last year the street railway deposited two-thirds of the total cost, and the city asks that this understanding be in force for the present season. In view of the fact that the case is now about to be settled, and that speedy judgment may be looked for, the company has notified the city that it is willing to deposit one-half the cost, pending a decision.

Mr. J. Michaud, who for some years has been identified with the Montreal Street Ry. as foreman one of the repair shops, has accepted the position of Superintendent of Rolling Stock with the El Paso (Texas) Electric Street Ry.

Mr. Nelson Graburn, formerly superintendent of rolling stock and chief electrician of the Montreal Street Railway Co., and more recently connected with the Compagnie Generale du Traction, of Paris, France, has been appointed general manager of the Electric Railway at Alexandria, Egypt. Mr. Graburn is taking with him as assistant manager, Mr. Oscar Bessete, another ex-Montreal Street Ry. man, who left here last winter to accept a position with the Paris company.

The Pittsburg, McKeesport & Connellsville Street Railway Co. has begun the erection of a power house at South Connellsville. The structure is estimated to cost \$500,000.



# MECHANICAL DEPARTMENT

## TESTING CAR AT BALTIMORE.

One of the most completely appointed electric cars for making various kinds of tests and records that has ever come to our attention, has been built at the shops of the United Railways & Electric Co., of Baltimore, Md. In addition to its use as an ordinary office car, it is fitted with instruments and facilities for doing a varied

plot curves, make records, etc. In addition there is a folding table that can be set up at any place in the car, for which purpose sockets are provided at each locker as shown.

One of the most important details of the car is the scheme for bringing to one convenient point in the interior, the terminals of the different circuits used in carrying on various tests. From the diagram Fig 2, the scheme of wiring will be evident.



FIG. 1—INTERIOR OF TESTING CAR, UNITED RAILWAYS & ELECTRIC CO., BALTIMORE.

assortment of things, among which may be mentioned: Testing the voltage of trolley or feeders at any point on the line; testing drop or losses in the return circuit; determining resistances of single joints or sections of track; determining differences in potential between rails and neighboring pipes and mains at any point; testing out the electrical equipment of other cars without removing any of the parts; making speed and distance tests and records; determining grades on any section of track and plotting profiles; and making

The car is provided with four regulation car resistance boxes carried under the floor, and the terminals from these are brought to a small switchboard placed in one of the lockers. Four ordinary hood or canopy switches are so mounted on this board as to work simultaneously, the handles being connected as shown in Fig. 4, so that all four switches are thrown in either direction by one movement of a lever. The resistance terminals are so distributed on the board as to permit of several combinations, as follows: Putting

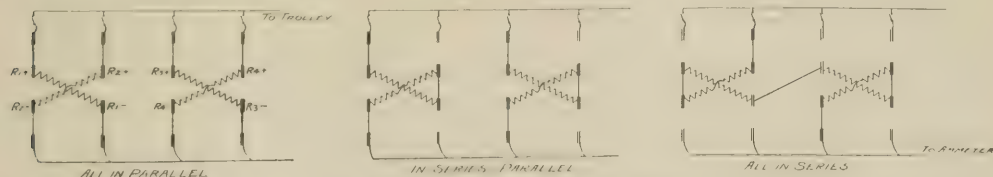


FIG. 3—ARRANGEMENT OF RESISTANCES.

numerous other records and data of value to the manager and all heads of department.

The car is an ordinary 16 ft. closed body, mounted on a Bents single truck with two Westinghouse 36 motors. As will be seen from the half-tone engraving (Fig. 1) the seats have all been removed, and six lockers arranged along each side, the tops of these lockers forming two shelves, on which to place testing instruments;

the four boxes in parallel; or in series by pairs and the pairs in parallel; or all four in series. The connections are made as indicated in Fig. 3, with copper bridges and a piece of flexible cable.

The terminals of the several circuits indicated in Fig. 2, are all brought to the left hand side of the car near the center and just above the top of the lockers, as will be seen in the half-tone (Fig. 1). It will be understood from the diagrams that by the proper dis-

position of bridges and instruments at these terminals, in conjunction with the resistance switches and board, almost any combination of circuits and variation in amperage can be made for testing purposes. The terminals marked "outside" in Fig. 2 pass through the side sills and have plug connections in the outside of the cars. By plugging into these with long flexible leads, readings can be taken from hydrants, from track, or from other cars, the actual readings of course being made by attendants, from the instruments inside the car. The convenience of this method will be evident.

One important way in which the car is designed to be used is by running it to the different car barns on the road, and at opportune times, testing out, one after the other, the electrical equipments of all the cars operating from each barn. This will be accomplished by merely connecting the controllers on the motor leads of each car in turn, to the testing car, and regulating the flow of current

iron pipe, 12 ft. long, carried parallel to the car floor. At either end of the pipe are upright gage glasses. The pipe and glass tubes contain a mixture of glycerine and water, and attached to one of the upright tubes (See Fig. 1), is a graduated scale giving readings in per cent grade. When the car is moving this device would theoretically indicate difference of grade in the roadbed over which the car traveled, but in practice the tetering of the car, dissimilarity in the truck springs, and other influences tend to render the readings unreliable, although as before stated the contrivance is found useful in general work.

For keeping maps and charts in shape for quick reference the car carries two racks of spring rollers, which will be seen under the transoms in the interior view. These are standard curtain rollers, to which the maps may be easily attached, and will be found to be a very useful detail.

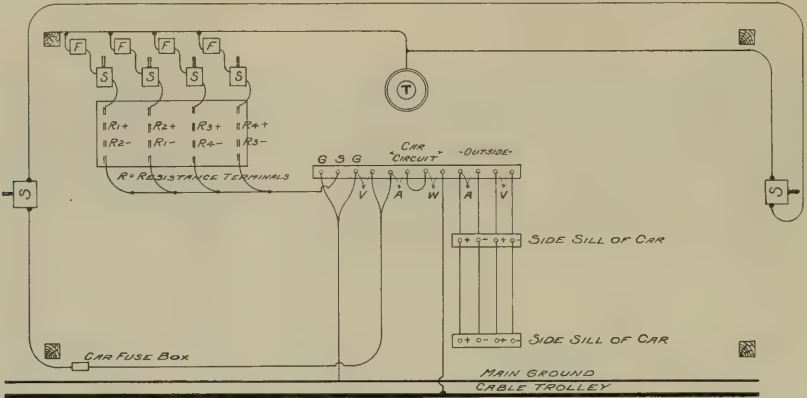


FIG. 2-DIAGRAM OF WIRING FOR TEST CAR.

by the resistance switches as previously described, the instruments in the testing car quickly indicating troubles. The operation can be carried on without removing any of the parts, and it is believed will prove to be an effective way of determining the condition of the equipment and discovering faults before actual breakdowns result.

On the side of the car opposite the testing instruments are a standard tachometer or speed recorder, a distance recorder and a

HINTS ON THE CARE OF A SNOW-SWEEPER.

BY ARTHUR B. WEEKS.

The snow-sweeper, more than any other apparatus belonging to the modern electric railway equipment, requires careful inspection, since snow and ice conceal many defects which would not otherwise be apparent, until the sweeper became disabled upon the road. A number of things must be gone over before the sweeper is put out; even before the motors are put in place, connected and tested. Care should be taken that there are no open or split links in any of the chains, as at times the strain upon them in raising the broom is very severe; then such links will open and drop the brooms, or lose control of the brakes, as the case may be. See that all nuts and bolts are in the best possible condition, using cotter pins and lock washers when possible.

The constant rattling and jarring of the sweeper, since there cannot be the flexibility of the ordinary electric car, will tend to loosen every nut and bolt, especially the boxes of the motor axle in the car for the brooms, and the bolts through the hangers and floor for these motor axle supports. The collars on the end of the motor axle will require a countersink for their set screws. Set the collar at a distance which will admit of some end play, run the set screws down to mark its location on the shaft; then remove collar and drill a shallow hole for the seat of the set screws. If the chains run directly on the motors, the motor axle hangers inside the car may be raised by placing a block of wood of proper thickness between the floor and base of hangers.

The brooms will throw a great deal of dirt and grit, which will work its way into the car. There is an oil hole in the caps of each bearing, which may be tapped for an oil or grease cup. A compression grease cup for a light grease may be best. Avoid using a wooden plug, or inserting waste in the hole. Grit will surely find its way into the box and cause trouble, if either is used. Keep the broom clutches well oiled and free from grit; for if allowed to get dry, and sand works into them, it will be difficult

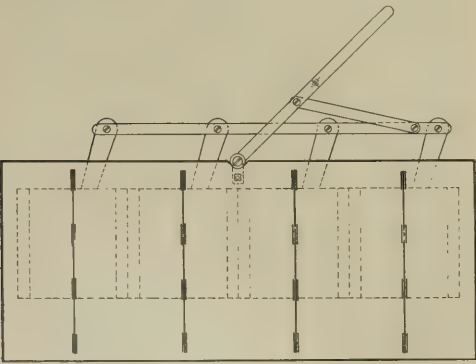


FIG. 4.

grade indicator. The distance recorder is in reality a revolution counter. It is geared to the car axle and is arranged to give readings in feet traveled.

The grade indicator is known to be accurate only within certain limits, but is found to be of considerable aid in general work where close accuracy is not required. The device consists of a galvanized

to get the clutch out to stop the brooms from revolving. If the clutch lever is lengthened, the clutch can be more easily operated. Wedge the sand-box lever down, to prevent all the sand dropping out while running.

When the broom motor is in place, secure the front of it upon some firm support, with spring suspension, being sure the support cannot pull loose when the direction of rotation of the motor tends to pull upward upon it. The writer recalls an instance in which the motor turned completely over, catching an attendant beneath it.

The chain will cause some trouble and annoyance, until one gets the hang of it. To place in position and connect, proceed as follows: Place the chain over the sprocket wheel of the broom end of the motor axle, with the free ends beneath, and midway between the sprocket wheels. Secure a strong light wire rope to the second link of one end of the chain and run the other end of the rope through the second or third link of the other free end of the chain. Throw in the broom clutch. Fasten a small chain block to a part of the truck frame, and with the rope secured to the chain block, draw up on the rope. If the links come together, put in the pin and its cotter. There should be a shoulder on this connecting pin, fitting into a recess in the link at this place, to prevent its wearing rapidly away by turning around in the link.

Undue force should not be used to bring the chain together, or a bent broom shaft will result. To tighten the chain after considerable wear, an idler may be used, placed under it to take up the sag or slack. Should it be thought preferable, a link may be removed from the chain, and each remaining link filed slightly on the inside bearing, until the chain comes together. This is a tedious process, but works satisfactorily. Avoid running the chains at too high a rate of speed. A slack chain is liable to run off frequently, causing annoying delays, and possibly allowing the road to become snowed under.

The brake chain will wrap better if twisted links are used. Do not have the bolt for the chain through the brake staff longer than is absolutely necessary, since the great leverage applied here

will break off the bolt. One thing to be overcome here, also, is the striking of the brake rod by the broom chain when in motion. Have the blacksmith give the rod an offset, raising it above the chain. A hanger to retain it in this position will be of service.

A brace will be necessary at the lower end of the brake staff hanger, in line with the pull of the chain, for the pull on the staff will loosen the hanger which is fastened with lag screws to the car body. Box in the gear and pinion below the car at the bottom of the broom staff for snow and ice will freeze in the teeth and prevent the raising or lowering of the brooms. A hinged band around the sections of the broom in place of the two part band will greatly simplify an annoying task, when one's hands are almost frozen, and nuts and bolts are dropping constantly out of sight.

A curtain back of the motorman is a good thing to have. Have a car gong on top of the canopy, with the cord in reach of the motorman. Do not run the brooms too low, as it causes unnecessary wear, breaking off the rattan. Short rattan is better than long.

Armatures, or even the entire motor, may be lowered into the pit by means of special jacks, and the sweeper run out of the way, when the parts may be removed from the pit for necessary repairs.

As a result of several years' actual experience in the operation of sweepers, the writer has found the above hints all that are necessary to provide against any contingency which may arise.

### ALBANY & HUDSON RIVER DAILY REPORTS.

We show in the following illustrations two daily report blanks which are used by the Albany & Hudson Railway & Power Co. These report blanks were prepared according to the ideas of Mr. Charles Mork, the master mechanic of the road, and they are largely self explanatory. Fig. 1 shows the condition of each of these cars for each day ending at 6 p. m. The headings of the col-

## ALBANY & HUDSON RAILWAY & POWER CO.

### DAILY CAR CONDITION REPORT.

		For day ending at 6 p. m.		100																								
CONNECTIONS	MOTOR CAR	TRUCK CAR	WINTER CAR - EAST LINE												SUMMER CAR - WEST LINE													
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12		
1. Motor, Connections and Brakes																												
2. Motor Body - Air and Grease																												
3. Controller Finger Tension																												
4. Cleaning Controller																												
5. Control Brakes																												
6. Commutator and Switch																												
7. Air Compressor and																												
8. Air Governor and Regulator Valve																												
9. Brake Shoes and Gearings																												
10. Brake Cylinder and Piston																												
11. Trolley Wheel - Insulated Ropes																												
12. Cleaning Car - Working Tools																												
13. Car - Tools																												
14. Third Rail - Shoes and Trackers																												
15. Hoisting Gear and Hoist																												
16. Hoisting - Reel and Reel Hoist																												
17. Hoisting - Hoist per day or number hoists per day																												
18. Hoisting - Mechanical Defects																												
19. Hoisting - Electrical Defects																												
20. Hoisting - Hoisting Defects																												
THIRD RAIL MEN	OCCUPATION	HOURS	SUPPLIES	USED	TROUBLE REPORTS AND REMARKS:																							
			Motor Grease	lbs.	Browns																							
			Grease	lbs.																								
			Journal Oil	gal.																								
			Cotton Waste	lbs.																								
			Wool Waste	lbs.																								
			Motor Pistons																									
			Air Comp. Pistons																									
			Brake Shoes																									
			Third Rail Shoes																									
			Trolley Wheel																									
			Controller Fingers																									
			Car Lamps																									





## Late Street Railway Legislation.

### Alabama.

#### ELECTRIC LIGHT AND POWER COMPANIES MAY CONSTRUCT AND OPERATE RAILWAYS.

Act No. 1,000 of the Acts of Alabama of 1901 provides that any electric light and power company of this or any other state shall have the right to construct, maintain and operate pole and wire lines for the transmission of electricity for lighting, heating and motive power, and for operating telegraph and telephone lines and for running railways along and across any railroad or public highway or other telegraph or telephone lines in this state. Such company shall have the right to contract with any person or corporation owning any lands, franchises, or easements for the right of way along and over which it proposes to construct its poles, lines or railways, or for the erection and occupation of offices for the accommodation of the public. It shall be entitled to the right of way over the lands, franchises and easements of other persons or corporations and the right to erect, maintain and operate poles, wires and railways and establish offices on such right of way, upon making just compensation as now provided by law. But it shall not construct its poles, lines or railways on the right of way of any railroad, public highway or other telegraph, electric or telephone company, except when it may be necessary to cross the said rights of way; and in no case shall said poles, lines or railways be so constructed as to hinder travel, endanger life or damage the property of said railroad or other telegraph, electric or telephone company, or in any wise interfere with the public operation of the same.

### Arkansas.

#### AUTHORIZES CITIES TO PROHIBIT UNLAWFUL RIDING ON CARS.

Act LXXXIX of the Acts of Arkansas of 1901 provides, That all cities and incorporated towns shall have the power to pass ordinances prohibiting persons from unlawful riding on cars within the limits of such city or incorporated town.

#### POWERS CONFERRED ON INTERURBAN ELECTRIC TRACTION COMPANIES.

Act XC of the Acts of Arkansas of 1901 provides that any number of persons, not less than three, may organize themselves into a private corporation, traction company, for the purpose of constructing, acquiring, maintaining, and operating interurban electric roads between and connecting cities, towns and villages and into, over, and through the streets of the cities, towns and villages reached by such electric roads, and to furnish light and power to consumers. The manner and method of organizing such corporations shall be the same as provided by law for the organization of manufacturing and other business corporations.

Every such corporation shall have the right to survey its lines, lay out its road, acquire its right of way not exceeding 200 feet in width and where necessary to acquire such right of way shall have the power to enter upon, condemn and appropriate the lands, right of way, easements and property of persons, firms or corporations and the method and manner of making its surveys, laying out its roadways, acquiring its right of way either by contract or by condemnation, shall be the same as now provided by law, in case of the exercise of the right of eminent domain, by telegraph, telephone and railroad companies, and it shall be subject to the same duties, liabilities, and have the same rights as prescribed with reference to railroad companies; Provided This Act shall not be so construed as to authorize the condemnation of public streets or highways.

Such corporations shall have the right to issue stock, common and preferred, borrow money, mortgage its franchise and property for the purpose of securing the payment of any indebtedness contracted for any of the purposes of such corporations; and shall possess all the rights and powers granted to private corporations, whenever the same may be applicable to corporations of this char-

acter. Corporations organized under the provisions of this Act, may lease or purchase any street or suburban railway, together with all property, real, personal or mixed, and all the franchises, tracks and privileges respecting the use and operation of such railway constructed and held by any other corporation, firm or individual, in any city, town or village reached by the line of said inter-urban road; and the corporation, firm or individual owning such street or suburban railway, are hereby invested with corresponding power to lease or sell, and convey its, their or his property upon such terms and conditions as may be agreed upon between the parties and the corporations created under this Act, shall have the right to own and operate the property so leased or purchased by it as well as the line or lines constructed by it for profit.

### Colorado.

#### REVENUE REQUIREMENTS.

Sections 235-7 of chapter 94 of the Session Laws of Colorado of 1901 provide: Every corporation, association or person operating any railway or tramway, electric road, cable road or street railway, located in the streets of any city or town or upon any public road, shall, in addition to the other matters required to be set down in the schedule of property of corporations, specify the particular streets, alleys and public roads by it occupied by its railway, tramway, cable road and other structures; the number and date of the municipal ordinance, resolution or other public grant authorizing the occupation of such street, alley or public place, and the date when, by the terms of such ordinance or grant, its right expires; also the particular description of all grants occupied or used in connection with such railway, tramway, cable road or electric railway for depot, station, power house or other purpose whatsoever.

The assessor shall set down in his assessment roll a brief description of such franchise, giving the date and number of municipal ordinances or other grants, and all such franchises or rights to occupy any street, alley or public road, and all such depots, stations, power houses and other properties used in connection with such railroad, shall be set down in the assessment roll and taxed with the said railroad, cable road or other city railway, as one property, and in case of non-payment of the tax, the same, together with the railroad, tramway, cable road or other city railway, shall be sold by the treasurer of the county where the principal office of said person, association or corporation operating such tramway, cable road, electric road, or other city railway, may be kept.

Redemption may be made from the sale of any such tramway, cable railway or other city railway for the non-payment of the tax, within the same time, upon the payment of the same penalties, interests and costs, as in the case of lands sold for non-payment of taxes.

Section 238 provides that, if no one bids on the property, the treasurer having authority to collect the tax shall petition the court therefor and a receiver shall be appointed to take possession of and operate the property of the delinquent company until from the net proceeds of the operation thereof such taxes and all taxes thereon accruing in the meantime shall be paid and discharged.

#### REQUIRES EMPLOYEES TO BE PROTECTED FROM IN-CLEMENCIES OF WEATHER.

Chapter 103 of the Session Laws of Colorado of 1901 provides: It shall be unlawful for any person, partnership or corporation owning or operating any street railway or the cars thereupon, in this state, or for any officer or agent thereof superintending or having charge or control of the line of railway or the cars thereupon, whether the motive power of such car is electricity, steam, by cable or otherwise, which require the constant service, or care or attention of any person or persons on any part of such car, except the rear platform, to require or permit such service, attention or care of any of its employees, or any other person or persons, unless such person, partnership or corporation, or superintending officer and managing agents thereof, first provide the said car with a proper

and sufficient inclosure constructed of wood, iron and glass, or similar suitable materials sufficient to protect such employe or other person from exposure to the rain, snow, cold or other inclemencies of the weather.

Where there is a trailing car or cars being drawn by a head car upon which the propelling or drawing power is situated and used and where no person is required to remain constantly at one point either for the purpose of keeping the lookout or for the purpose of operating any apparatus or machinery upon such trailing car or cars; this act shall not be construed to apply to any car except the head one; nor shall it be construed to mean that the inclosure for the mortorman or for the employe managing or operating any apparatus or machinery of a car at any point shall have his view obstructed, but the said inclosure or vestibuling shall be constructed in a manner so as to permit a front and side view from the position which it is necessary for the person to occupy while he is in the performance of his duties.

For each day that any car is permitted to be operated contrary to the provisions of this act, it shall be deemed to be a separate offense, and any person, partnership or corporation, or the superintending officers or managing agents thereof operating any such line of street railway or the cars thereupon who shall violate any of the provisions thereof, upon being convicted, in any court of competent jurisdiction, shall be deemed guilty of a misdemeanor, and shall be fined not less than \$50 nor more than \$100 or imprisonment in the county jail not to exceed 30 days for each and every offense.

### Connecticut.

#### MAPS OF LINES TO BE FILED AND STATE MAP SHOWING STREET RAILWAYS TO BE MADE.

Chapter 67 of the Public Acts of Connecticut of 1901 provides: Section 1. Every company owning or operating a street railway within the limits of this state, shall, on or before the thirtieth day of September, 1901, file in the office of the railroad commissioners, a map or plan of the road or roads constructed and owned or operated by it on the thirtieth day of June next preceding, and, on or before the thirtieth day of September annually thereafter, every street railway company shall file in the office of said commissioners a map or plan of all roads constructed by it during the year ending on the thirtieth day of June next preceding. Said map or plan shall be drawn upon sheets of the state topographical map of Connecticut, or, if required by the railroad commissioners, upon such other map as shall be designated by said commissioners, and the route or routes operated by such company shall be shown thereon by black lines indicating single track lines, and double tracks shall in all cases be indicated by red lines. Said maps or plans shall in all cases be drawn to the approval of the railroad commissioners, and said commissioners shall furnish the sheets of said state topographical map at cost to all street railway companies applying for the same.

Sec. 2. The railroad commissioners shall make or cause to be made, from the maps or plans first required to be filed by this act, a general map or atlas of the state, showing thereon all street railway lines as the same shall appear upon the maps or plans so filed, and shall, from time to time, revise such map or atlas so that the same shall show the lines of street railway in operation in this state.

Sec. 3. Every corporation violating the provisions of section one of this act shall forfeit and pay to the state fifty dollars for each such violation.

#### MUST STOP BEFORE ATTEMPTING TO CROSS DRAWBRIDGES.

Chapter 127 of the Public Acts of Connecticut of 1901 provides: Section 1. All cars of any street railway company shall be brought to a full stop at a distance not less than 150 feet, nor more than 200 feet, from the draw in every drawbridge upon the line of its road over which such cars are to run, before being run upon or over such draw, and such cars shall remain at a full stop until such draw is closed and securely fastened. Sec. 2. Every person directing or operating any street railway car, who shall violate the provisions of the preceding section, shall be fined not more than \$100 or be imprisoned not more than three months; and the presi-

dent and directors of any street railway company, who shall knowingly permit any violation of the provisions of the preceding section, shall be fined \$500.

#### STATE PAYMENT FOR PUBLIC DRAWBRIDGES CROSSED BY STREET RAILWAYS.

Chapter 145 of the Public Acts of Connecticut of 1901 provides that every town or city owning, operating, and maintaining a drawbridge over and across which any street railway company operates its car shall, upon the presentation to the comptroller of a certificate to that effect, signed by the selectmen of such town or the mayor of such city, receive from the state annually the sum of \$500 for each and every such drawbridge.

#### POWERS AND DUTIES OF RAILROAD COMMISSIONERS.

Chapter 156 of the Public Acts of Connecticut of 1901, entitled "An act concerning the railroad commissioners," is largely a revision and consolidation, with more or less changes, of many scattered provisions. Its scope is indicated, section by section, as follows: Street railway not to be opened without certificate from railroad commissioners; examination and supervision of street railways by railroad commissioners; duties of railroad commissioners as to construction of street railways; orders of railroad commissioners, how made; appeal of street railway company to railroad commissioners; appeal to railroad commissioners from order locating track; railroad commissioners may amend order; appeal to superior court; recommendations by railroad commissioners; railroad commissioners' report; hearing on street railway matter by mayor and common council, etc.; salaries and expenses of railroad commissioners, how paid; employment of electrical engineers, experts, and agents; railroad commissioners may summon and examine witnesses; repeal; cases to which this act shall apply.

Chapter 166, an act concerning grade crossings, provides that street railway company may petition for removal of grade crossing, gives powers of railroad commissioners as to allotment of expense, and covers appeal from decision of railroad commissioners.

### Maine.

#### EXTENSION OF ROADS AUTHORIZED.

Chapter 181 of the Laws of Maine of 1901, entitled "An act to further regulate the powers and privileges of street railroads," provides: Any street railroad corporation formed under the general laws of this state or any such corporation formed under a special act of the legislature may be allowed to extend its road to other points or places on application to the board of railroad commissioners and by conforming to the general laws of the state relative to street railroads so far as the same may be applicable.

#### ARTICLES OF ASSOCIATION, LOCATIONS, AND PETITIONS MAY BE AMENDED.

Chapter 177 of the Laws of Maine of 1901, entitled "An act to further regulate procedure in the organization of street railroad corporations," provides: Articles of association filed under the general laws of the state for the organization of street railroad corporations may be amended at any time upon petition therefor signed by all of the corporators after such notice be dismissed because of the death of any person named as a director corporator before final decree of approval of location, but the survivors may elect a new director or admit another associate, who shall sign the original articles of association and the subscription of stock then on file in the office of said commissioners. Any location may be amended at any time before final approval thereof, after notice and hearing thereon by the railroad commissioners, by filing a consent to said amendment signed by the municipal officers of the town interested. Amendments to petitions filed under such general laws before the railroad commissioners may be made at any time before final decree with or without notice, as the commissioners may decide public interests may require.



## THE MECHANICS OF ELECTRIC TRACTION.

BY R. W. CONANT, CAMBRIDGE, MASS.

It has occurred to me that it will be interesting as well as useful to deduce the equations and plot the curves showing the relation between the various mechanical factors concerned in the movement of cars and trains, and particularly with relation to electric traction. The factors are force, speed, time and distance, from which can be found the power necessary, delivered to the car axle by the electric motor.

The value of these deductions is expected to be two-fold. First, by disregarding the losses in motors and controlling mechanism they should show the best possible results that might be obtained, both as to schedule speed and power consumption. Secondly, by comparison with actual results obtained in practice, they will be of value in pointing out just where the losses take place. The schedule speed that can be maintained becomes very important in laying out the time table, since it follows that the higher the schedule the less the number of cars required to perform the work.

The mechanical equations are very well adapted to show the probable limits of speed obtainable and they will also show the rate of increase of power consumption as the schedule speed is increased. The equations also show the effect of varying the number of stops per mile at the different schedule speeds.

The assumptions made in what follows are that during the period of acceleration, the draw bar pull or the net tractive effort is constant to the point of shutting off the power, after which the car is allowed to coast, being retarded by a constant train friction to the point of application of the brakes. This braking force is also assumed to be constant during the braking period. These are not the actual conditions that are found in practice but nearly enough so to give comparable results.

The following are the factors and letters used in the formulae:—

- a=Net tractive effort during acceleration, in lb. per ton.  
b=Gross braking effort during braking, lb. per ton.  
c=Car or train friction in lb. per ton.  
S<sub>a</sub>=Seconds of time of acceleration.  
S<sub>b</sub>=Seconds of time of braking.  
S<sub>c</sub>=Seconds of time coasting.  
S=Total time of run between stops in seconds.  
D<sub>a</sub>=Distance travelled during acceleration in feet.  
D<sub>b</sub>=Distance travelled during braking in feet.  
D<sub>c</sub>=Distance travelled during coasting in feet.  
D=Total distance between stops in feet.  
V<sub>a</sub>=Speed in miles per hour at beginning of coasting.  
V<sub>b</sub>=Speed in miles per hour at end of coasting.  
v=Schedule speed in miles per hour.  
G=Limiting constant.  
n=Number of equidistant stops per mile.  
r=Seconds of rest between stops.  
W=Watthours per ton-mile at car axles.

The formulae connecting these various factors I find to be as follows:

$$\begin{aligned} S &= \frac{3(aW)}{nv} + r \dots\dots\dots 1. \\ D &= \frac{5280}{n} \dots\dots\dots 2. \\ G &= abS^2 - 124.2 D(a+b) \dots\dots\dots 3. \\ S_b &= \frac{aS}{a+b} - \frac{1}{a+b} \sqrt{\frac{(a+c)G}{b-c}} \dots\dots\dots 4. \\ S_a &= \frac{cS + (b-c)S_b}{a+c} \dots\dots\dots 5. \\ S_a + S_b + S_c &= S \dots\dots\dots 6. \\ D_a &= \frac{aS_a^2}{124.2} \dots\dots\dots 7. \\ D_b &= \frac{(a+c)D_a - cD}{b-c} \dots\dots\dots 8. \end{aligned}$$

$$D_a + D_b + D_c = D \dots\dots\dots 9.$$

$$W = \frac{n(b-c)D_b}{2640} + 2c \dots\dots\dots 10.$$

$$V_a = \frac{aS_a}{91.1} \dots\dots\dots 11.$$

$$V_b = \frac{bS_b}{91.1} \dots\dots\dots 12.$$

An examination of these formulae shows that we may obtain the power consumption, in watt-hours per ton-mile and the highest speed attained for any schedule and any number of stops per mile provided we know the car friction, the net accelerating effort and gross braking effort together with the duration of the stops. In order that the term watt-hours per ton-mile may not be misleading, I desire to state that in these equations it means the mechanical work in foot-pounds to drive the car multiplied by the necessary reduction factor to change it into watt-hours of electrical work assuming there to be no loss in the transformation.

It will now be in order to show the application of these formulae to a special case, for which purpose a set of conditions will be assumed that come within the range of ordinary practice as follows:

Net accelerating effort, a = 100 lb. per ton.

Gross braking effort, b = 170 lb. per ton.

Car friction, c = 20 lb. per ton.

Number of stops per mile, n = 4.

Number of seconds of rest per stop, r = 10.

Schedule speed to be maintained, v = 10 miles per hour.

Then inserting these values in the equations it is found that Formula No. 1, gives S = 80 seconds.

2. D = 1320 ft.
3. G = 64535120.
4. S<sub>b</sub> = 3.018 seconds.
5. S<sub>a</sub> = 17.106 seconds.
6. S<sub>c</sub> = 59.876 seconds.
7. D<sub>a</sub> = 235.6 ft.
8. D<sub>b</sub> = 12.48 ft.
9. D<sub>c</sub> = 1071.9 ft.
10. W = 42.8 watt-hours per ton-mile.
11. V<sub>a</sub> = 18.77 miles per hour.
12. V<sub>b</sub> = 5.63 miles per hour.

In other words these conditions, which may be said to represent the movement of a street car on some routes, indicate that to maintain a schedule speed of 10 miles per hour with 4 stops per mile and each stop having a duration of 10 seconds, it is necessary to attain a maximum speed of nearly 19 miles per hour and if the motors and controlling mechanism had 100 per cent efficiency this could be done with an expenditure of 43 watt-hours per ton-mile, at the car. Or supposing that the car weighed 10 tons 430 watt-hours per car-mile. It is well known however that actual tests on the road under

Below are the fundamental equations used in deriving the formulae in this article, for the benefit of those who may care to follow through that part of the work.

$$D_a = \frac{aS_a^2}{124.2} \dots\dots\dots I.$$

$$D_b = \frac{bS_b^2}{124.2} \dots\dots\dots II.$$

$$aS_a = cS_c + bS_b \dots\dots\dots III.$$

$$aD_a = cD_c + bD_b \dots\dots\dots IV.$$

$$D_a + D_c + D_b = D \dots\dots\dots V.$$

$$S_a + S_b + S_c = S \dots\dots\dots VI.$$

It will be recognized by the student of algebra that these six equations are sufficient to solve for the six unknown quantities, namely, S<sub>a</sub>, S<sub>b</sub>, S<sub>c</sub>, D<sub>a</sub>, D<sub>b</sub>, and D<sub>c</sub>.

In performing this work G is substituted for  $abS^2 - 124.2 D(a+b)$  for convenience.

For deriving the power equation No. 10 the fundamental equation used is  $W = \frac{2(a+c)D_a}{D}$

By combining this with equations No. 2 and also IV and V the final power equation No. 10 is obtained.

fairly similar conditions show the electric power required to be about twice this amount.

I believe that the losses causing this discrepancy are about 65 per cent in the motors and controlling mechanism, and the balance 35 per cent is due to the lack of information on the part of the motorman and other causes that result in his not applying the power and brakes in such a manner as to make the practical movement of the car follow this ideal one. Under adverse circumstances this percentage of loss due to the motorman would amount to more

cases through the range of schedule speeds from 5 to 20 miles per hour. The results are extremely interesting but quite voluminous, the tabulation occupying some 20 pages and consisting of about 35,000 figures. As it will be impossible to give these tables in an article of this length I shall try to present a general summary in the form of curves plotted from the data obtained.

In Fig. 1 is a representative power curve showing the variation of power consumption with the tractive effort for a schedule speed of 10 miles per hour and 8 stops per mile. This is lettered

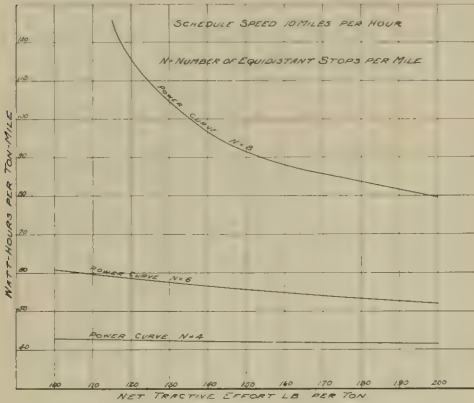


FIG. 1.

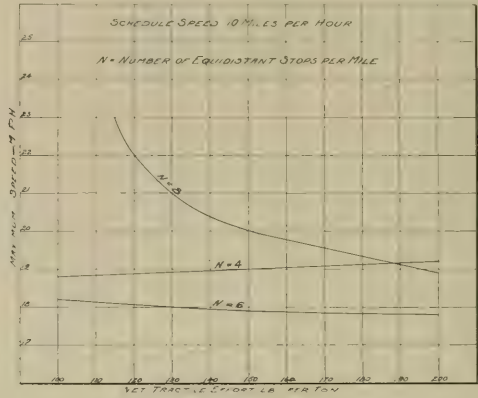


FIG. 2.

than the figure given, as cars under similar conditions have taken over 1000 watt-hours per car mile.

It will be apparent on consulting these formulae that the power consumed can be greatly increased by too much application of the brakes. An examination of equation No. 10 discloses the fact that the power consumed equals twice the car friction plus a term dependent on the distance of braking. If this distance is zero, which means that we coast to a stop, this term disappears and we get the least possible consumption of power, namely 2c or with a car fric-

"Power Curve  $n = 8$  and it is interesting to note that by increasing the accelerating effort from 120 to 195 lbs. per ton the power is reduced from 115 to 80 watt-hours per ton-mile, a saving of about 30 per cent. This is a saving worth taking into consideration as the accelerating effort may be readily increased by using a larger motor. With the smaller number of stops, as for instance the curve shown for  $n = 4$ , there is very little gain by increasing the accelerating effort. The broad principle governing this is that the waste of power causing this variation, takes place during the application

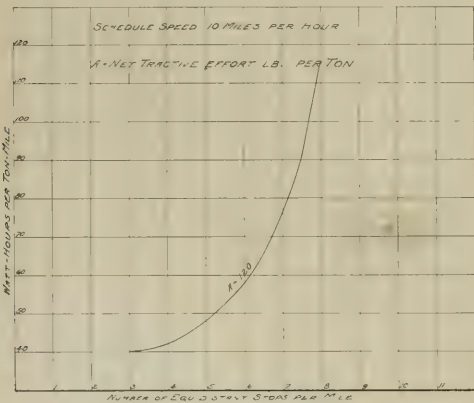


FIG. 3.

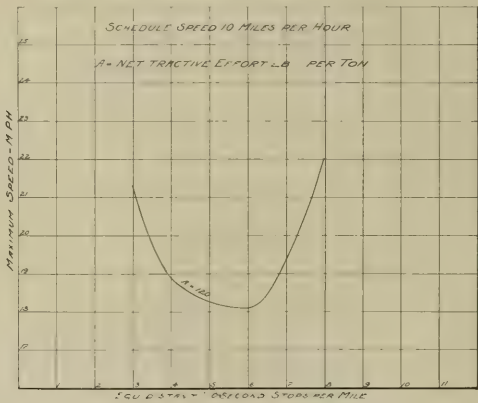


FIG. 4.

tion of 20 lb. per ton, 40 watt-hours per ton mile. The other requirements of speed and stops do not usually permit this, however, but this limit is easily found by the use of the equations. In using the formulae for this purpose an impossible set of conditions will render either  $G$  or  $S_b$  a minus quantity. When  $G$  is minus it is an indication that the draw bar pull is insufficient to enable the car to cover the distance in the required time. When  $S_b$  comes out minus it means that the draw bar pull is too high.

By the aid of these formulae I have solved all the important

of the brakes and is converted into heat and warming the wheels and shoes. At a fair accelerating effort it is apparent from this plot that doubling the number of stops per mile from 4 to 8 increases the power consumption three times. That is to say with the car making 8 stops per mile under these conditions there is about twice as much power wasted as is required to drive the car. The reason that the greater tractive effort or larger motors results in a saving of power is that the car is enabled to cover the stated distance in the requisite time and reach the point at which brakes have to be

applied at a lower speed. This saving only takes place in case the proportion of stops to schedule speed is high. But as the advantage of high schedule is coming to be more and more appreciated, it becomes of greater importance to calculate these relations. I have not attempted to introduce the effect of the dropping off of accelerating effort, due to the peculiarity of the railway motor as that is not practicable in an article of this character.

Fig. 2 exhibits the curves of the maximum speed attained for a schedule of 10 miles per hour. With 8 stops per mile the maximum speed increases rapidly as the tractive effort is reduced. With 4 stops it gradually decreases, while with 6 stops there is a gradual increase as the tractive effort is reduced.

In Fig. 3 are presented the variations of power consumption with the number of stops per mile, the tractive effort in this instance being 120 lb. per ton and the schedule speed 10 miles per hour.

Fig. 4 indicates the different maximum speeds attained with the various stops per mile, the accelerating effort and schedule speed

## MEDALS AWARDED FOR GOOD RECORDS.

The Newton & Boston Street Railway Co., of Newton, Mass., has inaugurated the policy of offering medals to its motormen and conductors making the best record during the year and the scheme has proved of great advantage to both the company and its employees.

Nov. 1, 1900, Mr. E. C. Spring, superintendent of the company, offered two gold medals, one for the best record as motorman during one year and one for the best record as conductor, in everything pertaining to the daily work upon the cars. The men entered into the scheme with great interest and the results at the end of the year were very gratifying. The competition for the medals was so keen that Mr. Spring decided to have two silver medals awarded at the same time as second prizes. This was done and a very pleasant meeting was held on November 8th on which occasion the medals were presented by Mr. A. D. Chaffin, president of the company. The men who were awarded the medals were as follows:

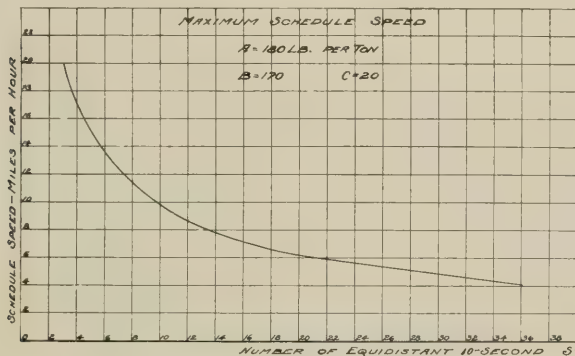


FIG. 5.

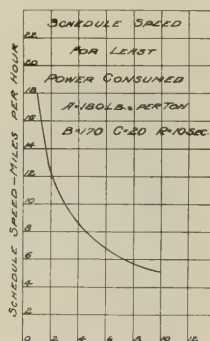


FIG. 6.

being 120 lb. per ton and 10 miles per hour respectively. It is observed from these two curves that the power rapidly increases from 40 to 115 watt-hours per ton-mile while the maximum speed first increases and then diminishes, being a minimum at about 6 stops per mile, of 18 miles per hour.

Adding stops is therefore a very expensive proceeding looked at from a purely operating standpoint, without considering the increased revenue. As illustrated above with a constant schedule it increases both the power consumed and the sizes of the motors. In case of additional stops introduced at the rush hours this usually results in slowing the schedule and thereby requiring more cars to do the work.

In this connection a curve has been plotted showing how large a number of stops it is possible to make and still maintain all schedules between 5 and 20 miles per hour. This has been obtained from formula No. 3 by considering  $G$  equal to zero. It is shown in Fig. 5 and is based on a constant accelerating effort of 180 lb. per ton, this giving about the greatest practical acceleration, namely about two miles per hour per second. To realize these schedules both the power consumption and the maximum speeds are extremely high as there is no coasting, the brakes being applied as the power is shut off.

As a companion to this curve the other extreme is exhibited in Fig. 6, giving the resulting schedules when the car is allowed to coast to a stop without any application of brakes. This method of operation we have seen to entail the least possible expenditure of power, the watt-hours being obtained by doubling the car friction. These two curves will be found useful in determining whether or not a proposed schedule is practical.

The New Orleans City Railroad Co. increased its service on the Prytanian line for the purpose of handling large circus crowds, October 21st-23rd.

Joseph Timoney, gold medal for best record as conductor; John Hendricks, gold medal for best record as motorman; William Wilson, silver medal for second best record as conductor; John Kelley, silver medal for second best record as motorman.

This plan of awarding medals is, we believe, an entirely novel one among street railway companies and in the present instance has worked admirably. It has been watched with a great deal of interest by several other superintendents of New England roads and will in future undoubtedly be adopted in a number of other places.

The department of the employees in this instance has been benefited in a marked degree and has called forth many compliments from the citizens in that vicinity. Another great advantage accruing to the company is the reduction of the accident account which for the past year has decreased one half over that of the year previous. Mr. Spring is highly gratified at the results of the competition for the medals and announces that the same policy will be carried out during the coming year.

## NEW CALIFORNIA INTERURBAN.

The Santa Clara Valley Electric Railway & Power Co., is about to construct an extensive electric railway from Oxnard to Hueneme on the south and to El Rio on the north. The company has perfected its organization and incorporation papers have been forwarded to the Secretary of State. The capital stock is \$500,000, of which \$100,000 has been subscribed, and the plans of the company embrace an extensive system of city electric lines in addition to the interurban lines. Franchises have been asked for that will give Oxnard a very complete city railway service, and it is proposed to make Hueneme a popular sea side resort. The officers of the company are as follows: Col. J. A. Duffell, president; Maj. P. A. Carr, vice-president; J. A. Whitmore, second vice-president; M. P. Thacher, secretary; Bank of Oxnard, treasurer.



### HOME-MADE SNOW LEVELLER.

Street railway companies operating in city streets and also to a certain extent those running through suburban towns, frequently find an aggravating source of annoyance in the piles of snow that always accumulate along the sides of the track after a snow fall. The ordinary nose snow plows will effectually remove the snow from the track itself, by pushing the snow and ice to one side, but the ridges of snow so formed along the street railway lines obstruct the streets, render vehicle traffic difficult, and are alike annoying to the public and to the company.

To prevent the formation of these ridges and to keep an open space at either side of its tracks, the Lynn & Boston Railroad Co. uses a home-made snow leveller, which is nothing more than a flat car with a swinging wing at the side. The car is one employed the year round for hauling track material and other freight and supplies. At the first signs of snow the levelling wing is adjusted in place, and is carried swung in close to the car, where it is always ready for instant use. The wing is a heavy timber, bound on the lower edge with an iron strip, and is hinged near

to operate over the streets on which the large business houses are situated and from the docks on the river to the railroad yards.

### ATLANTA RAPID TRANSIT CO. ENTERTAINS.

Mr. C. Jerome Simmons, president of the Atlanta Rapid Transit Co., tendered an elaborate dinner last month to C. R. Spence, of Baltimore, T. Jefferson Coolidge, of Boston, and W. H. Whipple, of New York, all of whom are largely interested in the street railways of Atlanta. About 150 prominent business men and city officials were also invited to meet the guests of honor in an informal way. After the repast, Mr. Simmons who acted as toast master introduced a number of speakers. The addresses were all extemporaneous and elicited frequent applause. Mr. Coolidge who is one of the largest northern investors in Georgia properties was one of the principal speakers on this occasion and dwelt at some length on the unparalleled opportunities for capital in that state. He stated that he had traveled extensively through the South but in his opinion Atlanta was the best city in that part of the country for the



SNOW LEVELLER ON LYNN & BOSTON ROAD.

the center of the car so as to have considerable vertical play, the wing hanging by two eye-bolts sliding on an upright iron rod. The wing or leveller is 14 ft. long, and is handled by two rope falls, one controlling the angle and the other the elevation, so that the wing can be adjusted at any angle or height desired. With this device a hard smooth roadway is easily maintained on both sides of the tracks, regardless of the amount of snow that may have fallen, or been thrown, at the side of the rails.

One cut of Leveller.

### FREIGHT STATIONS IN TROY AND COHOES.

The United Traction Co., of Albany, N. Y., has finished two new freight stations in Troy and Cohoes, N. Y., which will greatly increase its facilities in handling this class of business. The growth of the freight business of this company induced it some time ago to begin the alteration of its old car barns in the cities mentioned into commodious freight depots. Work of remodelling the buildings has just been completed at a cost of between \$10,000 and \$12,000 and the new depots which are designed for the reception of all kinds of freight for transportation over the company's lines were opened for business on November 11th. The United Traction Co. operated 6 freight cars on regular schedules before the completion of the new buildings and with its increased facilities it is now prepared to handle the freight coming to it in the cars of other companies.

The Hudson Valley Railway Co., whose cars run into Troy and whose lines cover the territory as far north as Lake George, it is expected will begin running freight cars at once. The operation of freight cars on this road would provide the United Traction Co. with considerable additional and profitable business.

It is reported that the Troy Terminal Electric Ry. is to be incorporated and will do a freight business only. This company plans

investment of capital. Among the speakers were Mayor Mims, of Atlanta, and Judge H. E. Palmer, T. P. Howell, C. R. Spence, ex-Governor Bullock and Capt. Jas. W. English.

### TROLLEY CARS ON VESUVIUS.

According to the New York Times, much of the romance of European travel is rapidly disappearing, due to the introduction of the trolley in historical places. The most recent example of this modernization is the trolley road which is now being built up the slope of the volcano of Vesuvius for the accommodation of tourists who find mountain climbing too arduous. The trolley line starts at the foot of the mountain and connects with a cable road which carries passengers all the way up to the edge of the crater. There is already a trolley line in operation from Gizeh to the Sphinx, another runs part of the way up Mont Blanc, and several roads with all modern accessories run through the streets of Rome. The most incongruous combination of ancient and modern however, will be found in the electric railway which is planned to be operated through the Catacombs.

The Lansing (Mich.) City Electric Railway Co., whose property was recently purchased by the Hawks-Angus syndicate, of Detroit, on November 1st elected the following officers: J. D. Hawks, president; James D. McNamara, vice president, and S. F. Angus, secretary and treasurer.

The floating debt of the Lake Street Elevated Railroad Co., Chicago, amounting to approximately \$800,000, was wiped out some weeks ago when the company purchased the Chicago & Maywood electric line, the terms of purchase stipulating that the former owners of the latter should pay the floating debt.

## Interurban Railways: Suggestions as to Their Physical Future.

BY JAMES A. BRETT.

Four or five years ago he was a bold man who would advocate the building of an electric interurban railway more than twelve or fifteen miles long. Today he must be quite as bold who will place a limit on the commercially possible length of the interurban. It is the object of the writer to discuss how these roads should be built rather than how long they may be, and to make or reiterate some points, that it is believed are both opportune and important.

The recent phenomenal advance in interurban railway building in the United States is the best possible evidence of the value of such roads as an investment, and all things considered the earning power of the interurban is a succession of surprises even to the initiated insider. Of course there are a very few exceptions, but taken as a general proposition the interurban is here to stay and the next ten years will doubtless witness the building of thousands, if not tens of thousands of miles of electric interurban roads as well as the extending, connecting and consolidating of most of the lines now in operation. A venture at the future of the interurban railways may therefore be of interest to those concerned in their construction, ownership and management.



J. A. BRETT.  
Photo by Tonnesen, Chicago.

The future evolution of the electric interurban will undoubtedly in a large measure be very similar to the experience of the steam railway, in that the lines in each given territorial district will be merged and owned or controlled and operated by the interests dominating the merger process and this process will multiply and expand along the same lines of organization and operation that have obtained in the case of the steam railways. Where there are ten separate companies today, there will be one company in the future. The number of power plants will be similarly reduced. The through passenger, freight and express business will increase to an extent not now dreamed of, sleeping and parlor cars will be added, freight and express trains, with suitably adapted equipment and carrying a big tonnage will be the vogue, union passenger and freight stations will be built in the larger centers, trains equipped for multiple control will be the rule, and ultimately all cars, urban, suburban and interurban will be provided with some system of train control. All of this inside of ten years. That this unparalleled movement is upon us is as true as is the fact that the entire movement will be along lines as closely imitating the steam railroad in all phases as is possible to attain. And the obstacles resulting from the two cardinal points of difference between the electric and steam railroads, viz., electric power and operation through city streets, will not be permitted to interfere to any extent in the adoption of steam railroad methods. In fact the tendency to follow steam railroad practice is already apparent, but the influence of the strictly street railway engineer and manager is still plainly and in some cases painfully seen in the operation, construction or equipment of interurban lines.

We are in a far more favorable position for the successful creation of a comprehensive railroad system than were the early steam railroad men or than were, more recently, our friends the horse car men. Both of these were called upon to devise and exploit new appliances, to invest large sums of money in materials and apparatus, which had to be abandoned almost as soon as installed, as a brief glance at the record of the present electric street railway will illustrate. Assuredly the electric street railway's present high standard of excellence challenges the admiration of the world and the history of its achievements is a monument to American brains and energy. This standard has been immensely expensive to attain, but it is worth to American trade all that it cost and more. The expenditure of money and energy in the advance of the street railway was as natural as it was unavoidable, because of the lack of experience or precedent in almost all of the many phases of its development. Roadbeds used for horse cars were ridiculously in-

sufficient; ties, rails, fastenings, special work, buildings, cars and running gear, were as toys compared with similar modern appliances and all had to undergo, step by step, the radical changes demanded by the ever increasing size, weight and speed of rolling stock. Car motors used at Richmond in 1888 were rated at  $7\frac{1}{2}$  horse-power each, 15 horse-power to the car, while today a car of the same size has 60 horse power, an increase of 300 per cent, and coincidentally has the weight of rails increased 30 per cent from 25 lb. to 100 lb. per yard. Even today it may be observed that cars are steadily increasing in size calling for heavier rails and more substantial roadbed, running gear and equipment, and for the larger cities the questions of electrolysis and removal of overhead wires must be met and so on, ad infinitum. In this connection it seems strange that the public will in one breath cry down the trolley wire and in the next congratulate themselves on the acquirement of a ponderous and roaring elevated railroad.

It is contended that the men who take part in the coming interurban railway building have everything that can be desired in the way of precedent, example and experience to guide them and they shall not be doing justice either to themselves or to the public if they do not avail themselves of their plain opportunities. The present state of perfection of electrical and steam machinery leaves almost nothing to be wished for except, possibly, alternating current car motors, and this being the case the example for practically all of the remainder of the requirements of the interurban railway is to be found in the steam railroad. If this statement is not broadly correct then steam railroad practice today must be considered deficient. Of course it is not contended that there may not be a few details to be worked out independently, but it is hard to conceive any of a very serious nature. The operation of interurban cars in city streets and the joint use of city tracks seems to present the most difficult features, but this question will work itself out speedily and satisfactorily, in most cases by consolidation, in others by alteration to track at the expense of the interurban companies, and in others by elevated or other independent entrances, preferably the latter being provided. In short no ordinary obstacle can stay the forward march of the interurban, the public wants them, they pay, and that is sufficient.

The interurban railway should be built and operated after the manner of the steam railroad in every possible respect because of the volume of traffic it will be called upon to handle and the vital necessity of handling its passenger traffic safely. To have a few head-end collisions on the average interurban is to invite financial disaster; in fact the avoidance of personal injuries is the most important detail of operation, made especially so by reason of the almost universal use of single track and the equally general and deplorable absence of suitable signal systems, and also by the diseased public conscience when damage suits are pending against a corporation.

A striking example of the wisdom of following steam railroad practice may be found in the elevated railroads of the country which have from their inception adopted steam railroad methods of construction and equipment, and have suffered little if any of the ills of evolution experienced by the street railways. The fact that all elevated roads are now or shortly will be operated by electricity and that some now so operated were converted after having used steam cannot be said to be an ill, for the reason that great economy of operation was effected and the change involved motive power only.

Besides following steam railroad practice in construction and equipment their methods in other departments may be adopted with profit. Notably the system of standardizing equipment and appliances, rules and regulations and discipline, dispatching and signalling, maintenance of way, repair shop practice and general policy in economics. Private rights of way in and between cities should be acquired wherever possible, even at seemingly high cost. The operation of cars over city streets or country roads gives an opening for the attacks of the public ownership and anti-franchise agitators, which it is highly important to avoid. This right of way question will become more important yearly, especially so as the freight carrying business increases. Although we shall follow the



example and profit by the experience of the steam railways there is no reason to expect that we shall be very closely allied to them. Nor is their almost passive attitude up to date any criterion for the future.

In the steam railway the interurban will have an opponent more formidable than the three cent fare and municipal ownership advocates. This opponent will have the advantages of wealth and organization and while it has not yet shown marked hostility this will follow shortly. Therefore an active association of interurban railway companies is greatly to be desired. This body may be allied to but should be entirely distinct from the American Street Railway Association. Its purposes would not entirely harmonize with those of the Street Railway Association, and besides it would be obviously better for both not to unnecessarily draw the street railways into an imbroglio wherein their participation might work greater complication. This interurban community of interests could create a fund to be drawn upon as needed for legal or legislative battles. It would also be of great value in many other directions of a more peaceful nature than those suggested.

If we shall endeavor to profit, as far as possible, by the experiences of the steam and of the street railway, the interurban will not only hold its present position but will year after year improve in earning capacity and when the steam railways get ready to absorb their electric competitors they will have to pay the price.

### AN ORNAMENTAL OVERHEAD CROSSING.

The accompanying engraving shows an ornamental bridge recently built at Madison, N. J. It spans two lines of railway, crossing the park in a deep cutting. The center part of the bridge is a steel plate girder, built in the form of an arch. The bridge has a clear span of 50 ft., and width of 10 ft. The two plate girders are connected at the bottom with light beams, and between these are laid curved sheets of corrugated iron. The girders are held in a vertical position by gusset plates riveted to stiffeners on the



PARK BRIDGE AT MADISON, N. J.  
(Designed by H. G. Tyrrell, C. E., Boston, Mass.)

web, and fastened to the floor beams. Beneath the floor beams are cross braces in the plane of the bottom chord, and at each end there is a vertical cross frame. The girders are capped with heavy cast iron hand rails.

On the outside of each girder there is built a projecting fascia to represent an elliptical arch, thin at the crown, and increasing in thickness towards the abutments.

The abutments are built of ornamental stone work, and at each end there are two heavy cast iron lamp posts and globes.

The whole structure is surrounded with plants and shrubs, and presents altogether a pleasing appearance.

The Jackson (Mich.) & Suburban Traction Co. has received seven new cars with observation and smoking compartments and lavatories, to be put in commission of the Jackson-Grass Lake run. The cars cost \$12,000 each. Superintendent Foote is quoted as stating that the roadbed to Battle Creek will be completed by February 1st.

### FIRE AT RICHMOND, VA.

November 10th, fire destroyed the four-story brick structure on the corner of Main and 7th Sts., Richmond, occupied by the Richmond Traction Co., the Virginia Electric Railway & Development Co. and the Tower-Bingford Electric Supply Co. Several people were slightly injured and one or two seriously. The total loss was estimated at \$100,000 and the cause of the disaster was thought to be the explosion of the boiler which operated the steam heating plant of the building.

### CAT STOPS THE POWER OF NIAGARA.

The street car systems of Buffalo, Niagara Falls and Lockport were all brought to a standstill for several minutes on the afternoon of November 13th by the short circuit of the main feed wires from the Niagara Falls power house which run to Buffalo. A cat climbed one of the poles and getting its fore feet on one of the wires and its hind feet on another was instantly killed, and its body short circuited the lines. There was no current beyond that point. A car coming from Niagara Falls reached this point when the power was instantly cut off and while waiting for it to start up, the motorman discovered the cause of the stoppage. Everybody left the car and all took a hand in dislodging the cat from its position on the wires. As soon as it fell, the car started off with a rush leaving the crew and passengers behind. It was caught, however, by the motorman after a considerable chase and brought back to receive its load of passengers.

### NEW YORK RAPID TRANSIT EXTENSION.

Further testimony was given on November 8th by the special commission appointed by the Supreme Court to take evidence in regard to the extension of the New York rapid transit tunnel to Brooklyn. Chief Engineer Parsons of the commission testified in regard to the length, construction and general circumstances of the proposed extension. A number of citizens also appeared at the hearing who were interested in seeing that the facilities of the tunnel were to be the best possible. They appeared to have some doubts as to whether a two-track tunnel would be adequate, and if it was not, it was their purpose to try to carry through an entire change in the plans.

Mr. Parsons stated that the time required to take passengers from Broadway and Ann Sts., Manhattan, to the Brooklyn terminus would be between 8 and 10 minutes. He thought that 480 trains an hour could be run, each carrying 100 passengers crowded, or 48 seated. The time required for the construction of the tunnel would be approximately two years.

At a subsequent hearing, President Orr of the commission stated in regard to the capacity of the tunnel that a four-track tunnel could not be built unless a portion of the road in Brooklyn was done away with, and the latter proposition could not be considered. Further hearings in regard to the extensions are to be held.

The party of engineers of the subway commission, who went abroad to study the rapid transit problem in European countries, has returned and reports that the trip was highly profitable and interesting. Mr. Parsons says that he learned from the Paris subways, the advantages of making underground roads look attractive. All the stations in Paris have an exceedingly pleasing appearance. The desirability and necessity of avoiding unsightly stations appealed to every one of the party. There was little to learn from the London underground roads as they are of the tube construction and differ radically from the work in New York. The cars used on the European underground lines are considered by the engineers to be entirely too small; the roofs are low and poorly ventilated. Even with good air in the subway the air in the upper part of the car is extremely bad. There are no ventilators in the roof and the passenger who stands cannot avoid breathing foul air as his head is above the ventilators over the windows.

Another thing which was specially noticed was the bad smelling wood in the Paris subways. The ties for the road bed had been impregnated with creosote and the road has lost considerable patronage on account of this odor which permeates the atmosphere of the tunnel.



## RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

### DUTY OF MOTORMAN TO BE ON THE LOOKOUT FOR SUDDEN DANGER ESPECIALLY WHEN PASSING OBSTRUCTIONS CAUSED BY PRIVATE IMPROVEMENTS.

*Buehler v. Union Traction Co. (Pa.)*, 49 Atl. Rep. 788. July 17, 1901.

It is the duty of a motorman, the supreme court of Pennsylvania holds, at all times to be on the alert, looking ahead of him for any sudden or unexpected danger, and this is especially true when he is about to pass a point where private improvements have, to some extent at least, temporarily obstructed the street.

### BACKING OF CAR NOT TO BE WATCHED FOR ORDINARILY.

*Central Railway Co. v. Knowels (Ill.)*, 60 N. E. Rep. 829. June 22, 1901.

The common course of street cars being forward, and not backward, the supreme court of Illinois says that a person, traveling along a public street, will not ordinarily be required to watch a car that has passed, to see if it is not going to stop and run backward, instead of going forward. It also holds that it is proper to submit to the jury the question of negligence where there is evidence that a street car was backed when there was no one on the rear end of it who was looking out for travelers, the conductor having his back turned in the direction that the car was backed.

### RIGHT TO ENJOIN ANOTHER COMPANY FROM ILLEGALLY INTERFERING WITH TRACKS.

*Atlanta Railway & Power Co. v. Atlanta Transit Co. (Ga.)*, 39 S. E. Rep. 12. May 20, 1901.

A street railway company which has constructed, and is legally operating, a line of railway in the streets of a city, the supreme court of Georgia holds, is possessed of such a property interest as gives it a legal right to maintain an application to restrain a similar company from interfering with its line of tracks already laid, and from constructing a line of road over its private property without authority of law. Moreover, to such an application the city is not a necessary party defendant.

### LIABILITY FOR INJURY FROM ABANDONED TRACK BECOMING UNCOVERED.

*Paducah Railway & Light Co. v. Ledsinger (Ky.)*, 63 S. W. Rep. 11. May 29, 1901.

A track having been abandoned, the trolley wires taken down and the track covered with gravel, but, afterwards, either from an insufficiency of gravel, or the wear of the street, the rails became exposed, and, by reason of the exposure of the rails, a man driving down the street was thrown from his wagon and injured, the court of appeals of Kentucky holds that, while the evidence of negligence was conflicting, it was sufficient to warrant the submission of the case to the jury, and that their finding for the man was not so against the evidence that it could be disturbed by it, the defect in the street having existed so long that the company and city, which were sued together, were chargeable with notice of it.

### NUMBER AND LATITUDINAL LOCATION OF TRACKS ARE FOR MUNICIPAL REGULATION.

*Baker v. Selma Street & Suburban Railway Co. (Ala.)*, 30 So. Rep. 464. June 29, 1901.

The supreme court of Alabama says that it cannot consent to the proposition that it is essential to the validity of a franchise or right to construct and operate a street railway in the public streets of an incorporated town or city that the declaration of incorporation and the consent of the municipal authorities should specifically designate the exact location latitudinally in the streets over which such railway is to be constructed and operated, or the number of tracks to

be laid. These, it holds, are matters which are wholly within the power of the municipal authorities to regulate and control, after consent given and obtained for the construction and operation by the railway company of its line of Railway.

### A TROLLEY LINE IS NOT A RAILROAD USE AND IS TAXABLE LOCALLY.

*In re Jersey City & Bergen Railway Co. (N. J. Sup.)*, 49 Atl. Rep. 437. June 10, 1901.

Property not possessed and used by a railroad company for railroad purposes being subject to local assessment only, the supreme court of New Jersey holds that property which is used as a trolley road is not so possessed and used, and hence is lawfully taxed locally only, instead of being assessable by the state board of assessors. In short, it holds that a trolley line is not a railroad use.

### INTEREST IN SOIL OF HIGHWAY TAXABLE AS REAL ESTATE.

*Mayor, Etc., of City of Newark v. State Board of Taxation (N. J. Sup.)*, 49 Atl. Rep. 525. June 10, 1901.

While it says that it must be assumed that the laying of trolley tracks in a highway imposes no additional servitude upon the title of the abutting owner, and that as between the company and the abutting owner nothing is taken from such owner for which he is entitled to compensation, the supreme court of New Jersey holds that, nevertheless, as between the public and a trolley company the latter has such an interest in the soil of the highway over which it passes as is taxable as real estate.

### USE OF ROAD FOR TRANSPORTATION OF FREIGHT—BY LESSEE INCORPORATED AS FREIGHT CARRIER—NO INJUNCTION FOR ABUTTERS—LIABILITY FOR INJURY TO ADJACENT PROPERTY.

*Aycock v. San Antonio Brewing Association (Tex. Civ. App.)*, 63 S. W. Rep. 953. May 22, 1901. Rehearing denied June 20, 1901.

The use of the streets for the operation thereover of a street railway for the transportation of freight, the court of civil appeals of Texas holds, is consistent with the purposes for which streets exist, and, when authorized by law, abutting property owners are not entitled to have such use restrained by injunction, or declared a nuisance. Moreover, where the owner of a street railway is an ordinary street railway company, and has no authority itself to operate a freight railroad over its line, but another corporation that actually has such power has obtained, with the sanction of the proper authorities, the right to so use this street and its line, the court holds that an injunction against such use would be improper. On the other hand, where an ordinary street railway company practically leases its line to a company which has power to operate a freight railroad over it, and is a party to the use thereof for freight traffic, receiving a rental and other benefits therefrom, the court holds that it will be liable equally with such other company for injury to adjacent property.

### CITY AS OWNER OF CROSS STREETS IS NOT AN ABUTTING PROPERTY OWNER.

*City of Council Bluffs v. Omaha & Council Bluffs Street Railway & Bridge Co. (Ia.)*, 86 N. W. Rep. 222. May 21, 1901.

Under a city ordinance which provided that "where the tracks are laid upon a street already paved, the company shall pay the property owners abutting for the paving between the rails and one foot outside thereof," the supreme court of Iowa holds that the city was not entitled to recover for paving between the tracks and one foot outside thereof at street intersections of such street. To

say that the words "property owners abutting" were intended to apply to the city, as owner of its streets, the court declares would be at variance with what is commonly understood, and foreign to what was intended. If it had been intended to impose this liability on the company, it would not have been left to construction, but would have been plainly provided for.

#### INJURY OF EMPLOYE OF TELEPHONE COMPANY WORKING ON WIRE WITHOUT PERMISSION.

Sias v. Lowell, Lawrence & Haverhill Street Railway Co. (Mass.), 60 N. E. Rep. 974. June 18, 1901.

A street railway company having granted to a telephone company the right to use its poles, the latter company agreeing to "assume all risks as to any damages which might arise from or to their employees while working on the poles," and an employee of the telephone company being injured while at work upon a wire of the railway company, without its permission, express or implied, the supreme judicial court of Massachusetts holds that the railway company was not liable to him for damages, the highest duty that the railway company owed to him while he was thus at work being that of not willfully or wantonly injuring him. Still less does it consider answerable a second street railway company which supplied the power, but which owned neither pole nor wires, the evidence tending to show that the charging of the wire that caused the injury was due to contact from the sagging of a guard wire which was above the trolley wire to such an extent as to touch the trolley wire when pushed against it by the trolley of a passing car.

#### NOT LIABLE FOR INJURY OF PERSON USING INSTRUMENT TO REACH TROLLEY WIRES.

Proctor v. San Antonio Street Railway Co. (Tex. Civ. App.), 62 S. W. Rep. 939. Apr. 10, 1901. Rehearing denied May 15, 1901.

A man whose son and son-in-law had a contract to remove a large pile of cinders from the yard of a street railway company at its power house carried their dinner to the two men and took up a hoe with an iron handle to dig down the cinders which were at that place about seven feet high, and, about the second blow, caught the hoe on the trolley wire, and received an electric shock which almost instantly killed him. The court of civil appeals of Texas holds that the company was not liable for damages. It says that if any one owed it to the man to give warning of the danger of standing on steel or a wet surface, he having stood near, if not on, the rails of the street car track, and the cinders, being hot, having been saturated with water, and with wet hands grasping an iron hoe and touching a charged trolley wire, it devolved on the contractors, whose servant he was. Nor does the court consider that any liability was imposed by a city ordinance which provided that "no switch, lamp, motor, dynamo, or any other conductor having exposed uninsulated parts shall be erected or maintained where any person unacquainted with the dangers of the same could easily come in contact with the same." It does not think that the ordinance had reference to persons coming in contact with wires by using some instrument to reach them, but was evidently guarding against accidents from bodily contact with the objects named.

#### NOT SUBJECT TO STATE BOARD OF RAILROAD COMMISSIONERS—TERM "RAILROAD" RESTRICTED.

Board of Railroad Commissioners of the State of California v. Market Street Railway Co. (Cal.), 64 Pac. Rep. 1065. May 15, 1901.

Section 22, of article 12, of the constitution of the state of California, which was framed and adopted in 1879, provides: "The state shall be divided into three districts as nearly equal in population as practicable, in each of which one railroad commissioner shall be elected. \* \* \* Said commissioners shall have the power and it shall be their duty to establish rates of charges for the transportation of passengers and freight by railroad and other transportation companies." Looking to the words used, the context, the object in view, and the evils that were intended to be remedied, the supreme court of California holds that the words, "railroad and other transportation companies" do not include a street railway company in a municipality engaged in the business of carrying passengers on street railroad cars, and hence that such a com-

pany is not subject to the supervision of the board of railroad commissioners of the state of California, under the provisions of an act of the legislature entitled "An act to organize and define the powers of the board of railroad commissioners," approved April 15, 1880. Furthermore, the court says that in the ordinary acceptance of the term "railroad company" or "railroad," it is not understood to mean a street railway engaged in the business of carrying passengers the entire distance, or any part of the distance, over which the road runs, for one and the same fare.

#### LIABILITY FOR INJURY IN COLLISION OF TRACK-LAYER RIDING HOME ON TICKET.

Peterson v. Seattle Traction Co. (Wash.), 65 Pac. Rep. 543. June 24, 1901.

On rehearing in this case, which has been heretofore reported under the above heading, the supreme court of Washington says, among other things, that it expressly holds that, if the employee's transportation constituted a portion of the consideration for his services, he became a passenger for hire, just the same as anybody else who parts with anything of value for transportation; but, if the consideration for his services was independent of his transportation, and his transportation was a mere gratuity bestowed upon him by his employer, as claimed by the company, he stood like any one else traveling on a free pass so conditioned, namely, exempting the company from any liability for injury to him, notwithstanding his employer would not probably have bestowed the transportation if the recipient had not been in its employ.

#### MONEY FORFEITED TO CITY BY ONE COMPANY CANNOT TO BE DONATED TO ANOTHER COMPLETING WORK, AND MAY BE RECOVERED AFTER ATTEMPT TO DO IT.

Adams v. Jackson Electric Railway, Light & Power Co. (Miss.), 30 So. Rep. 58. Mar. 25, 1901.

Two questions were presented here: (1) May money, the property of a city, the fruit of a forfeiture by one company of its contract to construct a street railway, etc., be donated by the board of mayor and aldermen to another company, on and after its completion of such work, under a contract between it and the city having no reference to that fund, (2) May such money be recovered from such company so receiving such donation by the state revenue agent for the use of such city? After the most careful consideration, the supreme court of Mississippi answers the first question in the negative, and the second in the affirmative. It holds that when the forfeiture occurred in this case, the money became the property of the city, although it was in the hands of its custodian, and that the donation of it to the second company was an appropriation of the money of the city to a corporation in direct and palpable violation of the state constitution, in consequence of which no title to the money passed to the second company, and being money of the city, a cause of action accrued to the state revenue agent to recover it.

#### RELATIVE RIGHTS OF CAR AND WAGON.

Moore v. Charlotte Electric Street Railway Co. (N. C.), 39 S. E. Rep. 57. June 4, 1901.

In what appears to be its first decision on the subject, the supreme court of North Carolina says it admits that the company has the superior right to the use of its own tracks, as otherwise it could not use them at all. If a wagon and a car meet, going in opposite directions, the wagon must turn out, because the car cannot. If going in the same direction, the wagon must also get off the track, because the car cannot go around the wagon, and the public convenience requires the car to travel at a greater speed than the ordinary vehicle. But this superior right is not exclusive, and will not justify the company in needlessly interfering with the convenience of the public, or excuse it from the consequences of its own negligence. Where the wagon and car meet at right angles, either can stop long enough for the other to pass without serious inconvenience; and, as the wagon must cross the track in order to proceed, it is said that under such circumstances the rights of the wagon are somewhat greater than between crossings, with a corresponding obligation resting upon the railway company to exer-

cise greater care, on account of the greater probability of meeting vehicles and pedestrians, with the increased risk of accidents. But this rule cannot be extended to interfere with the right of the public to cross the track with reasonable care at any point that their convenience may suggest.

**LIMIT TO DISTANCE AT ALL NECESSARY TO LOOK FOR CAR—WHAT MAY BE ASSUMED AS TO APPLIANCES FOR REDUCING SPEED.**

*Woodland v. North Jersey Street Railway Co. (N. J. Sup.), 49 Atl. Rep. 470. June 10, 1901.*

A trolley company, the supreme court of New Jersey holds can claim no superior right to that of the driver of any other vehicle in the use of the highway, regard being had, however, to the former's fixed line of travel. Each must have due regard to the rights of the other in its use. Then it says that the plaintiff must be considered as having acted with a knowledge of these mutual rights and liabilities. The rules that regulate the crossing of steam railroads have little application here. It was contended that the plaintiff did not look, as he should have done, before crossing. But the rule is, as to crossing a roadway, that one must use his powers of observation in respect to other passers thereon, and a reasonable judgment to avoid a collision. He is not required to extend his observation to an approaching car, however distant, but only to the distance within which vehicles proceeding at customary and reasonably safe speed would threaten his safety. In this case, the plaintiff, in a well-lighted street, at night, when about to cross the highway in his carriage, a short distance from the regular crossing, saw a trolley car approaching 250 feet away. He at once proceeded to cross with his horse on a walk, without further watching the approach of the car, which collided with his carriage, causing him personal injuries. Upon the trial of his action the court refused to nonsuit on the ground of contributory negligence, and the supreme court, affirming judgment in his favor, holds that the ruling was correct. And it says further that the plaintiff had a right to assume that the car was furnished with appliances to reduce speed and to stop, and that it would not contribute to run at a rate of speed incompatible with the safe use of the street by other vehicles. Nor was he found to refrain from crossing for fear that the motorman would not reduce the speed.

**HOW INCORPORATED RATHER THAN USE OF ELECTRIC POWER AND INCIDENTAL FUNCTIONS DETERMINE CHARACTER OF ROAD.**

*Malott v. Collinsville, Caseyville & East St. Louis Electric Railroad Co. (U. S. C. C. A.), 108 Fed. Rep. 313. Apr. 9, 1901.*

This company was incorporated under the Illinois act of March 1, 1872, providing for the incorporation of railroad companies, to construct and operate an electric railroad for the carriage of passengers, etc. The inquiry then arose, when it wanted to cross a steam railroad, as to whether it was a railroad company within the meaning of the act of May 27, 1889, relating to the crossing of one railroad by another, and as to whether its exercise of the right of eminent domain was subject to the provisions and limitations of that act. The United States circuit court of appeals, seventh circuit, holds in the affirmative on both points. It holds that the fact that its trains were to be operated by electricity instead of steam did not affect its place in the laws of the state, as a railroad company. There is nothing in the acts of 1872 and 1889, it says, that restricts railroads therein mentioned to the use of steam as a motive power, or prevents existing steam roads from changing their motive power to that of electricity. There is nothing in these acts that necessarily or fairly excludes its application to electrical roads, as they now exist; indeed, these electrical roads, in the speed of their trains, in the distances travelled, and in the capabilities for transportation, are well within the field of public utilities hitherto occupied by the steam railroads alone. And the court cannot conceive that these acts, so far, at least, as they are reasonably applicable, were not meant to cover every form of railroad that, in the march of events, answers the purposes of general transportation. Nor, it holds, does their incidental function as street railways, in the towns or cities traversed, lift them out of the railroad statutes; for it has been held that an elevated road wholly

intramural—is, in its creation and its powers, within the contemplation of the railroad statutes, and exercises its right of eminent domain by virtue of those statutes.

**A ROUTE MUST BE CONSIDERED AS A WHOLE—LEAVING OUT A BRIDGE MAKES A DIFFERENT ONE.**

*Appeal of Cherryfield & Milbridge Electric Railroad Co. (Me.), 50 Atl. Rep. 27. July 23, 1901.*

A route or location of a street railroad presented to the municipal officers for their approval, the supreme judicial court of Maine holds, cannot be considered merely with reference to particular streets, one by one. It must be viewed as a whole. The municipal officers are to act in a judicial capacity. They are vested with a judicial discretion. Application is made to that discretion. They may consider the width and other conditions of the streets, the convenience and safety of the public, and, in case where it is proposed to cross a bridge, in addition to the matters already spoken of, they may consider whether the bridge has the requisite strength to support a street railroad and moving cars. And, the court says, it may well be that, taken as a whole, a proposed location, including a bridge, would be manifestly unsuitable, while the same location without the bridge would be proper. The reasons which might properly lead the municipal officers to refuse approval of the first location might be entirely wanting in the second. Even so simple a change might put an entirely different phase upon the questions presented for the consideration of the municipal officers, and their action, or refusal to act, might thus be placed upon new and entirely different grounds. In short, the location as a whole, as presented to the municipal officers for their action, is not the same.

**CITY MAY AUTHORIZE THIRD RAIL LAID BY COMPANY WHOSE RIGHT TO USE IT IS IN LITIGATION—USING ENDS OF TIES, FILLER BLOCKS AND LONG TIE RODS.**

*State v. King (La.), 29 So. Rep. 359. Feb. 18, 1901.*

The supreme court of Louisiana holds that the city of New Orleans was acting within the scope of its administrative and police power in authorizing the laying of a third rail in connection with the rearrangement of the tracks upon, and the paving of, one of its streets, though the question of the right of the particular company actually laying such rail to make use of the same was involved in litigation. Whether it was advisable to lay the rail under such circumstances, in order to provide against the possible future breaking up of the pavement for that purpose, the court says, was a matter of legislative discretion. Street railway companies, it goes on to state, do not own the soil of the streets of New Orleans upon which their tracks are laid, and their ownership of the ties, rails, etc., constituting their tracks, is qualified by the fact that the city has the right to authorize other roads to use such tracks. In this case, an injunction having been issued to restrain the laying of a third rail, the laying of which was authorized by the city, the court holds that the injunction should have been dissolved as on bond upon the application of the city, and on bond upon the application of the company acting under such authority; and mandamus to that effect was made peremptory.

Another thing the court says is that the rights of a company on a street where space is measured by inches are not to be determined by any rule which might be applied if its tracks were laid through a wilderness, upon a right of way of the usual width. Then, it says that it was not advised that it was necessary, considering the character of the paving which was being done by the city, that cross-ties should be used, and still less that it was essential that they should project beyond the rails constituting the track. Therefore, it declares itself not in a position to hold that the laying of the third rail where it was proposed to lay it, resting upon the ties supporting the track of the objecting company, would, from any point of view, conflict with the rights granted to that company. As to the substitution of "filler blocks" for spikes and of long tie rods for short ones, it thinks it enough that the company's property was not injured, and that it was not thereby interfered with in the use of its tracks. To this the court adds that it has no reason to believe that there was or could be anything in the grant to that



company which would authorize it to so maintain its tracks as unnecessarily to obstruct the laying of others, and that, in its opinion, it would be a misapplication of a valuable principle of law to hold that the acts in question constituted a taking of private property without compensation.

#### VALIDITY OF SUBCONTRACTOR'S LIEN ON NEW POWER HOUSE.

Pittsburg Testing Laboratory, Limited, v. Milwaukee Electric Railway & Light Co. (Wis.), 86 N. W. Rep. 592. June 20, 1901.

A subcontractor's lien may be enforced against a new power house of a corporation engaged in operating a system of street railways and an electric light and power plant in a city, the supreme court of Wisconsin holds, where such lien could be enforced if the premises were owned by a private party, if the new power house is not essential to the operation and maintenance of the corporation's system of street railways and its electric light and power plant for the public purpose for which the corporation was established, as where it is engaged in carrying out and completing its contract with the city by means of its plant and appliances other than the new power house. There can be no question in Wisconsin, the court says, but that electric railway corporations, as well as other railway corporations, although constructed for the private emolument of those engaged in such enterprises, are highways, which have, nevertheless, been established under the authority of law, and primarily for the convenience and benefit of the public. Debts against such corporations must be recovered in the ordinary way, so as to allow them to progress with their undertaking, and accommodate the public. The rule to be deduced from the best-considered cases seems to be that a railway is an entirety, and that under the general language of a statute no lien attaches to a particular section or part of the road essential to its operation and maintenance for public purposes; but that, under the general language of such statutes, a lien may be enforced against such structures and property of the corporation as are not essential to the operation and maintenance of the railway for the public purposes for which it was established. In other words, courts are not authorized, in the construction of such general language, to repeal pro tanto or to that extent the charter of a corporation so created primarily for the public benefit; especially in violation of a well-established rule of construction of such general statutes so far as public rights are concerned.

#### INJURY OF PASSENGER BY ACT OF CONDUCTOR SUD- DENLY PLACED IN A POSITION OF PERIL.

Kantrowitz v. Metropolitan Street Railway Co. (N. Y. Sup.), 71 N. Y. Supp. 394. July 9, 1901.

After a car had stopped to allow several passengers to alight, and one, at least, of them had alighted, and another was about to alight, a large truck drove up behind the car, the driver shouting to some one to get out of the way, endeavoring to stop his horses, and the horses sliding over the wet pavements, so that the pole was elevated, with an apparent danger of running into the car and injuring the passengers upon it. There was no one, apparently, in the act of alighting, the passenger referred to as about to alight, and who was injured being upon the platform. Thus was created a condition under which the conductor was required to act at once, and, having acted in a way that seemed to him to be for the protection of the passengers, the first appellate division of the supreme court of New York holds that, even if he was guilty of an error of judgment, in starting the car, which was extremely doubtful, the company was not liable. Then, too, the court holds that, as the jury might well have found from the plaintiff's evidence that she was thrown by the conductor striking her and pushing her against the car, and not by the starting of the car, the jury should have been instructed that, if this accident to the plaintiff was caused by the act of the conductor, who was obeying a natural impulse in seeking to escape an actual peril for which he was in no wise responsible, and a person of ordinary prudence might have acted in the same way under the same circumstances, the defendant company was not guilty of negligence, and the plaintiff could not

recover. In short, the court says that it fails to see that the jury were justified in treating this act of the conductor, whether to avoid an injury to himself or to protect the passengers of the car, or whether the accident was caused by the conductor striking the plaintiff in his attempt to start the car to avoid a collision with the truck, or by the actual starting of the car as negligence for which the company was responsible.

#### CARE REQUIRED OF MOTORMAN—OF PERSONS ON STREET AT CROSSING—THEIR DUTY TO SEE CAR— EVIDENCE—REGULATIONS IN OLD FRANCHISE— ORDINANCE REQUIRING CONTINUOUS RINGING OF BELL UNREASONABLE.

Stafford v. Chippewa Valley Electric Railroad Co. (Wis.), 85 N. W. Rep. 1036. Apr. 30, 1901.

It is not actionable negligence for the motorman in charge of a street car, when the car is in operation upon a street and approaching a street crossing, the supreme court of Wisconsin holds, to fail to exercise the highest degree of care or such care as a vigilant or prudent person would exercise under the same or similar circumstances. It is sufficient if he exercises the care of a person ordinance requiring the continuous ringing of a bell upon a street car while such car is in motion upon a street is unreasonable and of average prudence in the same or similar circumstances. Moreover, the court says that an instruction that a person in the circumstances above indicated must exercise due care or proper care, unexplained, fails to instruct and may mislead. Coupled with instructions to the effect that the term refers to the highest degree of care, or any degree of care other than that of a person of average prudence under like or similar circumstances, it is error. Again, the court says that the motorman in charge of a street car approaching a street crossing must use ordinary care for the safety of travelers liable to get into the pathway of the car, but he has the right to expect that such travelers will use ordinary care to inform themselves of the approach of the car and not to retard its passage.

As a rule, the court further says, the mere operation of a street car so as to render it dangerous for a person to cross the street in front of it is not negligence.

The mere acquirement by purchase of a street car franchise containing regulations as to the manner of operating cars, as a condition of a new and independent grant which does not refer to or in any way make the provision of the old grant a part of the new one, such condition being clearly imposed to prevent a conflict of rights, does not add to or restrict the provisions of such new grant.

A city ordinance is not valid unless reasonable, and whether it satisfies that requirement or not is a judicial question. A city to that extent void for any purpose, unless made a condition of the grant. If a requirement of the character above indicated is valid for any purpose because made a condition of the grant itself, the violation thereof does not constitute actionable negligence or evidence of such negligence, because, as regards the safety of travelers on the street, it is unreasonable.

A traveler upon a street at a street crossing, desiring to cross the street car track there situate, has not the same right to require the speed of a car to be slackened to enable him to pass over the track as the person in charge of the car has to require him to give way to allow the car to pass. It being the duty of the traveler upon the street, in approaching a point where he desires to cross a street car track, to look and listen for a coming car and to perform that duty when and where he will have reasonable opportunity to render his efforts in that regard effective, it is as much his duty as a matter of law to see an approaching car which is in sight and in dangerous proximity to the crossing, and not to negligently place himself in the way of it, as it is to look for the car; and evidence that he performed the duty of looking but did not see the coming car does not raise a question of fact for the jury to determine. Testimony of a person or any number of persons that he or they when approaching a street car track with a view of crossing it, looked along the track for a coming car and did not see one, though a car was in plain sight and so near the point of observation as to render an attempt to cross the track in front of it dangerous, is inconsistent with reasonable probabilities and a jury should not be required or allowed to consider the subject as involving a disputable question of fact.

# IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

## MCKENZIE TRAVELING GRATE STOKER.

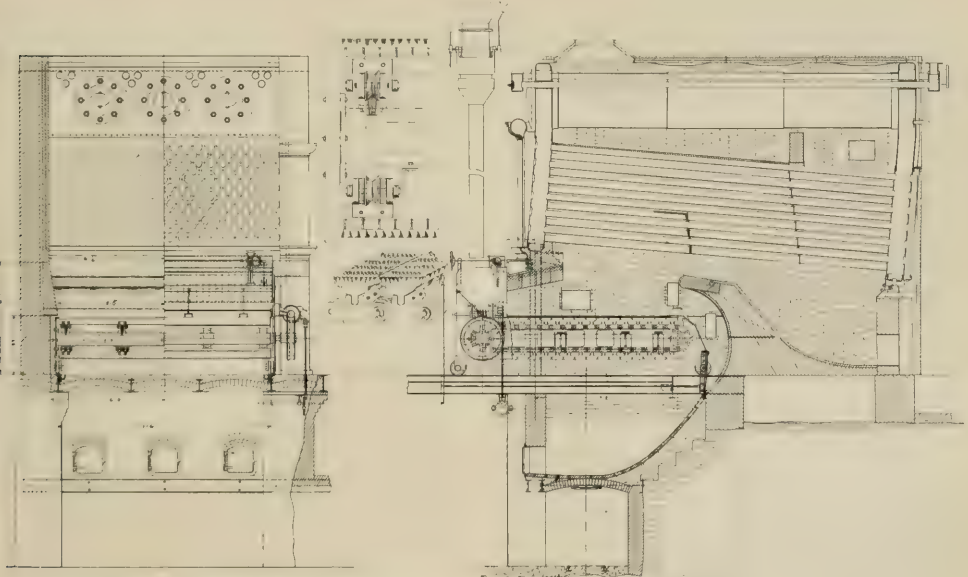
The accompanying illustration shows the furnaces equipped with McKenzie traveling grate stokers now in course of construction for the Aurora, Elgin & Chicago Ry., at its power plant at Batavia, Ill., and by reference to this drawing the following description of the apparatus will be better understood.

The grates, which are moved by a worm driven by an eccentric for which the power is derived from a small engine, are mounted on a series of heavy chains which revolve upon sprocket wheels at the front and rear. By this movement the upper portion of the grates are carried constantly forward. Each link of the chain is provided

the small amount of iron from being overheated. There is no part of the coal bed lying on the grates larger than  $\frac{3}{4}$  in. that is not receiving the proper amount of oxygen; this permits rapid combustion, and the uniform distribution of the air results in minimum of unconsumed carbon. The separate grates are supported at four equidistant points on sprocket wheels.

Fresh fuel is coked at the front end where there is a fire brick arch.

The apparatus as a whole is mounted on wheels running on rails placed at the sides of the ash pit, and can be drawn out clear of the boiler (even while the fire is on), for inspection and repairs or to make room when necessary to replace furnace linings. In case of



ELEVATION AND SECTION OF MCKENZIE TRAVELING GRATE STOKER.

with a cold rolled steel pin and three rollers, so that the chains roll on tracks on the bottom as well as the top, thereby relieving the machine of all the extra friction and strain in carrying its own weight. The coal is ignited near the front and is carried slowly backward, the speed of the grate being so adjusted that the time of travel is sufficient for the complete combustion of the coal. The coal is fed through a hopper of the full width of the grate, and the depth of the layer of coal fed is regulated by a door in the hopper which can be easily and quickly lifted or lowered; it fires itself automatically by the dropping of the coal through this grate in the hopper onto the grate bars at the front end. After the coal has been consumed, the ashes, clinkers and refuse are carried over the clinker apron at the back end and fall to the ash receiver without admitting any air to the boiler from the rear.

Each section of this grate is built in the form of a truss the thickness of which is  $\frac{3}{4}$  in., and they are about  $2\frac{1}{2}$  in. apart. One reason for the long life of this grate is that the air supplied prevents

repairs on the grates, it is said to be not necessary ordinarily to stop the machine, the motion being so slow that one or more sections can be taken out and replaced while in motion.

With cheap coal there are often clinkers of considerable size which with hand fired grates cause much trouble, and which this grate is designed to dispose of automatically. The clinker apron is kept cool by means of a stream of cold circulating water. The closeness of this apron to the grates effectually disposes of clinkers or foreign material when the rear end of the furnace is reached. The nearness of the apron to the grate bars, and the receptacle for ashes being practically air tight, prevent back draft, and causes the air to come through and from under the grate upon which the coal is burning. This feature is urged as being of the greatest importance in producing the proper draft at all times.

The ash receiver is closed by a heavy bar except when occasionally dumped by means of the dumping lever at the front end of the furnace. This door is accurately adjusted and notwithstanding the



weight (from 500 to 1,000 lb.) it can be dumped with little exertion; in practice the ash receiver is dumped about once every four or five hours.

The weight of a McKenzie stoker for the average 500-h. p. boiler is given as about 27,000 lb., and the power to drive it at  $\frac{1}{4}$  h. p.

The benefits claimed for the automatic stoking of furnaces with the McKenzie stoker are, briefly, higher furnace efficiency with the saving in coal bills from 15 to 25 per cent; complete combustion of the carbon, and consequent absence of smoke; the proper ratio of air to fuel is maintained; a material decrease in the temperature of the boiler-room is secured; a more uniform steam pressure can be maintained and the cost of maintenance is reduced to a minimum.

The following data are taken from the report of a test made by Messrs. Sargent & Lundy, of Chicago, at the power station of the

in this article to describe a few of the signalling arrangements which have been adopted in various large stations.

It will be well to consider, first, those signals which draw attention to occurrences; and secondly, those which convey instructions. It is, however, necessary to remember that there is no distinct division between the classes.

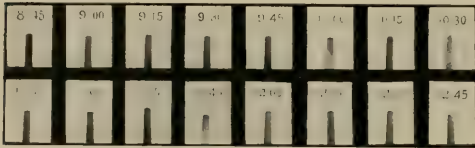
It is frequently the case in large stations that while care has been taken in the design to have engines and boilers conveniently placed for observation and working, other parts of the plant, no less important, are crowded away into odd corners in order to economize space. This particularly applies to water tanks, such as hot wells, reserve feed water supply, or circulating water reservoirs in connection with cooling towers. The failure of supply from these tanks would mean disaster. Everyone knows the result of shortness of water in a boiler, and no station engineer will view the failure of condensing water on heavy load with anything but dismay. It is clear, then, that in addition to the ordinary water-level indicator a prominent signal should be given in the boiler house whenever the water is dangerously low in these tanks. A very effective device in use for this purpose is an electric contact in circuit with a battery and loud-ringing bell, the contact being actuated by a float on the surface of the water, and set so as to make connection when the float has sunk to a certain level.

In many modern generating stations quick-steaming boilers are in use. In these, the water-level is likely to rise and fall very rapidly, and unless careful attention be paid, the boiler may be ruined through shortness of water, or the steam pipes and engines may be wrecked through water coming over into them. It is therefore standard practice among boiler makers to include among their fittings a high and low water alarm whistle. The whistle is blown by steam from the boiler, this steam being admitted, both for high and low water, by the action of a float or floats in the interior of the drum. The fireman is thus warned to look more closely at the water gages, a warning very necessary in a boiler house containing, perhaps, 20 or 30 gages, probably well above eye level and insufficiently illuminated.

These two general methods—the electric bell signal or the steam whistle—are used in various special cases in connection with steam-raising plant, which cannot be entered into in detail here. A warning is, however, necessary against increasing the number of such signals indefinitely, either in boiler or engine houses. The drivers and stokers are paid to look after the plant, and too many precautions may give a false feeling of security. Also, in time of emergency confusion may arise in the minds of the men owing to a multiplicity of automatic signals being given at the same time.

Trouble has occasionally ensued because steam and water valves have been thought to be open when they were closed, or vice versa. For this reason some station engineers have taken the precaution to so arrange all important valves that they show conspicuously whether they are open or shut. Some valves have external threads which can be seen in one position and not in the other; others have guide-blocks which move with the valve. Whatever the indicator may be, it should be painted or otherwise made as conspicuous as possible. Where there is no external signal it is an easy matter to arrange one, geared or linked to the handle or valve stem. It does not appear to be a satisfactory plan to provide tablets to be attached by hand to the valve with "open" or "shut" upon them, owing to the probable negligence of the men.

It is, however, in the running machinery and electrical equipment more than in the steam-raising portion of the plant that the need for signals arises. Except in extreme cases, there is always a minute or two to put matters right in the boiler house. In dealing with the running machinery the time available to avert a catastrophe is often to be reckoned in seconds. As an example of the necessity of signaling arrangements in this work, the general practice may be mentioned of providing a synchronising lamp in full view of the drivers in alternating-current stations, so that they may run up their engines to exact speed without loss of time. A variation of this practice is adopted in some stations where alternating current arc lamps are used. Conspicuous marks are painted on the rotor of the alternator. When the machine is slightly under speed, these marks appear to revolve backwards. They appear to go forward when the speed is too high, and at exact synchronism they seem to stand still. In some single-phase



VIEWS OF STACK AT TOLEDO DURING CAPACITY TEST.

Toledo Railways & Light Co., on a Heine boiler equipped with a McKenzie traveling grate stoker. This test was made for the purpose of determining the maximum capacity of the boiler and furnace, and the accompanying fuel economy. The test lasted for about 15 hours. Bituminous coal known as Cambridge mixed pea and slack was used.

The actual duration of the test was 15 hours and 25 minutes, and during this entire period the average capacity developed was 790.5 h. p. or 1 h. p. for 5.37 sq. ft. of water heating surface. The average equivalent evaporation at this capacity was 10.33 lb. of water from and at 212 degrees per lb. of dry coal.

Calorimeter test of the coal made by the Dearborn Drug & Chemical Co., showed the heating value to be 12,690 B. t. u. per lb. of dry coal as fired, and 14,003 B. t. u. per pound of combustible which gives an average efficiency during the entire 15 hours of the test, for the boiler and furnace together of 78.55 per cent. One of the illustrations shows a series of photographs of the stack taken every 15 minutes during this test and the almost entire absence of smoke will be noticed.

## METHODS OF COMMUNICATION IN ELECTRIC GENERATING STATIONS.

A very large proportion of the accidents which occur in electric generating stations is due either to attention not having been drawn in time to certain occurrences, or to insufficient means of communication between charge engineers and their men. That this is so does not necessarily reflect discredit on those responsible for the design or management of these stations, as the supply of electricity is so decidedly a "hand-to-mouth" concern, that means of observation and communication must be very efficient in order to ensure success. The Electrical Review, of London, gives the following description of the various methods of signalling and communication in vogue in such stations. For the purposes of this article a signal may be defined as a device or motion that gives notice or conveys information in a prominent manner.

In a small station the plant is usually grouped closely together, well under the observation of the engineer in charge of it. The men are also few in number, are close at hand, and are generally well in touch with their chief and their work. In these stations the need for signals is small, as the necessary information can be gained from direct observation of the machinery and measuring instruments, and conveyed by word of mouth. As a station grows in size, however, it becomes more and more necessary that information should be conveyed to a common center, from which center instructions should be sent out again. This is imperative if any one man has to assume responsibility for the running of the plant. In this way automatic and manipulated signals become of increasing necessity as the station grows larger. It is intended



high tension stations it is customary for the switchboard attendant to synchronise by means of a signal lamp instead of a voltmeter. Messrs. Siemens & Halske have devised an extension of this lamp signal (using three lamps) for three-phase work, by which one is enabled not only to tell when two machines are in phase, but also, if this is not so, whether the incoming machine is revolving faster or slower than the synchronising speed.

Another application of the incandescent lamp as a signal is found in the "earth" detector common in low tension two-wire stations. Two lamps are connected in series across the bus bars (which are normally insulated from earth) and a connection to earth is made from the wire joining the two lamps. Hence, if both halves of the system be perfect, a current will flow through the signal lamps in series, causing them to burn with an equally dull red glow. If, however, there is an earth on either side, the lamps will be subjected to unequal pressures, and one will burn more brightly than the other. The "earth" is of course on the branch opposite to the brightly-burning lamp. This device has also been applied to the field circuit of high tension stations, when the machines are excited from a common source.

In high tension alternating current stations the following modification of the incandescent lamp signal has been adopted with some success. A Geissler tube is connected between the high tension cable and earth. So long as the pressure is maintained the tube shows a bluish light. Should the insulation break down, the light is extinguished. This is particularly useful in three-phase work, as one is enabled to tell at a glance which of the three branches is at fault. The tube also incidentally solves a difficulty occasionally met with in practice—the fact that fuses sometimes fail very quietly, and therefore no attention is paid to the interruption of supply until complaints begin to arrive. In order to make the Geissler tube of value in this way, its point of connection should be on the cable side of the fuse—not between the fuse and the bus bar.

On a switchboard with a large number of distributing panels it is an easier matter than would at first sight appear to overlook the failure of a fuse. For this reason it is desirable, other things being equal, to adopt a fuse that makes a noise when it goes. Fuses which depend on the expansion of heated air within a fuse pot (either wholly or partially) to blow out the arc invariably make a bang when the fuse melts, the noise forming a signal to the attendant which cannot be disregarded.

In direct current work automatic circuit breakers are to a large extent replacing fuses, more especially in combined lighting and traction stations. These have a trick of coming out quietly, and an additional signalling device is useful where more than five or six cut-outs have to be watched. A very good method which has been adopted is to so arrange an auxiliary switch on the base of each circuit breaker that the thrust of the cut-out handle, when the contract is broken, closes the circuit of a bell and indicator system. The circuit breakers should be boldly numbered in conformity with the numbers of the indicator drops, and a reference tale of circuit breakers and numbers kept beside the indicator board.

In low tension systems a ready means of signalling the failure of a fuse, where this is inconveniently placed for inspection, is to place an ordinary glow lamp in shunt with the fuse. At the failure of the fuse the potential of the cable in all probability drops considerably, while that of the bus bar remains the same. A current therefore flows through the lamp, due to the difference of pressure between its terminals, and the glow attracts the attention of the man in charge.

In high tension stations, whether continuous or alternating current, there should be a permanent danger signal on all wires at high potential. This is usually effected by means of painting such wires a distinctive color. This is not entirely satisfactory, as one is never sure whether the cable is really alive or not until one has traced the connections. The suggestion may perhaps be permitted that there is without doubt a fortune awaiting the man who invents a paint or other covering for a cable, which can indicate by change of color or otherwise when the potential of the cable which it covers exceeds the limits of safety to life. Unfortunately, there appears at present to be no clue upon which to work in this direction.

Turning now to the important class of signals designed to convey instructions, it will be found that the chief points inside a station between which rapid communication is necessary are the

switchboard and engine room. This is particularly the case in alternating current stations, where the operation of synchronising has frequently to be performed in the utmost hurry; but it is also true for direct current stations. It will be found that nearly every station has its code of signals between switchboard attendants and drivers, often consisting in its simplest form of pointing with the finger at an engine and an upward or downward motion of the hand, varying in vigor in accordance with the amount of alteration required. This is enough for a small station, but quite inadequate in a large one. Perhaps the most legitimate outcome of this system can be seen at a station in the metropolis, where, after a preliminary whistle to attract attention, the deal-and-dumb alphabet, with various supplementary signs, is used! Apropos of this, it is well to remark that whistling or shouting in an engine room, except according to a pre-arranged plan, should be strictly put down.

In order to indicate which engine is to be run up, the signal in a large provincial station is a light board mounted on a handle with a figure painted prominently on it, this figure corresponding with the number of the engine. A gong is sounded to attract the attention of the drivers, the board is held up, and a motion of the other hand completes the message. Another useful method is to have a colored lamp fixed to each engine, which can be lit by a numbered switch on the board when anything has to be done on that engine. A signal bell completes the equipment.

A rather more elaborate system is suitable for use in a station where the switchroom is partitioned off from the engine room. A large dial is fixed on the wall of the engine room, on which the numbers of the engines are painted in the manner of the hours on a clock face. A pointer moves round this dial, being actuated through bevel gear and iron rods by a handle in the switchroom. This handle moves round a similar horizontal dial, marked in the same way as the engine room dial, and the handle and pointer are so fixed that the same number is indicated on both dials. A similar pair of dials with "Slow," "Fast," "Right," "Stop," on them, and an electric gong to attract attention, completes the arrangement.

In stations where machines are run in parallel, it is very often the custom to run on the stop valve, the load being shifted on or off the engine by the driver opening or shutting the valve. At times of variation of load (such as on the "peak") a driver will have to be in constant attendance at the engine to open or shut the valve as required. In order to get perfect smoothness in the running, a very good system has been adopted of placing two bell pushes on a bench immediately below the main voltmeter, one actuating a high-toned, the other a low-toned bell. A stroke on the high-toned bell means that the driver is to give more steam to the engine which he is regulating. The other bell signals the reverse. Thus a man watching the voltmeter is able at once to give the necessary direction to the driver. The signal gong system has in some places been extended into an elementary code, one ring, for instance, meaning "attention," two rings "lower speed," etc.

It is very often necessary to give more complicated instructions than can be transmitted by the above methods. It is necessary, therefore, in large stations to have a more complete system of communication, such as is afforded by a telephone system. A station should be fitted with a private telephone exchange on the switchboard, the points to which communications are most frequently sent being connected with this center. These points will generally be found to be the chief engineer's office, the mains superintendent's office, the boiler house, and the stores. It is a matter of some difficulty, however, to get a telephone to work well in a boiler house, owing to the amount of coal dust, moisture and ash flying about, and the liability to rough treatment from the works hands. The telephone should be fixed in a quiet place, and a loud-ringing bell used as a signal.

The mains department should also be fitted with a private telephone exchange communicating with the switchboard, the chief's office and each sub-station. The station should, in addition, be on the general telephone exchange of the town, and loud-ringing signal bells should be placed in the mains engineer's office and on the switchboard, in addition to the usual call-bell in the clerks' office.

It will in general be found a paying investment to equip a station with complete facilities for signaling and communication, provided that no unnecessary fads are indulged in.

## POTTER MESH SEPARATOR AND SUPER-HEATER.

From a paper by Frederick A. Scheffler, read before the American Society of Mechanical Engineers.

It is a well-known fact that under certain operating conditions even the best designed boiler is likely to "throw water," or prime or foam badly. This may be due to various causes, which we have not the time to discuss now, and frequently is not due to improper construction of the boiler.

The "Potter" mesh separator is designed to prevent this trouble from occurring within the boiler itself, and while boilers equipped with the apparatus may prime for various reasons, the separator

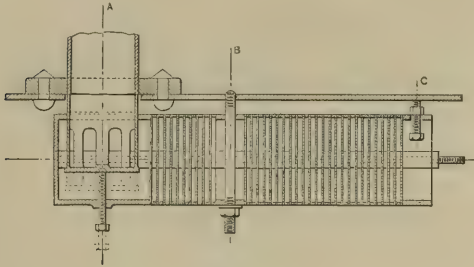


FIG. 1.

makes it impossible for the boiler to "throw water." The device is placed in the steam space of the boiler, and is connected in a manner similar to a dry pipe, or it can be connected to the end of the dry pipe, and the holes in the latter stopped up.

The construction of the separator is shown in longitudinal sectional elevation (Figs. 1 and 2), and consists of a series of galvanized or copper wire meshes or screens placed alternately between rings of cast iron, there being generally from 25 to 30 layers of mesh. The area of the screens depends on the size of the boiler outlet.

Tests show that the introduction of the separator in boilers from which steam is delivered at any particular range of moisture results

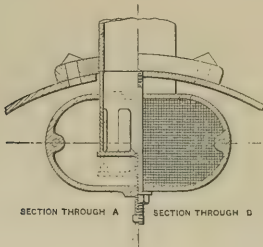


FIG. 2.

in a change of quality of from 25 to 75 per cent (making it drier) and at the same time prevents any priming.

The theory on which the action of this separator is based is, as may already have been surmised, that the small globules of moisture contained in the steam are broken up by the first piece of mesh, and this action is continued through each successive layer of mesh until it is so completely atomized upon reaching the outlet chamber, or header, that it flashes into dry steam upon the addition of a small amount of heat, which is obtained by the wire-drawing due to the steam and water passing through the screens. The reduction of the pressure is about 1 per cent, and the temperature is increased proportionately.

The separator is designed so that it can be placed in any type of boiler which has a manhole of the usual size (11x15 in.) and is held in place by one or more studs screwed into the shell of the boiler.

## OILING LARGE CYLINDERS.

In operating large street railway generator units, which are in this country most generally driven by compound engines, there is seldom any difficulty experienced in securing proper lubrication of the high pressure cylinder by the usual method of introducing oil into the steam before it enters the cylinder whether the engine is of the horizontal or vertical type. With the low pressure cylinder of horizontal engines, however, there is usually trouble, because a sufficient quantity of oil is not carried over by the steam, or if it is it does not reach the rubbing surfaces.

A few years ago Mr. Thomas Farmer, mechanical engineer of the Detroit United Ry., devised a simple arrangement which has since been applied in a number of power plants and in every case has been entirely successful in providing proper lubrication of the low pressure cylinders. The engine was a 28 and 52x48-in. tandem compound, the low pressure piston of which had a 9-in. face and weighed 3,200 lb. Although from 10 to 12 gallons of oil were used per day the piston wear was excessive and caused much trouble. The plan adopted by Mr. Farmer was to tap into each side of the cylinder midway of its length at the level of the center line and introduce the oil through sight feed lubricators of the usual type. Since adopting this plan the oil supplied is only 3 quarts per day and all difficulties due to excessive wear have disappeared.

## THE AMERICAN EXHIBITION AT LONDON CRYSTAL PALACE.

An exhibition is planned for 1902 to be held in the Crystal Palace, London, which will consist exclusively of American products, arts, industries and inventions, and which it is expected will be the largest and most important exhibition of its kind ever seen in the United Kingdom. The increase of American exports for the past 20 years has been phenomenal and with its large population, natural resources and great industrial wealth, this country offers a wide scope for a great national exhibit.

The advantages of the Crystal Palace for the accommodation of large exhibitions are well known. The buildings cover 16 acres, all well lighted, heated and ventilated, and they are surrounded by ornamental grounds containing over 200 acres. As the year 1902 will be marked by the coronation of King Edward VII, in the month of June, there will be drawn to London an unusual number of visitors and it is therefore a most auspicious time for the carrying out of such an exhibit.

In connection with the exhibition a commercial bureau will be established where necessary information can be obtained as to the channels of trade and the placing of goods upon the European markets. The bureau will be under the direction of the committee of representative American and British firms.

Special rates have been secured for transportation covering all through charges to the exhibition hall and if desired reduced return rates will also be granted. Plans and particulars of space may be obtained from Messrs. Alfred H. Post & Co., Produce Exchange, New York City.

## MEETING OF EVERETT-MOORE MANAGERS.

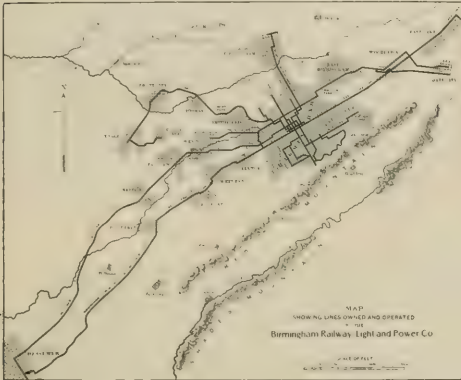
The November meeting of the general managers of the Everett-Moore properties was held at Detroit on November 20th and 21st. Those in attendance were: J. L. Hutchins, general manager, and A. H. Stanley, general superintendent, Detroit United Ry.; C. W. Wason, president, Cleveland, Painesville & Eastern R. R.; R. L. Andrews, general manager, Cleveland & Eastern R. R.; Ira A. McCormack, general manager, Cleveland Electric Ry.; L. E. Beilstein, manager, Toledo Railway & Light Co.; James Anderson, manager, Sandwich, Windsor & Amherstburg Ry.; C. E. A. Carr, manager, London Street Ry.; Charles Currie, general manager, Northern Ohio Traction Co.; A. F. Edwards, general manager, Detroit & Toledo Shore Line R. R.; F. W. Brooks, manager, Rapid Ry.

The Jackson (Mich.) & Albion Electric Railway Co., which was recently organized by the Boland interests to build a line between these cities, has applied for the approval of the railroad commission of two overhead crossings of the Michigan Central and Lake Shore & Michigan Southern railroads near Albion.

## BIRMINGHAM (ALA.) NOTES.

On November 1st the Birmingham Railway Light & Power Co moved into its new quarters, mention of which was made in the "Review" for October. Everything is very conveniently arranged and no pretensions to elegance are aimed at except in the president's office and directors' room. This room has a flooring of hardwood, which has been waxed and varnished and numerous rugs are laid here and there, giving it a very cozy appearance. The furniture is all antique oak and the whole effect is very pleasing to the eye.

Some time since mention was made of an electric freight car which was to be put in commission on the Ensley and Pratt City division. This car is 48 ft. long, 16 ft. high and 8½ ft. wide and is equipped with a Christenson air brake and whistle and the General



Electric Co.'s four motor equipment. It bears in silver letters on the side the word "Alfred" in honor of Col. Alfred M. Shook, the former president of the company through whose instrumentality, principally, this car was built. The trial trip was made on the morning of Oct. 17th with Col. Shook, Messrs. J. B. McClary, manager of the railway department, G. H. Harris, superintendent of equipment and N. Morrison, train master Ensley division, on board. The trip was highly satisfactory and the "Alfred" proved itself well worthy of its name. It makes three trips daily between Ensley and Birmingham and pulls six and eight cars.

It was found to be detrimental to passenger cars to use them for hauling material for construction work, so a flat car was equipped with motors of the G. E. 1000 type, a ridge pole put on it and it was turned out of the company's shops a full fledged construction car.

Several months ago a petition was filed with the city council requesting a franchise for 78 blocks in a growing residential part of town and after being referred to committees and frequently discussed it was finally decided to allow the franchise for a period of 30 years. The company insisted that a franchise for so short a time as that would be of no service to it and unless it received a franchise in perpetuity it would be forced to withdraw the request. This was refused and the company promptly withdrew its petition. The property owners along the route of the proposed line then took the matter up and circulated a petition, to which they got a large number of signatures, which was presented to the mayor and aldermen requesting them to allow the franchise as requested by the railway company, if not unlimited, then for 99 years. It now stands this way before the board and a meeting has been called for an early date to consider this petition. As the territory through which the company asks for the franchise is only thinly settled a franchise of only 30 years would almost be valueless to it.

This company has lately adopted a rigid examination for all applicants for positions of motormen and conductors. A new form of blank which the applicant fills out covers about all the information desired concerning him and after this is examined and all references have been heard from he is given an order to learn the road under the instruction of some experienced motorman. The first

three days, however, are spent in the shops where the mechanism of the motors and other machinery is fully explained to him. Then after he has practiced for a period of twelve to fifteen days he is subjected to a rigid examination concerning the rules and regulations, the different parts of the car, the city ordinances pertaining to the street railway, the map of the city of Birmingham, the locations of the various public buildings, and, if the applicant has been training for conductor, an examination in arithmetic and spelling. All this is under the direction of the chief dispatcher, and if the applicant passes satisfactorily his application is approved and sent to the manager who puts a few important questions to the applicant and sends him to the company surgeon who gives him about the same examination that he would be subjected to if he desired to join the army. If the applicant successfully passes all these he is well fitted to take charge of a car and is issued a badge and assigned a run. The object of all this, it can be plainly seen, is to get only able bodied intelligent men for the handling of the cars.

The requirements as set forth in the medical examiners certificate are as follows: Age, 21 years to 40 years; standard height 5 ft. 8 in.; minimum height accepted 5 ft. 4½ in.; ability to see with each eye half-inch letters at a distance of 10 ft.; ability to hear a standard watch tick at arm's length with each ear; good condition of heart, lungs, liver, kidneys, etc. Applicants will not be accepted who have a rupture or any deformity. They must also show a satisfactory vaccination scar. Besides the medical examination the application blank for employment contains 34 questions concerning the name, address, nationality, etc., of the applicant and contains a form to be filled in showing how he has been occupied during the past ten years, whether employed or not. If after employing the applicant it is discovered by the company that any statement made by him on this application blank is false, it is considered sufficient cause for his immediate discharge.

A rule has just been put in effect debarring passengers from the front platform, it being found that when a passenger rides on the front end with the motorman there is a great temptation on the part of the motorman to engage him in conversation, and under this rule not even an officer of the company nor a dispatcher is allowed on the front end and the motorman has absolutely nothing to distract his attention from his duties.

On November 1st the trainmen of the company were the recipients of quite a pleasant surprise. All motormen and conductors who have been in the service of the company for a year and up-



FREIGHT CAR ON BIRMINGHAM RAILWAY.

wards will receive 17½ cents per hour. The old rate was based on a sliding scale running from 13 cents to 17½ cents per hour, and the increase will affect very perceptibly the younger men's wages. The men have already manifested their appreciation by their more careful adherence to rules and their vigilance and alertness in reducing the number of accidents very much. The management has also received letters of thanks from the different divisions.

Mr. George H. Harris, who was lately appointed superintendent of equipment, has also been made superintendent of traffic. This position is equivalent to that of assistant manager, as in the absence of the manager Mr. Harris assumes control. Mr. Harris is a thoroughly practical street railway man, has had considerable experience and is to be congratulated on his success.

A car has been put on the Wylam extension which is about com-



pleted and it will only be a short time before Wylam will have street car connection with Birmingham.

All the cars on the system have been equipped with bronze advertising racks,  $3\frac{1}{2} \times 3$  in. These are for the reception of schedules and the company weekly, are very neat in appearance and afford a most convenient method for distributing the schedules and weeklies.

### UNIFORMS PRESENTED TO MOTORMEN.

The Louisville Railway Co., of Louisville, Ky., on November 1st presented all of its employees who have been in the service of the company for five years or more, with new winter uniforms. Under the direction of Mr. Minary, general manager of the company, Mr. McClure, the secretary, sent each man who had been working for the company for the period named an order for a winter uniform. The note transmitting the order stated that the company appreciated the good work of its old employees and took this method of recognizing their good services. The men receiving these orders were highly pleased as it means a saving to them of about \$25 each. The company will give the same recognition to its old employees each year.

### NEW ST. LOUIS CARS.

The accompanying illustration shows one of an order of 10 cars which has been built for the Michigan Traction Co. by the St.



NEW CAR FOR MICHIGAN TRACTION CO

Louis Car Co., of St. Louis, Mo. The cars are 60 ft. long over all and they are handsomely finished, especially as to their interior decorations. Each car contains a lavatory and a smoking compartment. The main part of the car is reached by means of side entrances as shown. Peter Smith hot water heaters are used under the seats, the latter being of the St. Louis Car Co.'s type. The interior of the car is finished in mahogany, the front end of the car being used as an observation compartment; this contains four round revolving seats. The equipment of the car includes automatic air brakes, St. Louis arc head lights and St. Louis 23 B trucks.

### NEW INTERURBAN STATION FOR CINCINNATI ROAD.

General manager Wagenhals, of the Hamilton, Glendale & Cincinnati Traction Co. and the Millcreek Valley Electric Co., has leased a piece of property at the junction of these roads, on which is to be built a depot and waiting room. The present building on this site will be altered and enlarged for the use of the employees, such as inspectors and dispatchers. There will be a number of dispatchers at this point and the movement of all cars on both roads will be reported at this place. The company is also going to place a telephone system along the entire route on which there will be eight connecting points to the mile. In case of an accident or trouble happening to any of the cars, the motorman will be able to communicate at once to the dispatcher who will send relief. Every motorman will carry a portable telephone on his car which can be connected at these points along the road by means of which the position of each car can be located.

### SIGNALS FOR SUBURBAN RAILWAYS.

The Electro-Mechanical Switch Co., of Baltimore, Md., has placed a new device on the market which is designed for a signal to be used by intending passengers for stopping suburban cars. The apparatus consists of a cluster of five lamps, a switch, and a resetting device on the trolley wire. The device is arranged so that the passenger intending to board the car can, by the operation of the switch handle, turn on a cluster of five incandescent lamps which can be seen at a considerable distance by the motorman of an approaching car and which is understood as a signal to stop the car at that point. The lights when turned on by the passenger cannot be cut off except through the automatic action of the overhead device when the car passes that point. The switch for operating these lights consists of a magnet, armature and a handle for raising the armature up to touch the magnet core. The device for resetting the switch and putting out the lights consists of two U-shaped pieces of brass which are insulated from each other. This clamp is used in place of the car to support the trolley wire. By raising the armature up to touch the core of the magnet the circuit through the lamps is completed. When the car passes the resetting switch the wiring is so arranged that the current of the electromagnet is short circuited and the armature then falls, thus putting out the lights. It is claimed that on account of the cheapness of this device, it is practicable to have a signal at every stopping place for the convenience of passengers, and it is of considerable help to the motormen as they can see far ahead what stops they have to make.

### ELECTRIC HEATING.

The heating department of the Simplex Electric Co., of Cambridgeport, Mass., has issued a catalog on electrical heating which chiefly includes household devices for heating and cooking. The book is highly illustrated and contains descriptions of almost every heating and cooking device that could be desired.

The operations of cooking by electricity are free from all odors, flame or smoke and this method also realizes the acme of cleanliness. No change in the temperature of the room can be observed from the use of electrical kitchen utensils. The most complete electrical kitchen in the world was furnished by this company for the Natural Food Co. at its conservatory at Niagara Falls, which is open to the public at all times. The large restaurant of the General Electric Co., at Schenectady, has also been equipped with this company's cooking apparatus by which a complete five-course dinner has been cooked for over 250 people and served in the new shops of the company. Numerous apartment house electric kitchens have also been installed in many places, and in thousands of families, many light meals are cooked electrically by the aid of small electrical stoves or chafing dishes.

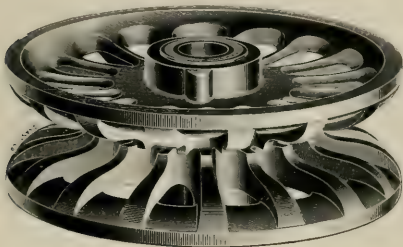
A perusal of this catalog will prove very instructive in pointing out the extent to which electricity can be applied to ordinary household articles.

The Columbus, Newark, Zanesville & Wheeling Traction Co. has perfected its organization with the following officers: J. M. Ickes, of Newark, president; John S. Black, of Cambridge, vice president; W. O. Littick, of Zanesville, treasurer, and L. C. Taylor, of Cambridge, secretary.

### TROLLEY SLEET WHEELS.

The approach of the winter season makes imperative the consideration of ways and means for guarding against the possible blockades caused by weather conditions. Almost as he dreads a heavy, packing snowfall, the street railway manager fears what is termed in our Northern climate, a "sleet" storm, in which the rain, freezing as it falls, not only coats the rails with ice, but what is more troublesome, covers the trolley wire with an effective insulation in the form of a thick coating of ice and sleet, upon which the ordinary trolley wheel makes but little impression.

The Stuart-Howland Co., of Boston, is introducing a new sleet wheel, which is said to do away with all possibility of delay from this cause. As will be seen from the engraving, the wheel is made



TROLLEY SLEET WHEEL.

with staggered or interlocking spokes, having sharp cutting edges, designed to clear the wire of all ice or snow, without cutting the wire itself. It is believed this staggered arrangement of the spokes renders the wheel less liable to become clogged, as the ice, when freed from the wire, will not lodge on the wheel, but drops through the ample spaces between the spokes. In practice the maker recommends that at the first sign of a snow or sleet storm the sleet wheel be substituted for the regulation trolley wheel, on several of the cars of each division, and that the wheels be kept in service until all danger of ice forming on the wire has passed. The substitution can be readily made in a few moments, the sleet wheel being designed to fit any form of trolley harp in use. The wheels are composed of a special metal made from a formula devised after exhaustive service tests, its characteristics being toughness, rather than hardness.

The Stuart-Howland Co. is one of the comparatively new comers into the street railway field, but judging from the appearances of activity in the shipping rooms of its warehouses at 281 Devonshire St., Boston, the company's supplies and specialties have met a lively demand. The officers of the company are: general manager, G. M. Stuart; vice-president, A. Howland; assistant general manager, W. W. Smith.

### SOLID STEEL PASSENGER TRUCKS.

The J. G. Brill Co., of Philadelphia, has issued the sixth edition of its catalog No. 80 in regard to its solid wrought steel passenger truck No. 27. These trucks in various forms have become well known to street railway men. The company has had six years' experience with them on city and steam railways and has adapted them to a large number of conditions, while the principle of the truck remains the same. The essential requirements embodied in the design are as follows: First, a strong, stiff, substantial frame built to keep the axles square and preserve them parallel under the heaviest stresses; second, the frame should not under any circumstances kick up under the action of the brake; third, journal springs are necessary to absorb the motion of the axles before it reaches the frame; fourth, the equalizing should be made perfect by making the weight bear at the center of the equalizer bar; fifth, when in motion there should be no jumping of the wheels when going over frogs, switches or irregularities in the rails, nor should there be any shirking of the load when passing over depressions; sixth, the distribution of the weight should be such that the boxes will not be canted in the jaws and there will be no sticking under any

circumstances. The frames of these trucks are built of solid forgings. The catalogue goes into a bit of history in regard to the first pair of No. 27 trucks built by the Brill Company. These were two experimental trucks included in an order of fifty which were built for the Buffalo & Niagara Falls Electric Ry. The performance of these trucks, which were put under one car, was watched with interest, and in less than a year from the time this car was put into service the road threw out all of its other trucks and equipped the line entirely with those of the new form.

The catalog contains a number of excellent testimonials from the company's customers in all parts of the country. The information which it contains will be found very useful to every street railway manager.

### WORLD'S FAIR PROGRESS.

The committee on grounds and buildings of the Louisiana Purchase Exposition is now considering the problem of a power plant and has several propositions before it, none of which has yet been decided upon. The General Electric Co., the Westinghouse Electric & Manufacturing Co., the Bullock Electric Manufacturing Co. and the Citizens' Light & Power Co., of St. Louis, have all submitted different plans, all of which have to be considered independently. Mr. Taylor, director of works, states that it will probably be one or two weeks before a definite conclusion in regard to the power plant is reached. The question of the location of the plant is not connected with the lowest and best bidder, but depends on the question of fuel and of whether the plant is to be an exhibit or service plant. If it is the former, it must be located in one of the big buildings, and if the latter it will be placed in some unobtrusive position on the grounds. The total requirements of the plant would be not less than 25,000 h. p. Fuel oil from the wells of Texas will probably be used under the boilers of this plant, and it is stated that if the expense of fuel oil either in first cost or in the cost of transportation is not prohibitive it will be used. One of its principal advantages in this instance where cream white is to be the color of the buildings, is that it does away with all smoke and soot which bituminous coal produces. It can also be transported into the grounds by a pipe line. This would be a great advantage as it obviates the necessity for a railway switch into the grounds for hauling ashes and coal. It does away with firemen, coal passers and ash handlers and precludes the necessity of banking fires when they are not in maximum demand.

The citizens of Wyoming have determined to make an elaborate display of the products and resources of that state at the exposition. An association has been organized for the proper representation of the state and a convention known as the Wyoming Industrial Convention met at Laramie on December 11th and 12th where the aggregate representation of this state was discussed.

The citizens of Texas are confident that that state will have not less than \$500,000 to spend for exposition purposes. Thirty commissioners are to be appointed by Governor Sayers to canvass the state for subscriptions for this fund.

### NEW CARS AT RICHMOND, VA.

The Richmond Traction Co., which is spending a large amount of money in the improvement of its plant and equipment, has ordered 25 new winter cars, some of which have recently been received. These cars are both longer and broader than those previously used and are fitted with every convenience in regard to their interior arrangements. The exterior design of these cars is very pleasing. The vestibules are wide and commodious, giving ample room for a smoking compartment at the front end and leaving the rear platform for the ingress and egress of passengers. The interior of the vestibule is finished in mahogany while the body of the car is trimmed in both mahogany and bird's eye maple. The seats are Hale & Kilburn rattan double walkover type with a central aisle between them. The seating capacity of the car is 28 people. Twenty of the new cars are being made by the American Car Co., of St. Louis, and five by the John Stephenson Co.

It is announced that the New York Central R. R. will reduce the round trip fare between Schenectady and Albany to 50 cents in order to compete with the electric railway system between those cities.

### LONG CARS AT WORCESTER, MASS.

The Bradley Car Works, of Worcester, Mass., has finished for the Worcester Consolidated Street Railway Co., 14 long cars that have been designed with special reference to the needs of an inter-urban road, running from a large city through several small towns, and therefore having considerable local and town to town travel, in addition to the regular long-distance and through travel. There is nothing radical in the details of construction, but the seating arrangement is unique, and different from the regulation cross-seat

of the Worcester Consolidated company states that the results in practice have proved the theory to be a good one.

The principal dimensions of the car are as follows: Length over end sills, 30 ft.; length over vestibules, 30 ft. 4 in.; length over all, 40 ft. 4 in.; width over side sills, 7 ft. 9 in.; width at eave, 7 ft. 11 in.; width outside of sheathing, 7 ft. 10 in.; width outside of crown moulding, 6 ft. 3½ in.; height from rail to under side of sill, 30¾ in.; height from rail to top of roof, 11 ft.; height from floor to ceiling, 7 ft. 9¼ in.



EXTERIOR WORCESTER INTERURBAN CAR.



INTERIOR OF CAR.

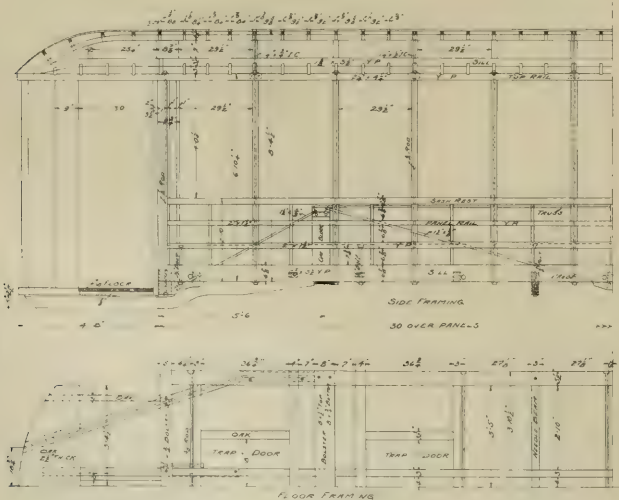
car, although a similar idea has been worked out to some extent on the Third Avenue R. R. of New York. It is a modification of the arrangement that has been used with good results by the elevated roads of Chicago and New York, and in the suburban service of the Illinois Central and other steam railroads.

The Worcester car has a seating capacity of 44, there being five double reversible cross-seats on each side of the aisle in the central portion of the car, and at each end there are two longitudinal seats, 7 ft. 10 in. long, as shown in the diagram. The theory of this plan

The cars are finished in cherry and the seats are upholstered in crimson plush.

The Worcester company's standard equipment includes Laconia double trucks, Christensen air brakes, and four G. E. 67 motors to each car.

The Kingston (N. Y.) Consolidated Railroad Co., which recently absorbed the two local systems of electric railways in Kingston, reports a marked increase of business for the past summer season.



SECTIONS AND FLOOR FRAMING OF CAR.

is that passengers expecting to go but a short distance will take a longitudinal seat near the door, while those going a longer distance will walk toward the center of the car and occupy the cross seats. This leaves near each door a larger space for standing passengers than is secured in the ordinary center aisle car. The management

The Albany & Hudson Railway & Power Co. contemplates installing storage battery head-lights on its cars so that they will not be without light when making crossings. The company has required motormen and conductors to pass the same examination that is required of employees on steam roads.



## CONNETTE'S TRANSFER PUNCH.

## NEW SUPPLY COMPANY.

Mr. E. G. Connette, general manager of the Syracuse Rapid Transit Railroad Co., has invented a new style of transfer punch which is illustrated herewith and which was designed with a view to circumvent the many schemes devised by passengers for beating street railways out of a ride by means of transfer slips improperly used. The device, Fig. 1, consists of a punch the general appearance of which is somewhat similar to those in common use, but having a larger head. This head contains four aluminum disks with dies on the outside edges. One of the wheels is for the month, one for the day of the month, one for the hour and one for the minute. These disks revolve on pivots and can be easily adjusted so that the figures and words for month, day, hour or minute will turn opposite a slit in the punch in which the transfer slip is inserted for punching. An

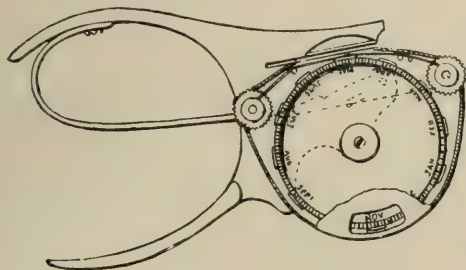


FIG. 1.

inked ribbon which can be easily moved forward as the ink is used, is inserted between the dies and the transfer slip. The transfer slip is inserted in the jaws of the punch, and by bringing the handles together, the dies on the wheels are pressed against the ribbon and the paper. A hole is punched through the transfer slip and on the back of it is printed in plain letters the month, the year, the day of the month and the time.

The illustration, Fig. 2, shows the manner in which the transfer slips are printed by this punch. In order to designate whether the transfer is issued in the morning or afternoon slips of different colors are used, white ones indicating the morning hours and colored ones the time between noon and midnight. Besides the advantage of having the slip indicate the date and hour in plain letters and figures, intelligible to all, another great advantage claimed for this punch is that a great saving in time results from its use. On the

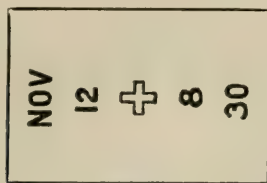


FIG. 2.

transfer slip in general use the conductor is obliged to punch four holes in different parts of it while with this device one punch does the whole business and removes the possibility of error on the part of the conductor.

The face of the transfer slip used with this punch has printed on it the names of the various lines issuing transfers and the conductor's number. A punch hole through the name of one of these lines indicates that it is the one on which the transfer is to be used. The saving of time claimed for this punch is also an important item on many roads, as frequently where the traffic is heavy conductors do not have time to punch the necessary transfers and agents stationed at junction points are necessary. With the new punch the conductor can issue four transfers as rapidly as he could issue one of the usual type.

The Standard Railway Materials Co. has been organized by Messrs. Garson Myers and J. H. McGill to take over the interests heretofore represented by them separately and to conduct a general street railway supply business. Both Mr. Myers and Mr. McGill are widely known, Mr. Myers having been actively engaged in this field for 12 years, that is practically since the introduction of electric traction, and Mr. McGill for seven years.

The company has already arranged to serve as agent for the R. D. Nuttall Co. handling its gears, pinions, "Union Standard" trolleys, and other Nuttall specialties; for the Westinghouse Electric & Manufacturing Co.'s Westinghouse repair parts, and for a line of railbonds, fare registers and specialties. Other agencies are now under consideration, it being the intention of the company to handle line and overhead material and a full complement of electric railway supplies.

One of the most interesting specialties of the company is the "Standard" resistance strip metal for rheostats which has been extensively introduced during the last two years by the Standard Railway Supply Co. organized by Mr. Myers. This metal is unique and its manufacture is the result of a complaint made by Mr. J. R. Chapman, then electrical engineer of the Yerkes lines in Chicago, that it was impossible to get a pure iron of uniform section suitable for rheostats; the only product then available was a hot rolled, black sheet steel in short strips. After canvassing the steel makers Mr. Myers succeeded in getting a remarkably satisfactory product which may be described as a cold rolled, pickled and annealed de-

## RESISTANCE PER 100 FEET.

Thick- ness.	WIDTH.						
	$\frac{1}{8}$ in.	$\frac{9}{16}$ in.	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	$\frac{7}{8}$ in.	1 in.	$1\frac{1}{8}$ in.
.007	Ohms. 1.60	Ohms. 1.40	Ohms. 1.25	Ohms. 1.05	Ohms. .90	Ohms. .79	Ohms. .70
.008	1.40	1.20	1.10	.92	.79	.69	.61
.009	1.20	1.10	1.00	.82	.70	.61	.54
.010	1.10	1.00	.88	.73	.63	.55	.49
.012	.91	.82	.74	.61	.52	.46	.41
.015	.73	.65	.59	.49	.42	.37	.33
.018	.61	.55	.49	.41	.35	.31	.27
.020	.55	.49	.44	.37	.31	.28	.24
.025	.44	.39	.35	.29	.25	.22	.20
.030	.37	.33	.29	.24	.21	.18	.16
.035	.31	.27	.25	.21	.18	.16	.14

carbonized steel of uniform quality and accurately gaged section; the uniform action is very important and results in a long life for the metal.

"Standard Resistance Strip Metal" is supplied in widths from  $\frac{1}{8}$  in. to 3 in. as desired and is put up in coils of 100 lb. containing continuous lengths of from 250 to 500 ft. unless otherwise specified. The accompanying table of resistances was calculated from tests of samples by Pierce, Richardson & Neiler and will be of interest.

Among the companies which are large users of this metal are: Chicago Union Traction Co., South Side Elevated R. R., Twin City Rapid Transit Co., Buffalo Railway Co., Brooklyn Elevated R. R., Market Street Railway Co., San Francisco; Omaha & Council Bluffs Railway & Bridge Co., St. Louis & Suburban Ry.

The Standard Railway Materials Co. has taken offices at 1203 Fisher Bldg., Chicago; the officers of the company are: Garson Myers, president; J. H. McGill, treasurer and manager.

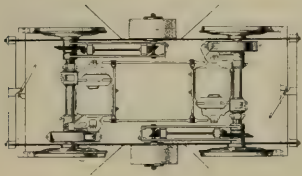
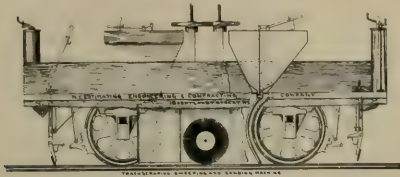
The gross earnings of the Boston Elevated Railway Co. for the fiscal year ending September 30th are reported to amount to about \$11,000,000, and the number of passengers carried was 265,000,000. Last year the gross earnings were \$10,141,000, and 245,000,000 passengers were carried.

The Wisconsin Rapid Transit Co., represented by C. D. Smith of Fond du Lac, is seeking franchises in that city and Oshkosh for an interurban electric line. Rights of way over a similar route have been secured by the Falk Co., of Milwaukee, and brisk competition between the promoters of the two lines is expected to result.

### TRACK CLEANING APPARATUS.

We illustrate here a combined track scraper, sweeper and sander that has been in successful use on the Third Avenue R. R., New York, for some time. For the operation of the car but one man is required in addition to the motorman.

The scraping tool is made from a piece of 1¼ or 1½-in. steel cable, fastened to an arm depending from the platform and designed



TRACK CLEANING AND SANDING DEVICE.

to be raised and lowered by a lever. The arm is mounted with a spring attachment which permits it to draw back and pass over any obstruction that might be on the track. The cable end is arranged to travel in the groove of the rail and effectually removes ice, snow or dirt from the groove, throwing it up on the head of the rail. At the center of the car are two circular rattan brooms which travel on the top of each rail and are regulated by hand wheels operated from the inside of the car as indicated. The brooms are 25 in. in diameter and receive motion, one from each axle, either by chain and sprocket wheel, or by beveled gears. The brooms gather the snow or dirt thrown up by the scraper, and toss it against inclined shields at the side, which deflect it outside the rail head and lay it in a long ridge at the side of the track.

The sanding device consists of ordinary sheet iron hoppers, with sand pipe leading down to the rail, the amount of discharge being regulated by a valve also under the control of the operator. By mixing salt with the sand, the car in winter becomes a very effective means of keeping the track clean in a light snow storm, and will in many cases save the expense of running out large sweepers.

The apparatus is the invention of Mr. J. H. Robertson and is sold direct or under license to build, by the New York Estimating, Engineering & Constructing Co., of 17 Cortlandt St., Manhattan.

### BUFFALO, ATTICA & ARCADE EXTENSION.

A new interurban railroad extending from Buffalo to Arcade, in Wyoming County, New York, is being surveyed. A part of this road is at present being operated by steam from Attica, located on the Erie Railroad, about 35 miles east of Buffalo, to Arcade which is on the Pennsylvania Railroad about 50 miles southeast of Buffalo. An extension will be operated by the overhead trolley from Arcade to Java Center, a distance of about 8 miles, and the existing steam road will be equipped with an overhead electric line. From Java Center, northwest, through the Valley of Buffalo Creek, a new electric line will be built to Buffalo which will be about 32 miles long. The entire road as planned will be nearly 50 miles long connecting Buffalo with a fine agricultural country containing many prosperous villages.

The new line passes through the center of the village of Arcade while the Pennsylvania station is about two miles distant. The present plans provide for a single track road on which the grades are very moderate.

Mr. S. S. Bullis, of Olean, N. Y., president of the company and chief owner of the road, has the work under his personal direction both as to the construction and the purchasing of equipments. No contracts have been let as yet. We understand that Mr. George A. Ricker, of Buffalo, is connected with the new road in the capacity of consulting engineer.

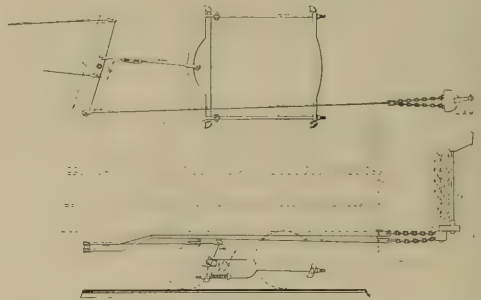
### ANNOUNCEMENT FROM MICA COMPANY.

The Mica Insulator Co. of New York has issued an important circular informing the trade that it has begun suit in the United States Circuit Court for the purpose of restraining certain parties from further alleged infringement of its patents. The Mica Insulator Co. now owns over 15 foreign and U. S. patents covering "Micanite" and processes of making electrical insulators from mica sheets. The circular states that the following companies have taken licenses under these patents: General Electric Co., Westinghouse Electric & Manufacturing Co., British Westinghouse Co., Westinghouse Electric Co. of London, British Thomson-Houston Co. and the Allgemeine Elektricitäts-Gesellschaft of Berlin.

### LEVERS FOR STERLING BRAKES ON DOUBLE TRUCK CARS.

The accompanying diagram which is reproduced from a recent publication of the Sterling-Meaker Co. describing the Sterling safety brake shows the standard arrangement of the Metropolitan Street Railway Co., of New York, for double truck cars.

The length of the floating lever *l*, is 48 in.; the distance *d* between pins for the arch bar rods is 9 in.; the length *b* of the truck lever is 13 in. and the distance *c* of the truck rod pin from the fulcrum of the truck lever is 3 in. With this arrangement of levers used in connection with the Sterling brake a pull of 65 lb. at the end of a 15-in. brake handle would give a total braking pressure of 29,000 lb., which is more than the total weight of the empty car. The leverages of the floating and truck levers can be varied to suit different circumstances. The proportions recommended, however, are



such as to make  $(l-d) \times (b+c) \times h \times 85$  equal the total weight of the car unloaded.

In the Sterling brakes the chain is not coiled around the brake staff in the usual manner of hand brakes, but there are two chains which are engaged by a double sprocket wheel into which their links fit. This provides a smooth and easy operation and the adjustment is such that the motorman can feel even a slight touch of the shoe upon the wheel. This double chain insures safety, as should the working chain break the safety chain would at once become operative.

The Frankfort & Indianapolis Electric Railway Co., which was recently incorporated with a capital stock of \$50,000 to build a 50-mile line between the cities named, has elected the following directors, all of them citizens of Frankfort: David F. Allen, David A. Coulter, Fred A. Sims, W. P. Sidwell, James McClamroch, George T. Dinwiddie, Chalmers Hillis, J. A. Hedgecock and John G. Clark. This is the third or fourth company which has been incorporated for the purpose of building an electric line from Frankfort to Indianapolis.

## THE POSITION OF THE ENGINEER IN MUNICIPAL SERVICE.\*

BY ALEX. DOW.

The Detroit Engineering Society has always avoided any semblance of political action. We have at times discussed matters of engineering interest so closely akin to what we recognize as politics that our discussion took a distinctly political tinge, but the tendency of each discussion was toward the education of our members as individuals and away from any action or even expression of opinion by us as a society. In choosing the subject of this presidential address I have not forgotten our laudable custom. The intent of this discourse is educational. It is based on personal experience and observation as an engineer, and is offered to you as engineers in the belief that it will be of interest and perhaps of service.

You will find my text in the Detroit Evening News of April 5, where one of the Public Lighting Commissioners is quoted as saying, "I used to think that municipal ownership was a good thing, but my experience has taught me that it is impossible to divorce public business from politics. It is all politics, and just now the Public Lighting Commission is composed of two Republicans and four Democrats."

It is quite true that the Public Lighting Commission is suffering from politics.—Democratic politics, labor politics, reform politics, and just enough Republican politics to season the mess. I suppose the labor men and the reformers object to being called politicians. Perhaps they are not such. Perhaps they are merely playing at being politicians,—you know the tale about the man who thought he played poker, but really didn't,—but they are partisans; and it is not the politician, in the honorable sense of the word, but the "offensive partisan," to use the expression invented by Grover Cleveland, who is a discredit to politics. The man who in public service endeavors to represent or to serve a faction instead of to represent or to serve the whole body politic is an offensive partisan. What his faction is or calls itself is a matter of no consequence. He may represent the Good Government League, or the Woman's Christian Temperance Union, or the Associated Charities, but when he announces that his service as a commissioner or his employment as a subordinate of a commission is in the interest of, or as the special representative of, any part of the people, and not all of the people, he is a partisan.

In my experience the most offensive partisans have been those who claimed to represent moral agencies. When they were honest, they were doctrinaires; when they were dishonest, their dishonesty overpassed exceedingly the dishonesty of the politician who admits that he is a politician. My experience is not peculiar. A friend of mine who has paid for his knowledge of city councilors in an Ohio city, where there is an organized reform party, tells me that the only difference between Democrats and reformers is that the reformers don't stay bought.

The common form of speech by which we express the offensive partisan is to call him a practical politician. This expression differentiates him from the man who takes an occasional whirl at politics because he has a momentary feeling that it is his public duty to do so. The practical politician calls that kind of a man a mugwump, and I think he deserves the name. I shall use the euphemistic expression in the remainder of this address, and you will understand that when I speak of the practical politician I am calling the person by the name which he has himself chosen.

The interest of the practical politician in any public department is primarily the money paid by that department as wages. The politician believes that the jobs belong entirely to him. He is even more interested in these than he is in the contracts which are given for supplies or for construction. On these contracts he and his friends can only expect a percentage of the profits, but he and his friends are ready to place their names on the payroll of the city for all the money in the treasury. Whether they can earn their stipends is immaterial. Of course, the work must be done by somebody, but the politician believes that if he and his friends are employed in sufficient numbers the work will be well enough done to keep the public quiet without any one wasting too much of his

time and energy on the performance of the small part which becomes his share.

You must not suppose that the politician in office is an idle man. He is exceedingly busy,—as busy as the devil in a gale of wind. The trouble is that he is not doing the work he is paid to do. He spends his time in promoting the interests of his party. He attends conventions, sometimes forgetting to get leave of absence, and always forgetting to have his name removed from the time-book. He is active at caucuses, and is a worker before elections,—a very hard worker. And when, after election, his worn-out system requires repose he takes the same cheerfully; still omitting to notify the timekeeper of his absence from duty. The interference with the work he is paid to do is just about the same as if he went on occasional drunks. The only real difference is that his irregularities are exceedingly regular, being predetermined by the laws fixing the dates on which elections shall be held.

Public opinion has long ago officially and practically condemned the man who allows his pleasures to interfere with his duties, but public opinion has not yet reached the stage of practical condemnation of the man who lets his politics interfere with his doing the work for which he is paid by the public. When it is effectively recognized that politics and dissipation are on the same footing if they prevent a man from doing the work which he is hired to do, public service can be performed as cheaply and as efficiently as is private service.

When a practical politician holds an office which gives him the power of appointing other public servants, he attains his maximum power for mischief. He not merely fails himself to earn his salary, but he employs others of his kind with a distinct understanding that they are to justify their employment by work done in the interest of him and his faction. That they are supposed to make some kind of a bluff at filling the nominal duties of their office is true, but the politician so appointed looks to his sponsor for protection in his idleness and does not in the least hold himself amenable to the taxpayers whose money he eats. He is not the servant of the city, but he is the "man" of such and such a boss. Sometimes the "boss" is a recognized party leader, and the appointment is made in the interest of the party. "The party owed me the job after all these years of work for it; I intend to take things easy and have a rest." That is how a man in this city, receiving such an appointment, stated the case, and he is even now resting at the public expense.

To return to my text. My experience is different from that of the commissioner quoted. It has taught me that it is entirely possible to keep public business separate from politics, even the public business of that very commission. My experience has led me to believe it possible to divorce public business from politics after the two have formed such an unholy alliance. To keep them separate in the beginning was the work of an engineer, and I now propose to tell how it was done. Hereafter I may justify my belief that the old condition can be restored.

The first Lighting Commission was absolutely non-partisan. In its constitution there was the usual recognition of each of the great parties, but each of those six men stood for the whole city and never for a moment for his own political friends. That was as it should be. A bi-partisan board is not a non-partisan board. You cannot neutralize these aggressive Republicans by appointing three equally aggressive Democrats. Two blacks don't make one white, and the result in practice is at best a deadlock. If by any chance a Republican partisan votes with the Democrats, he is called a traitor, and there is a howl for his political scalp.

This non-partisan commission decided that its duties were essentially legislative. Its members were business men who certainly could not give attention to details of commission work. You remember that these commissioners are unpaid,—well, perhaps I should not put it so, but the payment they get is of the kind best described by a tale concerning our fellow-member, Mr. Frank E. Kirby, who served a term as a Water Commissioner of this city.

The Water Board of a large Eastern city visited Detroit in the course of a tour in search of information. Mr. Kirby dropped his other duties to entertain the visitors, one of whom in conversation spoke as follows: "In our city there are three water commissioners; we each get \$3,600 a year. How many are there of you in Detroit, and what do you get?" The answer was grim, but precise, "There are five of us, and we get hell." The first Lighting Commissioners were well paid in the coin named by Mr. Kirby.

\*Address delivered at the annual meeting of the Detroit Engineering Society and published in the Journal of the Association of Engineering Societies.



Some of them are, I think, still receiving small installments of their salary. Be that as it may, they decided that their duties were legislative, and thereon they made a wise decision. They sought as their executive an experienced electrical engineer of good administrative ability. They failed to be satisfied by any of the numerous applicants who asked for the position; they made guarded inquiries concerning a number of men who were engaged in such work as they had to do, and they ended by offering the appointment to a man who was about as thoroughly surprised as any one could be by such an offer. That was me.

From the beginning, the separation of legislative and executive functions was complete. The commission decided on a policy. I reported on and advised as to possible plans whereby that policy could be carried out. The commission authorized the execution of a general plan presented by me, and then it became my duty to carry out that plan, myself selecting the immediate agents and settling the details. On me lay the responsibility for results. Lozely to me was given the choice of means.

Given full charge of the work and the force; given power to employ and discharge help; ordered positively to see that each employee earned his pay; to require no qualifications other than citizenship and competence; to disregard all indorsements which were not supported by my own observation of the work actually done for the commission, it would appear that I should have been able to keep practical politicians out of the service of the Public Lighting Commission. Did I do so? Well, I think I did. I was convinced of it by the fact that the Republican politicians of the city condemned me for a Democrat, and the Democratic politicians cursed me for a Republican. That was at first; after a year or two they sized me up better. Toward the end of my service I had the expert opinion of a recognized authority on such subjects as to whether I had succeeded in organizing a non-partisan force. The authority was the Hon. Hazen S. Pingree. I think no one here will question his competence. The opinion was given to me personally, in explicit language, and at some length. I do not know that it is advisable to quote it in full or verbatim; indeed, my memory fails me. But the salient point thereof was, "You people down there at the lighting plant are political eunuchs." Now, really, I don't like being called a eunuch, and I think that the Hon. Hazen S. Pingree's metaphor is somewhat startling, but it is so thoroughly expressive that I venture to pass it on to posterity by embalming it in this presidential address.

How did I carry out my plan? Well, I began, so far as the laborers and mechanics were concerned, at the top of the long list, which was arranged according to priority of application. I called for these men in bunches, sized them up personally after the fashion of all engineers who have to hire men; you know how it goes; you don't have to be told that some men are not worth a continental; you can see that by looking at them. I questioned them as to their citizenship and previous experience, rated them according to their claims and set them to work. I personally hired each man, and the hiring was a big part of my work. In a short time I could tell whether or not a man was competent. If he showed himself such, he remained in the service. Some of the men employed in this way seven or eight years ago are still on the Public Lighting Commission's payroll. If a man showed himself incompetent, he was summarily discharged. The orders of the commission were that no man should have a time appointment; that each man should be hired from day to day or from month to month.

There was an application blank which had spaces for name and address, trade or profession, previous experience and references. The references were often autographic. The rule that a man should be a citizen and a bona fide resident of Detroit led to many of the applicants establishing their status by presenting the signature of one of the aldermen of their ward or some other well-known Detroit man. Our foreign-born residents almost always secured the alderman's signature before presenting their application. The rule as to local residence was not absolute, but (after my own name) there never was but one selection made outside of the city; that selection was Mr. Walter D. Steele, a former member of this society, and who became my chief assistant and afterward my successor. Mr. Steele brought to my aid a knowledge of high-tension electric constructions, and particularly of underground cables, such as was not possessed by any Detroit man, and which was essential to the performance of the duties which fell to him.

In the original selection of employees many presented the indorse-

ment of local politicians. During the first three years, which were years of very hard times, there was an unusually large selection of employes available. Capable tradesmen were glad to get work as helpers or laborers, and for every position, excepting those requiring special technical training, there were from twenty to fifty applicants. It would have been possible to fill each such place after turning down every man indorsed by a politician. That would, however, have been a mistake. A selection from men indorsed only by the "goo-goo" element of our citizenship would, I think, have furnished about as large a proportion of utterly useless and worthless employes as could possibly have resulted had none but pernicious politicians been chosen. Some of the poorest specimens of mankind that were tried in the service brought the most magnificent indorsements from preachers and from pillars of churches. I honestly believe the average preacher does not know the making of a decent workman. I must expressly exempt the Catholic priesthood from this reproach. I noticed that a man who referred us to his parish priest was almost always a good find. On the other hand, some of the best men whom I found, including men who are still employed by the commission, carried the indorsements of politicians whose reputations are far from saintly. I don't say that a tough alderman invariably recommended a good man for a job; what I mean to say is that, especially in these years of business depression, the tough alderman could and did furnish from among their constituents enough mechanics and tradesmen, of a thoroughly reliable character, to fill any number of positions such as I had to offer. Of course the tough aldermen sometimes sent worthless men to me, but I had an effective method of dealing with such cases. If the man proved worthless, I summarily discharged him, and then I did not wait for his political sponsor to come to me complaining that his man had been "thrown down." I made the announcement myself to the sponsor, and followed it up by a few well-chosen remarks in the vernacular which let him understand that it was his business to know that a man was a good, capable worker before he sent him down to the Public Lighting Commission, and that if the said sponsor did not know any better than to send such a damnable specimen as the one just discharged I would decline hereafter to consider any of his recommendations.

I commend this prescription to any of you who may find yourselves in such a position as I then was in. The first dose, if liberal, effects a complete cure.

The places which required technical training were more difficult to fill. I have already mentioned that one place had to be filled by employment of a man from outside the city. The first draftsmen and inspectors were found by inquiry among the manufacturing and technical concerns in town. They were college men, and their coming to the service was followed by a succession of applications for employment from other college graduates, largely University of Michigan men. The names of most of those men have been on the roll of our society.

The engineering staff of the construction period was formed of these young men, and when the operating force was organized a number of positions were filled from the construction staff. The pay of these places was not high,—\$75 per month being the standard. I could not expect to retain such men permanently at the salaries which were possible, but I could and did arrange for a continuous succession in office. There was no place which was not well filled, and behind each occupant of a place there was a possible successor; the final vacancy of the series being a draftsman's position, which could naturally be filled by any graduate of the engineering department of the University of Michigan. The plan worked during my term; the men have assured me that they found their Public Lighting experience of value, and I am proud to say that they are all today filling positions of responsibility with credit to themselves and to their earliest employment.

I see in the press that one of these positions, formerly filled by a graduate engineer, is vacant, and that a competent man cannot be had for the pay. Well, I think the trouble is that a competent man will not take the place under the present limitations. The pay is plenty, and if the place at the salary named were vacant in one of my plants instead of in the city plant it would be filled mighty promptly by an Ann Arbor man.

The steam engineers and similar expert mechanics were selected from the list of applicants. In these classes the plan of putting a man to work and seeing what would happen could not be tried with the same freedom as was permissible with laborers. An

incompetent engineer might wreck an engine in demonstrating his incompetence; or an unskillful electrician send himself to paradise by the electric route, and thereby cost the city \$5,000 or so. It is really remarkable how valuable such a man becomes after he is dead. But the method was modified only in degree, not in kind. A man was first questioned and then tried. His indorsements counted for nothing, his politics for less than nothing.

The relations of the plant to what is called "union labor" were very early defined. The first commission announced that it recognized citizenship and competence as being the only essentials for employment. It classed union labor affiliations together with politics and religion, as being immaterial so long as they did not interfere with the performance of a man's duties. It resulted that we made no inquiry as to a man's being union or non-union, and that naturally a large proportion of the men employed were union men. I think the ground taken in the matter was solid, and that it is the only ground which promises permanent freedom from trouble.

It was not sufficient to obtain employees who were free from political obligations. It was necessary that they should remain clear of such entanglements. Our rule in the beginning was clearly stated, and it was reiterated from time to time as occasion required. It was that every employee should have opportunity to vote at primary and regular elections; that there should be no inquiry as to how or for whom he voted, but that no employee should on any pretense engage in what is called party work. A report that an employee was making himself notable in politics caused him at once to be called on the carpet and notified that a persistence in such activity would surely lead to his dismissal. In the early days of the commission it was necessary, in more than one case, to warn men individually of the consequence which would follow their persistence in political activity. These warnings took the form of a statement that the Public Lighting Commission was non-partisan; that the retention on the roll of an active partisan of either party would lead to demands from the other party that some equally active partisan of that stripe should be employed; that the commission did not propose to engage in any such balancing of evils, and that therefore the employee must limit his activities or quit the service. No man was ever discharged for political activity. One man resigned with the friendly statement to me that he thought he could better himself otherwise by his political work, and that he therefore preferred to sacrifice his present job. Anonymous charges were occasionally made that men were discharged because of their politics, but the record was easily cleared. These charges were all made in the early days, when each party said I was a vile tool of the other party.

For five years—three years of my service and two years of my successor's term—the relations of the commission to its electrical engineer were unchanged. You will recognize that these relations were essentially those of a board of directors of a corporation to their general manager. In my own case they were exactly the relations which I now hold to the directors of the corporations whose property I manage. They were the relations which exist in every such department in every city whose work is well done and free from political taint. Instances can be multiplied not only of the successful operation of this distribution of duties, but also of the evil results following when any other distribution is essayed. The Chicago newspapers have just furnished an excellent illustration of success and of failure. The success is in the management of the South Parks. In the past and in the present the South Park Commissioners have performed precisely the duties of a directorate of an incorporated company. The name and title on their letter heads, "J. Frank Foster, general superintendent and engineer," means just what it says. Mr. Foster is general superintendent in fact as well as in name. The West Parks have been managed on the other plan. The commissioners have been partisans, and have appointed partisan employees. The general superintendent has too often been chosen for his efficiency as a party worker. The engineer has always been a subordinate, and too often a negligible quantity in the equation. I speak from knowledge, because I have done engineering work on behalf of each of these municipal bodies. The results of the two systems are summed up by the published cost of maintenance per acre of each system. The average cost of maintaining the West Side Parks is \$498 per acre per annum. The average cost of the Washington Park is \$220 per acre per annum. And those who know their Chicago and can mentally compare the two park systems will promptly agree with the

newspapers that the conditions of the two systems are in the inverse ratio of the moneys spent upon them.

In Canadian cities the man in charge of public works is usually a civil engineer, and he is actually in charge. The Public Works Committee has legislative functions only, and a law duly enacted, not merely a ruling of a commission, prohibits the activity of any city employee in politics.

I have spoken of the successful operation of the public lighting plant while the functions of the commission and the engineer remained clearly defined. It is now in order to tell what happened when this definition became hazy. After five years' operation of the plant, ill-advised economies, insisted upon by the board in direct opposition to the advice of the engineer, caused a strike of the arc lamp trimmers. The question of detail was whether the trimmers did or did not do enough work for their pay; whether, in fact, their duties were proportionate to their wages; whether they had what in the newspaper discussion at the time was called a "snap." I think the trimmers' duties were no snap, and I know whereof I speak. A man who trims sixty open lamps on a circuit of average length daily, Sundays included, summer and winter, in fair weather and in foul, in the early hours of the summer morning and in the bitter sleet storms of our winter and early spring, has no snap if he does his work properly. Electrical Engineer Steele told the commissioners this. They overruled him. Be this minor fact as it may, the major fact was that the commission, to secure a small economy of operation, overruled its executive officer and ruined the discipline of the plant. The damage to the commission, directly and indirectly, by loss of discipline from that day to this, by the loss of capable employees and the expense of educating others, has offset many times the saving which was expected to be made. The trimmers struck, as I have said, and thereby put themselves in the wrong. They had no right to conspire to put the metropolitan city of Michigan in darkness. They forgot they were public servants when they planned such a stroke. That also is a minor detail. The major fact was that the commission assumed control of details which, even had it been competent to judge, it could not personally oversee, and deliberately permitted employees to feel that they had a grievance.

The engineer did his best. He won the strike for the commission, feeling that his duty to the city overrode his sympathy for the men; but thereafter he avoided responsibility, knowing that he could not depend on the support of his directors, and the clamor raised by the aggrieved employees had its unavoidable result. The appointing power, the mayor of the city, tried to remedy the harm done by nominating a commissioner who undertook to specially represent these employees, and who entered on his duties with a prejudice against his associates. This appointment was followed by another; this second nominee frankly declaring himself the special representative of organized labor. Partisans both of them, these commissioners; well meaning, no doubt, but limited in their action by the circumstances of their appointment, carrying to their duties not a receptive mind, but a preconceived hostility to the past management. At meetings of the board charges and counter-charges, criticisms and squabbles took the place of frank discussion and of willing submission to the decision of the majority. Tale-bearing by employees was encouraged, different members assuming the protection of different employees or cliques of employees. Matters of detail took up the time of the board, and business was impossible. The plant kept on going from sheer inertia, but the engineer very early concluded that he should end his connection with the institution. He had been wiser for himself, I think, had he come to this conclusion a year sooner than he did; but he, like almost all engineers, was faithful to his salt and tried to do the best for his masters, the public, under adverse circumstances. He economized to a fault; he left his machinery in perfect condition and a surplus of over \$50,000 in the treasury. The older commissioners finally gave an opportunity for the restoration of harmony by resigning almost in a body, and new nominees of the mayor, on whom, by these resignations, has developed the appointment of every present member of the commission, accepted appointment to the vacancies.

Had the commission then reverted to the original system of operation, all might have gone well. Seeing that all personal difficulties had been eliminated, they could have resumed their proper legislative duties, placing the executive responsibility in the hands of one competent engineer. If a local man were not available, they could have sought for such an engineer beyond the city, as did the



first commission. Unfortunately, the factional spirit still survived. Employes and ex-employes who had given aid and comfort to the commissioners now dominating during the time when they were a minority apparently had to be taken care of, and these commissioners found themselves the representatives of a faction of the most impracticable kind. A general superintendent was chosen, but he is superintendent in name only. When appointed he did not know the elementary principles of electrical generation and distribution, and he thereby became dependent on one of the re-appointed ex-employes, who was nominated as his assistant. In the public reports and specifications of the commission there is nothing to indicate that during the past year the general superintendent has learned any more about the electrical business than he knew when he started. I regret to say also that these reports and specifications indicate that not merely the general superintendent lacks essential knowledge, but that the assistant is far from having sufficient engineering ability to make good the deficiencies of his chief. It seems ridiculous that a plant which has sent a dozen smart electrical engineers to profitable employment elsewhere should not be able to find one able man to take intelligent charge of its own affairs. A private plant, offering the same salary, would have found such a man very promptly.

Of course (as shown by my text) the belief has gone abroad that partisan politics have dominated the selection of employes by the new commission. There is too much evidence in favor of this belief to allow one to contradict it lightly. There is a good working majority vote in the commission, and under those conditions it behooves the majority to be careful of its appointments if it desires that its motives shall not be impugned. To appoint as a general superintendent a person who has been a practical politician since the memory of man runneth not to the contrary is a proceeding subject to criticism under the best of circumstances. When the person so appointed knows absolutely nothing about the business he is running, when he and his assistant jointly send around to their subordinates a subscription paper inviting the donation of campaign funds for the party having the majority vote on the Public Lighting Commission; when other appointees to office are also notably party workers, and either without electrical experience or with an experience which is a record of failures, it seems to be a prejudged case that politics control the department.

The financial results do not clear the record. The past president started in with a remarkable program of proposed economies. He announced that expenses could be reduced \$20,000 per annum. During the year of his control the expenses apparently have been increased to the tune of \$10,000 per annum, and for the first time in its history the commission comes before the Board of Estimates reporting that it will apparently have a deficit at the end of the current fiscal year. That result indicates that there was something wrong with the program, and increases rather than decreases the evidence against the present system.

My conclusion is that a public works department can be operated efficiently and economically on the same lines as is the service of a private corporation; the commissioners assuming the duties of the directorate of such a corporation and the general superintendent, who must be a thoroughly competent engineer, performing all the executive duties. I can admit no exception to this rule. I am aware that in some organizations the peculiar knowledge of individual directors makes their advice exceedingly valuable in the executive department. This was the case in the first Public Lighting Commission of the city of Detroit. Of that commission, there was not one man who had not a general knowledge of the apparatus and methods involved in the electric lighting business; three of these had served as directors of electric lighting enterprises. The factory of one was a pioneer in the use of electric power distribution, and the commissioner who knew the least of electrical affairs was surprisingly familiar with the routine and costs of a model street railway plant in which he had an interest. Two of the members had technical knowledge and ability which brought them, in the course of their business, a large recompense, and which they gave freely to the service of the city of Detroit. One of these men had been a pioneer in telephone, electric light and electric railway developments, and he is now an officer and director of one of the largest telephone companies in the Middle West. The other, whom I may name, seeing that he is dead, Mr. George Howard Lothrop, was reputed the best authority on electrical patents west of the city of New York. The advice of these men

was constantly sought by me as the executive officer of the Public Lighting Commission, and it was always freely given and always valuable. I have indicated sufficiently the peculiar fitness of the first Lighting Commissioners of this city to take charge of detail and to perform the executive duties of their department, and yet it was these commissioners, who knew exactly what they were doing and who were, without exception, better fitted for their public work than any of their successors have ever been, who positively declined to depart from their legislative functions and who insisted upon the assumption by their general superintendent and engineer of the full responsibility and the full authority which his executive duties required. It has remained to men of less knowledge to initiate the contrary policy and to fail in it.

What has been done can be done. Let the Public Lighting Commission of the city of Detroit re-enact the rules of the first commission. Let it place the execution of these rules in the hands of a general superintendent who shall be—who must be—a thoroughly competent electrical and mechanical engineer. Let the commission confine its members to their legislative functions, and loyally support its superintendent in his executive duties. Then there will be again a Public Lighting Department free from politics, free from partisans, economical in operation and a model to be followed not only by other municipalities, but by private corporations. Go outside of Detroit if necessary to find the right superintendent. If he is an honest, capable engineer,—and an engineer, to remain in his profession, must be honest and capable,—his freedom from local acquaintance and entanglements will tend to his success.

### NEWSPAPER CARS FOR INTERURBANS.

A recent innovation in the business of interurban railways is the operation of newspaper cars or trains for the distribution of daily papers throughout the various towns and cities connected by such roads. The Union Traction Co. of Indiana has been carrying papers for some time, and this traffic is growing so heavy that it could not be handled on the regular cars. The general manager, Mr. George F. McCulloch, has announced that newspaper cars will be put in operation within a short time. These cars will be run to Anderson, Marion, Muncie, and Ellwood.

A car devoted especially to the distribution of papers is also in service on the lines of the Milwaukee Electric Railway & Light Co.; it leaves the city of Milwaukee at 3:30 every morning for Racine. This car also stops for passengers. As the distribution of newspapers now comprises a large business, this service by electric cars opens a new field for the suburban roads.

### LONDON COUNCIL PLANS MUNICIPAL LINES.

The London county council has just brought forward comprehensive plans for the relief of the transportation situation in that city. One plan is for a system of shallow tunnels for the carrying of passengers underground by electric tramways. The other is a system of subways for sewers, pipes, wires, etc., which will prevent the necessity of the upheaval of the streets and the consequent blocking of traffic; but it appears to be the general opinion that the council cannot carry out its schemes without prolonged delay caused by the interference of Parliament and the taxpayers. While London has fallen behind every great capital in railway facilities the burdens of local taxation are already so heavy that the taxpayers are generally unwilling to assume the financial responsibilities of new works of such magnitude.

This move on the part of the council is largely attributed to jealousy of the American syndicate which has become interested in British underground lines, but it still seems probable that Mr. Yerkes company will have the field practically to itself if it succeeds in obtaining a favorable decision in regard to the methods of electric traction to be installed.

The Rapid Transit Commission has completed 23 borings in Joralemon and Fulton Sts., Brooklyn, for the purpose of ascertaining the nature of the subsoil through which it is proposed to run the underground in Brooklyn. Fifteen more borings will be required for the remainder of the route to Atlantic and Flat-bush Aves.



## EXTENSION BY OTTAWA (ILL.) COMPANY.

The Ottawa Railway Light & Power Co., owning and operating the electric railway and light plants of Ottawa, Ill., is extending its railway from Ottawa eastwardly to Marseilles, about eight miles, and westwardly to Buffalo Rock, about three miles. It is the intention of the company to continue the westwardly extension to Utica and La Salle, also to continue the eastwardly extension to Morris or to Joliet to a connection with the electric railway now operating between Joliet and Chicago. The completion of the proposed extensions east and west of Ottawa to a connection with the Joliet lines will provide continuous electrical railway facilities between Chicago and La Salle, a distance of about 100 miles. In connection with the building of the railway lines it is proposed to develop the water power at Marseilles, Ill., and to generate the electrical power required to operate the railway and the electric light plants by means of the water power.

The construction of the railway between Marseilles and Ottawa, and from Ottawa to Buffalo Rock, is nearing completion and will be in operation in the early part of 1902.

The construction of all of the lines contemplated by the company will be vigorously pushed. Mr. J. L. Board, a well-known capitalist, is at the head of this enterprise, and Weston Brothers are the engineers and contractors.

## COMPARATIVE ACCELERATION TESTS OF ELECTRICAL TRAINS AND STEAM LOCOMOTIVES.

A test was made in the latter part of November on the experimental railway of the General Electric Co., at Schenectady, and on the tracks of the New York Central Railroad, in which the acceleration and draw-bar pull of the General Electric train controlling apparatus and the steam locomotive were compared. The test was made under the direction of Mr. B. J. Arnold and Mr. W. B. Potter of the General Electric Co. The train which was tested was varied from one to six cars and was drawn first by one and then two motor cars and then by two of the New York Central locomotives. The total weight of the six cars drawn in the train was approximately 250 tons, and as one of the locomotives was too large to be run into the yard of the General Electric Co., it was tested on the New York Central tracks. The two electric cars used were built by the St. Louis Car Co., were of large size, and weighed, including the equipment, 71,150 lb. and 69,800 lb., respectively. They were equipped with G. E. 55 motors, of 160 h. p. each, and type M controllers were used, by which the train was controlled and operated by one man in the cab. Each car contained an air compressor and motor with automatic governor for supplying the air brakes on the train.

## HUNTER'S GUIDE OF THE DETROIT UNITED RAILWAY.

A practical and attractive advertisement of the Detroit United and Rapid Railways has been issued in the form of a hunter's guide and time table, directing sportsmen to all grounds where good shooting may be found in season, reached by suburban electric lines from Detroit. An important feature of the guide is the publication of extracts from the game and fish laws. This is may be learned at a glance that the open season for deer is from November 8th to 30th, inclusive, except in certain counties; that ducks and geese and all wild water fowl may be killed from October 1st to November 30th; that prairie chicken, Mongolian and English pheasants, wild turkey and wild pigeon are protected until 1910, etc.

The suburban lines of the Detroit United Ry. reach some of the best shooting grounds in Michigan. During the present season, the prospects for killing woodcock, quail and partridge in the vicinity of Troy, Orion, Oxford, and Ortonville, on the Flint division, have been favorable. There has also been good duck and rabbit shooting. At all of these places the grounds are located at from one to three miles from the railway lines. Other towns on the Pontiac, Wyandotte and Rapid Railway divisions afford similar opportunities for good sport. A complete time table of all the divisions is included in the guide, and information concerning suburban and country hotels is given.

The pamphlet is appropriately illustrated with cuts of forest and inland waters, with pictures of game, and charming scenes along suburban railways. It is a feature of good advertising which will be commended and remembered by all lovers of sport.

## ENGLISH ENGINEERS INSPECT THIRD-RAIL SYSTEM.

A party of British railway officials visited this country last month with the object of making a thorough investigation of American railroading in its many details, and to give special attention to electrical equipments. The visitors were all officials of the London & Northwestern Ry., one of the principal railway systems of Great Britain. They state that the purpose of the third-rail investigation was not with the object of immediately adopting that or any other electric system in the place of steam, but it was to be ready to adopt some electric system should it become necessary. It was considered that the Hartford-Bristol line of the New York, New Haven & Hartford system had received the most thorough test in this or any other country with the third rail as a substitute for steam, and as this has been much discussed in railroad circles this road was one of the prominent ones included in the tour of observation.

Another party of gentlemen connected with the Yorkshire & Lancashire Ry., of Great Britain, also made, about the same time, a tour of inspection in this country which included the Hartford-Bristol third-rail system. Both of the parties were handsomely entertained by the officials of the New York, New Haven & Hartford.

The American Standard Railway Co., of New York City, has been incorporated with a capital of \$50,000. The object of this company is to construct electric railroads.

The Oklahoma Street Railway Co. has received a 99-year charter to operate electric railway lines in Oklahoma city and county. The capital stock of the company is \$200,000.

The Thomas S. Clarkson Memorial School of Technology, of Pottsdam, N. Y., of which Professor William S. Aldrich was recently appointed director, held its Founder's Day exercises on November 29th.

The freight business of the Dayton, Springfield & Urbana Electric Railway Co. is increasing steadily and the shipments of poultry have been remarkably heavy, one single shipment having weighed over a ton.

The Indian Territory Traction Co., of South McAlester, has been incorporated with a capital stock of \$200,000. The company projects operating a street railway in South McAlester, and has among its directors Messrs. L. B. Boyle and W. A. Thomas, of Chicago.

The Twin City Rapid Transit Co. has announced an advance in the wages of conductors and motormen beginning Jan. 1, 1902. The present scale has been 16, 17 and 18 cents an hour, according to the length of service. In the new scale the rate will be 18 and 20 cents an hour, those who have worked six months for the company receiving the latter rate.

An electric railway has been projected to run from Macomb, Ill., through Scotland to Industry. A bonus of \$30,000 has been asked from the latter place and \$12,000 from the former. The road is to be a standard gage and to connect with the C., B. & Q. Mr. W. A. Compton is president of the proposed road.

The Blue Grass Consolidated Traction Co. has been incorporated with a capital stock of \$7,000,000. The incorporators are Chicago, Detroit and New York capitalists and the object of the company is to construct a number of electric railways from Lexington, Ky., to eight or nine neighboring county seats. This company will absorb the Blue Grass Traction Co., which has secured the necessary franchises for the system.

## PERSONAL.

MR. CHARLES F. LUTHER has resigned his position as superintendent of the Dayton & Xenia Traction Co., to take an active interest in the Dayton, Covington & Piqua Traction Co.

MR. S. ROY WRIGHT has resigned his position as general manager of the Colorado Springs Rapid Transit Co., and is engaged in the real estate and loan business in Denver, with offices at No. 230 Colorado Bldg.

MR. ANTHONY HENRY METZELAAR, manager of the Knell Air Brake Co., was married November 20th to Miss Rae Sloman, daughter of Mr. and Mrs. Louis Sloman, of Coldwater, Mich. Mr. and Mrs. Metzelaar will make their home in Battle Creek.

COL. RUSSELL B. HARRISON has been admitted to the practice of law in the state and federal courts and has opened a law office in Indianapolis, where he will be associated with Professor Ingier, of the Indianapolis College of Law. Mr. Harrison was for some years engaged in electric railway work, having been president of the Terre Haute Electric Street Railway Co.

MR. E. W. MALONEY, of Worcester, Mass., has been appointed superintendent of the Manchester Street Railway Co., of Manchester, N. H., and assumed his new duties November 1st. Mr. Maloney, although only about thirty-two years of age, has been connected with the Worcester Consolidated Street Railway Co. for the past 14 years in the capacity of assistant superintendent.

MR. LOYD M. RICHARDSON, who for the past four years has been superintendent of the Saginaw Valley Traction Co., has tendered his resignation to take effect at the close of the year. This action is rendered necessary owing to the death of his father, whose extensive real estate interests will demand all of Mr. Richardson's time as soon as he is relieved of his present duties.

MR. R. LANCASTER WILLIAMS, has been elected president of the Knoxville Traction Co. to succeed Mr. Frank S. Hambleton, resigned. This company was recently absorbed by the Railway & Light Co. of America which, on assuming control of the property elected three new directors, Messrs. Williams, E. C. Todd, and A. H. Rutherford. The former Knoxville directors were retained.

MR. F. G. BANKER, president of the Indianapolis & Greenfield Rapid Transit Ry., tendered his resignation on the consummation of the sale of the controlling interest in that company to the Indianapolis & Southern Traction Co., and Mr. Frank Maus Favre, of Indianapolis, was elected to the position. Mr. Medford B. Wilson was elected vice-president of the company to succeed Mr. Elmer E. Binford, resigned.

MR. GEORGE M. KENYON, of St. Paul, Minn., Western representative of the Weber Railway Joint Manufacturing Company in Chicago and of this company and others in St. Paul, was on November 25th stricken with paralysis while at the Auditorium Hotel, Chicago. Pending Mr. Kenyon's complete recovery, which will doubtless be a matter of several months, the Chicago office of the Weber company will be in charge of Mr. F. A. Poor.

MR. R. L. JONES, superintendent of rolling stock of the Manchester Street Railway Co., Manchester, N. H., recently resigned his position with that company. Before leaving Mr. Jones was surprised at his home by a visit from nearly all the employees of the road, who presented him with a handsome diamond ring as a mark of their esteem. Mr. Jones has been with the company for a number of years and was a great favorite with all of the employees.

MR. WEARE PARSONS has resigned his position as superintendent of the Keokuk Street Railway Co., to become superintendent of the large water power plant at Joplin, Mo., which supplies power to several street railways, power and lighting plants in that vicinity. Mr. Parsons has been connected with the Keokuk railway for the last 13 months and during that short time has made many warm

friends among the officers and employees of the road. Before leaving Keokuk he was presented with a handsome diamond stud which was contributed to by all the employees of the company and given to him without any formalities as it was found impossible for all the men to meet together for this purpose. During his connection with the company about one third of the track has been renewed and the service of the road has been greatly improved.

MR. A. F. WALTER, of Boston, Mass., has been appointed manager of the Michigan Traction Co.'s lines, succeeding Mr. R. L. Rana, who has been assigned to take charge of the building of the company's road between Battle Creek and Jackson, Mich. Mr. Walters has had a long experience in street railway business, having been connected with it since the days of horse cars. He was connected with the Boston & Northern Street Railway Co. previous to his present appointment.

MR. HERBERT S. NOWELL, superintendent of the Lawrenceburg division of the Boston & Northern Street Ry., is to assume the position of auditor of the Boston & Northern system with offices at Lynn. Mr. Nowell's connection with this company dates from July, 1900, and his experience in railway work began in 1894. During his term as superintendent Mr. Nowell has made many friends and his appointment as auditor of the system is a guarantee of the esteem in which he is held by the company.

MR. JAMES D. CALLERY, president of the United Traction Co. and of the Southern Traction Co., of Pittsburg, will, it is announced, be president of all the lines in Pittsburg and Allegheny which are about to be consolidated by the Philadelphia Co. Mr. Callery is engaged in preparing plans for the consolidation and operation of all these lines as one enterprise. A number of official changes in the operating departments of these roads are scheduled to take place when the consolidated is practically effected.

MR. A. F. HASS, who has been manager of the Seattle Street Railway Co. for the past 10 years, was recently presented with a handsome diamond locket and gold watch chain by 45 employees of the company. The presentation was made in view of Mr. Haas' approaching retirement, and as a token of the friendship which has existed between him and the employees of the company. The presentation was made at the company's car barns where the men assembled. Mr. Haas thanked the men in an eloquent address.

MR. GODFREY MORGAN, who for the past three years has been the general manager of the Niagara Gorge Railway Co., has resigned his position to take effect January 1st. Mr. Morgan has received a very complimentary letter from the officers of the company accepting his resignation with regret. The letter states that the company appreciates the valuable services he has rendered during the reconstruction and reorganization of the road and the Pan American period, but it has realized that Mr. Morgan's qualifications call for a wider field of action.

MR. PHILIP DAWSON, who has been connected with the firm of Robert W. Blackwell & Co., Ltd., London, as chief engineer and managing director ever since its organization, has withdrawn from that position and will enter general practice as consulting engineer. Mr. Dawson is a member of all the principal engineering societies and is well-known as the author of "Electric Tramways and Railways" and the "Engineering Electric Traction Pocket Book." He has been connected in one way or another with nearly all the traction and electric transmission installations in Great Britain and Ireland and also with many such enterprises in the British Colonies and on the continent of Europe; the tramways built by him aggregate a thousand miles, while the electrical machinery placed in his stations is over 250,000 h. p. Mr. Dawson's experience has been such as to particularly fit him for consulting work; he has visited America several times and is familiar with our practice; he was retained by Mr. Yerkes to investigate the Ganz system and was an expert witness in controversy between the Metropolitan and District Railways; he is thoroughly familiar with the French, German, Italian and other European languages which is of great advantage. He is now connected with several large undertakings among which may be mentioned the Brighton & South Coast Ry., of which he is



consulting engineer; the suburban lines of this company are to be equipped for electricity.

MESSRS. BURT VAN HORN AND T. E. MITTEN, general manager and general superintendent of the Buffalo Railway Co., were callers on the "Review" when in Chicago recently.

MR. F. C. TIFFANEY, of Oakland, Cal., has been appointed superintendent of the Portland City & Oregon Railway Co. to succeed Mr. Knowles who has resigned his position on account of ill health.

MR. W. J. FLOYD, New York representative for H. E. Huntress, eastern agents for the St. Louis Car Co., has a large acquaintance in the East and his many friends will wish him success in any line of work he may take up.

MR. J. B. HANNA, who recently resigned as secretary and treasurer of the Cleveland City Railway Co., has opened an office in the Electric Building, Cleveland. Mr. Hanna's connection with the street railway systems of Cleveland commenced Apr. 1, 1883, at which time he was appointed secretary and treasurer of the West Side Street Railway Co. He remained in that capacity until the company consolidated with the Woodland Avenue Railway Co., on Feb. 1, 1885. The new company was known as the Woodland Avenue & West Side Street Railway Co., and Mr. Hanna succeeded to the same office with the consolidated company. On June 1, 1893, that company again consolidated with the Cleveland City Cable Railway Co., under the title of the Cleveland City Railway Co., and Mr. Hanna served as secretary and treasurer until the 15th of October last, when he resigned his executive position with the company in which he is still a director and stockholder. Mr. Hanna expects to give his full time in the future to the various projects of the Everett-Moore syndicate, of which he has been a member for several years.

### OBITUARY.

EDWIN DOTY, superintendent of construction of the Cleveland Electric Railway Co., died at his home December 3rd after a week's illness. Mr. Doty was a well known citizen in Cleveland and had been identified with the street railway service of the city for the greater part of his life. For more than 40 years he has been in the service of the Cleveland Electric Railway Co. in the capacity of superintendent of construction, and he was chiefly responsible for the excellent system which the company has at present. He was superintendent of the first street car line in Cleveland, which commenced operations in 1860, and was among the first to realize the practical value of electricity on street railways. He had the Cleveland lines equipped electrically among the earliest of any in the country. He was 71 years of age and leaves a widow and seven children.

MR. CLEMENT STUDEBAKER, president of the Studebaker Brothers Manufacturing Co., died Nov. 27, 1901, at his residence at South Bend, Ind. He was born near Gettysburg, Pa., Mar. 12, 1831, and when he was but four years old his family moved to Ashland, O. Here he learned blacksmithing and wagon making with his father and received his early schooling. In 1850 he moved to South Bend, where he taught school for two terms and then assisted in a threshing machine blacksmith shop. In 1852 with one of his brothers, he started a blacksmithing and wagon building firm, with a capital of \$68, which has since grown into the present extensive works of the Studebaker company. Four of his brothers were subsequently taken into the partnership. Besides his work as the head of this large business enterprise Clement Studebaker played a considerable part in public life. He was a city councilman for two years and a member of the St. Joseph City Council, a trustee of DePauw University as well as a generous benefactor of that institution; was president of the board of Chautauqua Assembly trustees and was long connected with the Methodist Book Concern. He was a United States commissioner to the Paris Exposition and was one of the Indiana board of managers for the World's Columbian Exposition. He was also appointed by President Har-

ison a member of the Pan-American congress. He leaves a widow and three children, all of which are residents of South Bend.

### NEW PUBLICATIONS.

PRACTICAL ELECTRICITY. Third edition. For sale by the Street Railway Review. Price \$2.00. This book is written especially to assist those who have some practical knowledge of the laws of electricity and who wish to become more proficient in the calculation of wiring and the design of dynamo electric machinery. It is written in a clear, concise style and at the end of each chapter is a series of questions designed to emphasize the salient points brought out in the text. In another part of the book the solution of all the questions is given, enabling the student to verify the results of his calculations. One who studies the text and can solve the questions at the end of each chapter should be able to calculate any wiring job and determine the dimensions and windings of a dynamo.

Omitting the elementary definitions and classical electrical experiments usually found in electrical text books, this work starts out with the statement of Ohm's law from which the properties of electrical circuits are deduced. Various methods of feeder distribution to secure a uniform pressure at all points of a system are explained and the chapter includes tables giving the values of bare, single and double covered copper wires. Chapter two contains a brief treatise on batteries mentioning only their essential features. A table of the electro-chemical series of the elements and one giving data on the most commonly used cells will be found of practical value. The chapters on magnetism and the magnetic circuit which follow introduce the student to the first principles of dynamo design, and it should be added that these subjects are treated from the standpoint of the practical designer rather than that of the theoretical mathematician. The calculations and formulas are all in the grasp of the average reader and no knowledge of higher mathematics is necessary in order to master the subject. The calculations of field and armature windings, hysteresis, Eddy currents, armature reactions, etc., are successively taken up and are explained in a brief but lucid manner, and while the size of the book does not permit anything like an exhaustive treatment of any of the subjects it contains, enough is given in each case to provide the student with sufficient data to make all the ordinary computations required in construction work or in the design and winding of dynamos and motors. The book concludes with a dictionary of electrical words, terms and phrases.

BULLETIN NO. 102 of the Sprague Electric Co. of New York has just been published in regard to direct current generators of the split-pole type. These machines are manufactured by the Sprague Electric Co., under the Lundell patents and are so named on account of the peculiar construction of their laminated pole pieces. The object of this design is to secure sparkless commutation at all loads and the method of constructing these generators as well as numerous illustrations of them is described in the bulletin.

WESTINGHOUSE PAN AMERICAN CATALOG. The Westinghouse companies have published a handsomely illustrated Pan American catalog printed in two colors which describes the well known and extensive products of the various Westinghouse companies. The book gives a brief history of the organization of these companies and tells the story of the gradual building up of their great works near Pittsburgh, also their shops at Wilmerding, Pa., and the works at Havre, France, organized in 1898. A synopsis of the equipment of the Niagara Falls power house is given and a diagram is shown representing the locations of the numerous industries which have been built up in this neighborhood which are supplied from the Niagara power house. The Westinghouse exhibit at the Pan American Exposition is also illustrated and described.

STANDARD ROOFS AND BRIDGES. By H. G. Tyrrell, C. E.; published by the author. This work consists of a series of blue prints and gives a series of typical structures of varying lengths and capacities, the stress and sizes of all members and estimated weights. The series on roofs are two in number, one giving 89



cases of 4-in. pitch trusses and the other 143 cases of 6-in. pitch trusses. The series on bridges includes five volumes on various kinds of trusses showing from 10 to 50 separate cases each. The author also publishes a Bridge and Structural Index containing condensed information relating to the principal bridges and steel structures in Europe and America built within the last 15 years. The descriptions are accompanied by outline sketches giving the form and general dimensions of the structure. The book includes among other things, draw bridges, simple spans, viaducts, cantilevers, suspension bridges and other steel and concrete structures. The book is issued in blueprint form, size 6x9 in., and contains 400 pages. Price complete, \$50.00. The prospectus and prices of the former works may be obtained from H. G. Tyrrell, International Hotel, Sault Ste. Marie, Ontario.

**PUBLIC SERVICE CORPORATIONS.** By Lemuel William Serrell, M. E., 99 Cedar St., New York. Cloth, 50 pp. The object of this work is thus set forth in the preface: "An effort has been made to put before the public, in a concise manner, the commercial engineering principles that underlie the various quasi-municipal companies, so that the reader may understand in a general way the technical construction and commercial efficiency of their plants, and those financially interested in such properties obtain some idea of how cheaply they may be operated when properly installed."

The book is divided into four parts—Municipal Ownership, Street Railways, Gas Plants, Electric Light Plants. In the first section the author points out some of the reasons why municipal ownership of what are called the public utilities cannot be recommended for American cities, and cites statistics to show the falsity of the claims made for the success of such enterprises abroad, the results obtained being compared with the conditions now obtaining in American cities much to the advantage of the latter. The essential weakness that prevents the economical administration of American cities is the fact that the taxpayers are the municipal stockholders, while the directors are chosen by voters, a very large proportion of whom are not taxpayers. The succeeding sections give brief historical accounts of the development of the street railway, gas and electric light industries, with some figures as to the cost of constructing and operating the plants. The author is a practicing engineer and the data presented are for modern plants, so that the layman will find the book of interest and value because of its contents, and to the specialist it will prove even more valuable by reason of the suggestions.

### POPULAR MECHANICS.

Our readers will all be interested in the announcement that Mr. H. H. Windsor, who was formerly editor of the "Street Railway Review," has again become identified with journalism as the publisher of *Popular Mechanics*, the first number of which will appear early in January, 1902.

It is the intention to make *Popular Mechanics* an illustrated weekly review of the mechanical press of the world. Its province will be to select such subjects as appeal to the better class mechanic and present the matter well illustrated in popular, simple and interesting language. The broad scope, which will require the greatest possible brevity, will make the paper a weekly guide post to its readers, many of whom cannot afford to take regularly more than a few publications.

The success with which publications of this general character have met in other fields, together with our knowledge of the energy and ability of the publisher, lead us to predict that *Popular Mechanics* will have a prosperous career. The field it covers is a new one and we believe that the paper will meet a real want in putting before a large class of readers a digest of current technical literature.

The Ohio Rapid Transit Co., which is preparing to construct a road from Martin's Ferry to Colrain, has asked the county commissioners for an extension of 60 days in the time required to begin construction. The extension of time is asked for the reason that the company is unable to have its material delivered by the day first set, and it will undoubtedly be granted.

The St. Louis Transit Co. is preparing to erect five freight depots in different parts of the city.

### WESTERN NOTES.

The Consolidated Railway Co., of Salt Lake City, is planning some important improvements in its uptown car service that will be acceptable to a large majority of the people. Instead of the dead ends that now exist at the corners, where the cars come to a stop a system of loops is to be put in in the business district so all the cars can run around blocks and enable passenger to transfer to other lines without walking a block.

The Oakland (Cal.) Transit Co., which owns and operates all street railways in that city, has decided that advertisements will not in the future be permitted in any of its cars. For years the street cars in that city have been placarded with the cards of merchants, but as soon as the present contracts expire no more will be taken for display. It is the intention of the company to replace the cards with others which will direct travelers which cars to take to reach points of interest in and about the city.

The Aberdeen (Cal.) board of aldermen has granted the promoters of the electric street railroad projects a 50-year franchise.

The trolley poles for the Alhambra and San Gabriel extension of the Pasadena & Los Angeles Electric Railway Co. have been delivered along the proposed line. It is expected that the grade work will follow very soon.

An enterprise of great magnitude and one that means much for Beaver County, Utah, is now being rapidly developed, and before this time next year a big power plant will have been installed on the Beaver River, above Beaver City, which will furnish light and power to the surrounding country. In addition an electric railway is proposed which will be operated between Milford and Beaver City, the county seat, and the present thirty miles or more of staging will be done away with. At the present time a preliminary survey between Beaver and Milford is in progress.

Negotiations are pending between the Consolidated Railway & Power Co. and the Utah Light & Power Co. which will obviate the necessity of the former expending \$300,000 for a new steam power plant. Expensive improvements are planned by the Utah Light & Power Co. A vast amount of additional power is being provided for in the proposed new dam and reservoir in Ogden canyon. There is now 1,600 h. p. derived from steam. While the steam power will always remain an auxiliary to the water power, there will ultimately be 3,000 h. p. from the latter source.

An electric road to tap the rich Salmon River mining regions is projected as an alternative in case the Oregon Short Line R. R. does not carry out its plan of extension to the neighborhood of the Blackbird district. The electric project is fathered by J. E. Dubois, of Pennsylvania, and Dr. P. A. H. Franklin, of Salt Lake, as a part of their mining operations in Idaho.

The City & Suburban Railway Co. has a large force of men at work upon its lines in Portland, Ore.; a large amount of new track and ties are being laid.

Improvement is the rule of the Anaconda, Mont., street railway lines. Recently the company has received 6 handsome cars which are 62 ft. long. They are provided with air brakes and have air whistles, which may be used instead of alarm gongs. The cars are capable of accommodating more than 100 passengers each.

### A FT. WAYNE-CINCINNATI INTERURBAN.

The Ft. Wayne, Dayton & Cincinnati Traction Railroad Co. has recently been organized and incorporated under the laws of South Dakota with a capital stock of \$1,000,000. A more direct railway connection between the cities of Ft. Wayne, Ind., and Cincinnati has long been wanted and a little over two years ago Dr. S. F. George, of Dayton, O., proposed a plan which comprises one of the most extensive electric railway systems in this country. Active work on this road was started early in this month on two divisions of the road, and the whole system is to be pushed to completion as rapidly as possible. The road is divided into four divisions which will be known as the Northern, Central, Southern and Western. The Northern division will extend from Ft. Wayne to Celina, the Central division from Celina to Dayton and the Southern division from Dayton to Cincinnati. The Western division will extend from Ft. Wayne to Bluffton and will pass through Portland, Ind., Ft. Recovery, Greenville, New Castine, West Manchester and Eaton, O., connecting with the line of the Southern division at West Elk-

ton, O. There will also be a branch from Celina and Chattanooga, O., to Bluffton, Ind., by the way of Burne. The entire system as outlined, covers a distance of 400 miles.

An increase in the capital stock of \$4,000,000 is to be made at an early date. This \$4,000,000 will be issued as common stock and the present stockholders will be given first preference.

The territory covered by this system is one of the most thickly populated as well as the richest and most productive section of Ohio and Indiana. The population of the various cities and towns that the different lines will touch, together with the country sections that the traffic will be drawn from numbers nearly 1,000,000 people. In laying out the various lines of the system a number of country districts will be opened up that are now entirely isolated from railroads. Many inhabitants of these sections are now obliged to go from 5 to 15 miles before they reach a railroad station where they can receive their supplies and market their products. The people in these country districts as well as in the different towns along the route have manifested great interest in the enterprise and have aided considerably in furthering the project of the company. Private rights of way have been secured covering the entire system in all of the cities, towns and villages through which the lines pass ground has been granted to the company for passenger and freight depots, cattle yards, etc.

In laying out the various lines of this system great care was taken not to parallel any existing steam or electric railroad. It is the purpose of the company to run through vestibule trains from Ft. Wayne to Cincinnati and also local cars for the accommodation of the people between the different towns. These trains will be thoroughly modern in their equipment and will contain all the conveniences necessary for comfortable travel. The company expects to do a large freight traffic and to have its electric locomotives haul the regulation freight cars as used on steam roads for the transportation of produce, grain, live stock and everything in the way of freight. The road will be double track and is to be equipped with a third-rail system, and having its own right of way throughout, will be able to operate at high speed. It will go into Cincinnati over the present Cincinnati and Westwood railroad and the Cincinnati depot is planned to be built at Brighton, the present terminus of this road.

The officers of the company are as follows: S. F. George, Dayton, O., president; D. W. La Fetra, New York, first-vice-president; Chas. L. Hyde, Pierre, S. D., second vice-president; Chas. W. Gehhart, Dayton, secretary and treasurer; Benjamin B. George, Dayton, purchasing agent; Robert E. Kline, Dayton, chief engineer.

### GAS ENGINES FOR A PENNSYLVANIA ROAD.

Mr. H. A. Siggins, treasurer of the Warren (Pa.) Street Railway Co., advises us that the company intends to install three Warren gas engines, of 325 i. h. p. each, in its power house. These engines will run at about 180 r. p. m.; the weight of each is about 90,000 lb. They will be fitted with Jacobson automatic throttling valve governors for close regulation.

At the outset one engine will be used to supply power to a trolley between Glade and Sheffield, a distance of 11 miles. Later, when a contract with a city power plant terminates, two engines will be used to furnish power for the interurban and for the city lines which comprise some 9 miles of track. The interurban line has Brill 40-ft. semi-convertible cars equipped with Westinghouse No. 56 motors, and Westinghouse magnet brakes and heaters. The heaviest grade on the line is 5 per cent and it is expected to make the run of 11 miles in 30 minutes. This road is believed to be the longest one in this country using gas engines in its power plant.

The officers of the company are: President, D. H. Higgins; secretary, J. D. Woodard; treasurer, H. A. Siggins.

### NEW ENGLAND STREET RAILWAY CLUB.

The regular monthly meeting of the New England Street Railway Club was held at the American House, Boston, on December 2nd, with about 100 members present.

After dinner the club was entertained by an illustrated lecture on "Long Distance Transmission of Power as Applied to Electric Railways," by Mr. D. E. Manson of the Westinghouse Co. Mr.

Manson used a stereopticon and showed several views of the Niagara power plant.

Mr. F. W. Teele, formerly secretary of the club and now superintendent of the Trinidad Electric Ry., Trinidad, Porte of Spain, was home on a visit and addressed the guests.

At the meeting 17 new applications for membership were received.

### MINIATURE RAILWAYS.

One of the most popular and best paying attractions at the Pan-American Exposition was the miniature railroad of which there were six lines in operation on the grounds. The miniature railway



STATION BUILDING.

has grown in favor and popularity and is now a feature of many of the leading pleasure resorts in this country and abroad. This attraction was introduced by the Cagney Brothers, now of 301 Broadway, New York, in 1892, and the Cagney miniature trains are running in Central Park, New York, in Earl's Court, London, and at Callao, Buenos Ayres and Gyaquil, South America, as well as in all parts of the United States and Canada.

The makers operated and were awarded gold medals at all the recent large expositions, including the Trans-Mississippi and Inter-



MINIATURE RAILWAY AT PAN-AMERICAN.

national Exposition at Omaha in 1898, the Glasgow Exposition and the Pan-American, and miniature railways are now running at the Charleston Exposition grounds.

The engines and track, as made by the Cagney Brothers, are perfect models of standard steam railroad equipment. The trains will carry twenty adults comfortably and the patronage comes from the old as well as the young.



## THE USES OF ELECTRICITY AT BERLIN.

From a report by Frank H. Mason, United States Consul General.

Notwithstanding the stagnation and depression which now overshadow industrial development in Germany, the application of electricity to the various purposes of power and illumination in Berlin has gone on apparently unchecked. The horse car, of which there were many hundreds in service in the capital and its outlying suburbs a year ago, have all but disappeared from the streets, except where they are used as trailers behind the electric cars to accommodate the rush of travel during the morning and early evening hours. Everywhere in streets and public places and in hundreds of new buildings, electric lights are supplanting gas and other means of illumination.

Especially has the development of electrical tramway lines been on a phenomenal scale. One year ago, the aggregate electrical output used for this purpose was 8,000 h. p.; it is now 16,800 h. p., having more than doubled in a single twelve-month. When the principal city lines were changed from horse to electric equipment, the municipality held out firmly against the use of overhead conductors in the central districts. The trolley was tabooed on all except suburban routes, so that cars intended for use on lines running from the central portions of Berlin to outlying districts were equipped for both methods of transmission—trolleys for suburban sections and heavy storage batteries to carry them over the downtown portion of their route. This made the cars heavy and costly, but they were worked fairly well until a 6-in. snow fall exhausted the already overtaxed current supply, and filled the busy downtown streets with "dead" cars that had to be hauled out by horse power. From that time the overhead wires crept farther and farther into the city, until they now substantially supply most of the lines throughout their entire length. This vastly improved service—especially the greatly accelerated speed on the suburban lines—has practically revolutionized the conditions of public transportation in Berlin, and has drawn a constantly increasing percentage of population to Halensee, Charlottenburg, Friedenau, Wilmersdorf, and a dozen more populous and handsomely built towns which have sprung up in recent years within a radius of 7 or 8 miles from the cathedral of Berlin.

Of the entire consumption of current, 21 per cent is used for lighting, 22 per cent for miscellaneous power purposes, while the remaining 57 per cent are charged to the tramway lines. The average price to consumers in Berlin is 18.9 pfennigs (4.5 cents) per kilowatt hour, and the total current supplied by the company increased from 62,349,846 kilowatt hours in 1900 to 89,668,258 in the fiscal year 1901.

## THE COEFFICIENT OF EXPANSION OF CONCRETE.

A paper on this subject was read by Prof. Wm. D. Pence, of Purdue University, before the Western Society of Engineers at its November meeting, and described a series of investigations, including two years' work, under the writer's direction.

Concrete varies radically in quality with the character, proportions and manipulations of its ingredients, and its coefficient of elasticity, coefficient of expansion and other so-called structural constants suffer a corresponding fluctuation. One constant however, the coefficient of expansion, probably varies but slightly, but it has received but little attention in the laboratory and there are but little published data on the subject.

Owing to the amount of work required it was early decided to restrict the first season's tests to a single brand of American Portland cement, and as the investigation was suggested by the question of temperature stresses in concrete-steel arches, it was further decided to limit the investigation to a single grade or quality of portland cement concrete representing the best practice in this type of arch work. The specifications from which the concrete was prepared are in part as follows:

The concrete shall be composed of clean, hard, broken stone or gravel with irregular surface, clean, sharp sand and cement, mixed in the proportions of one to four. The ingredients shall be placed in a mixing machine in the dry state and in the volume specified, and be thoroughly mixed, to which clean water shall be added and the

mixing continued until the wet mixture is thorough and uniform. No more water shall be used than the concrete will bear without quaking in ramming. The mixing must be done as rapidly as possible and the batch deposited in the work without delay.

The first seasons bars were made 6x6x24 in., but owing to the great length of time required to heat the 36-sq. in. section through to the center, two series of bars were made cylindrical 36 in. long by 4 in. in diameter. The general method commonly employed to determine the coefficient of expansion was used, namely: a bar of concrete of known length was subjected to an observed change of temperature, the increase of length determined and the coefficient calculated. Careful consideration was given the several methods of measuring the increase of the length of the bar of concrete. In the plan finally adopted a standard bar of steel or copper with known coefficient of expansion was subjected to identical changes of temperature with the test bar of concrete. The difference in expansion of the two bars was determined by the use of the arc lever.

The apparatus included two isolated foundations on one of which rested the tripod shoes of the telescope or engineer's level used to observe the expansion of the bars, and on the other foundation was placed a heating apparatus consisting of a double-walled, galvanized iron steam jacket in which the test bars were heated. This steam jacket has a double glass window near the upper end of the test bars through which the observations were made. A standard thermometer was placed inside of the steam jacket on which the temperatures were read.

Each series of tests include 10, of which 5 of the earlier and 3 of the latter were rejected because of obvious defects in the apparatus or other sufficient cause. Of the 5 successful tests of the first series 4 were on broken stone concrete bars and one on a bar of gravel concrete; and of the 7 acceptable results of the latter series, 3 were of gravel concrete, 3 of broken stone concrete and one of a bar of unbroken stone.

The final results are shown in the following tables:

TABLE I.  
COEFFICIENT OF EXPANSION OF 1:2:4 BROKEN STONE  
(PORTLAND) CONCRETE.

Series	Test	Kind of Stone	Brand of Cement	Standard Bar	Coefficient of Expansion (Fah.)
First	No. 5	Bedford	Lehigh	Steel	0.00000 52
First	No. 6	Bedford	Lehigh	Steel	0.00000 53
First	No. 7	Bedford	Lehigh	Steel	0.00000 53
First	No. 10	Bedford	Lehigh	Steel	0.00000 57
Average of results of first series					0.00000 54
Second	No. 2	Kankakee	Medusa	Steel	0.00000 56
Second	No. 3	Kankakee	Medusa	Copper	0.00000 54
Second	No. 8	Kankakee	Medusa	Steel	0.00000 57
Average of results of second series					0.00000 56
Average of entire series of results on broken stone concrete					0.00000 55
Coefficient of expansion of Kankakee limestone bar					0.00000 56

TABLE II.  
COEFFICIENT OF EXPANSION OF 1:2:4 (OR 1:3) GRAVEL  
(PORTLAND) CONCRETE.

Series	Test	Proportions	Brand of Cement	Standard Bar	Coefficient of Expansion (Fah.)
First	No. 4	1:2:4	Lehigh	Steel	0.00000 54
Second	No. 4	1:3	Medusa	Steel	0.00000 55
Second	No. 7	1:3	Medusa	Copper	0.00000 53
Second	No. 10	1:3	Medusa	Steel	0.00000 52
Average of results of second series					0.00000 53
Average of entire series of results on gravel concrete					0.00000 54

Grouping these results were have for the experiments:

Coefficient of expansion of gravel concrete, .0000054 per degree F.  
Coefficient of expansion of broken stone concrete, .0000055 per degree F.

Coefficient of expansion of lime stone bar, .0000056 per degree F.

The conclusion is therefore reached that the coefficient of expansion of concrete may be considered in general to be about .0000055 per degree F.

A radial system of electric railways connecting Dawson City, Alaska, with the mining districts lying between the Klondike and Bonanza and the Dome, to be used for the transportation of freight, is projected by E. C. Hawkins, whose resignation as general manager of the White Pass & Yukon Ry. will take effect so soon as navigation closes.



### ROUTE OF THE HUDSON VALLEY RY.

A small folder convenient to be carried in the pocket has recently been issued by the Hudson Valley Railway Co., giving all the distances and time schedules of the system as well as other matters of information in regard to the road. The accompanying map which is reproduced from this folder shows the extent of the companies lines and the various connections included between Albany and Lake George. The distances of the various divisions are as follows: from Albany to Waterford, 12 miles; Waterford to Stillwater, 12 miles; Mechanicsville to Saratoga, 18 miles; Stillwater to Fort Edward, 24 miles; Fort Edward to Glens Falls, 7 miles; Glens Falls to Warrensburg, 16 miles. There are three parks along the route of this railway, Ondawa Park is located 30 miles from Waterford and 20 miles from Glens Falls. Kaydeross Park is 34 miles from Waterford and Fort William Henry Park is 53 miles from Waterford.

The time table on the back of this folder gives all the connections between the cities touched, including the time of arrival and of leaving, and the time in transit as well as the fare in each case. Through ticket fares and round trips to the various points are issued at considerably reduced prices. The company's cars are heated with hot water; they contain an electric light for every seat, and there is a smoking compartment in each car.

### A NEW EMERGENCY BRAKE.

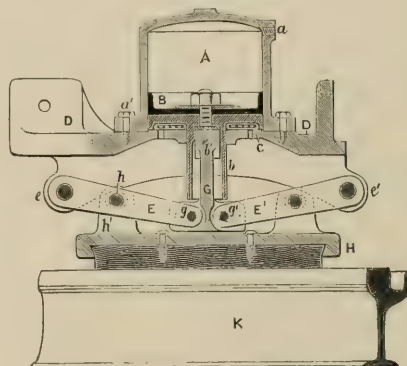
The question of brakes for electric railway cars has recently attracted considerable attention in England on account of a number of accidents due to the want of sufficiently powerful brakes. The Board of Trade has taken a decided stand in this matter with the result that in several cases the opening of new lines has been delayed until more effective brakes are procured.

While a number of accidents has been caused by runaway cars on grades, the greater number of accidents has occurred on perfectly level roads where passengers or vehicles have attempted to cross in front of the cars. In cases of emergency the wheel brakes have been found quite insufficient and the weight and speed of electric cars demand a brake which is capable of almost instantaneous application and which requires but little physical exertion on the part of the driver, so that his attention is not attracted from his other duties.

The Electrical Review, of London, gives the following description of a brake designed by Messrs. Hewett & Rhodes, consulting electrical engineers of Manchester, which it is stated has proved to be very effective as an emergency brake. It acts directly on the rails and is operated by means of compressed air procured of a compressor driven from one of the car axles. If a powerful brake is applied to the wheels instantaneously it simply causes them to skid and allows the car to continue for a time on its course and at the same time, it damages the wheels by producing flats on the treads. It is obvious, therefore, that an emergency brake to avoid mishaps, must act on the track itself and be entirely independent of the wheel brake.

The accompanying sectional drawing shows the construction of this brake. An air cylinder, A, is carried on the brake, D, attached to the truck. The piston B of the cylinder is connected by a swinging rod, G, to two levers, E, E', which have their fulcrums on the bracket at e and e'. The levers carry the slipper shoe, H, on which is fixed a brake block of oak or beech which can be easily renewed. Each brake is complete in itself and can be fixed to any type of truck. Four brakes are fitted to each car whether single or double trucks are used. The designers found that in going down inclines,

four brakes acted better than two brakes. In the latter case a large proportion of the weight of the car is taken by the front wheels instead of the by front brakes, as when four brakes are used. They are applied by means of a handle placed over the hand brake and above the handle is a pressure gage indicating the pressure available for use. A very small effort is necessary to operate the handle. The design of the brake is such that the air in the cylinder makes an elastic cushion between the rail and the truck thus avoiding the violent jolting usually associated with the sudden application of track brakes, and the wear and tear on the car is far less than that



EMERGENCY BRAKE.

caused by a purely mechanical brake. The brake has already been adopted on the cars of the Oldham and Stockport corporations and is being adopted on several other electric railway lines.

A trial of these brakes was recently made on a steep grade where the car was allowed to attain a speed of 20 miles an hour before applying the brakes. On their sudden application the car was brought to a standstill in a distance of practically twice its length.

### WINTER CAPS FOR EMPLOYES.

Street railway managements are realizing more and more that a just regard for the appearance and comfort of their conductors and motormen is an indispensable requisite if the highest efficiency of the service is to be maintained. Employees are now carefully trained in all the requirements of their duties, are instructed to be courteous and gentlemanly in all their actions, and to the same end they should be properly uniformed and required to present a neat and tidy appearance.

When selecting a suitable uniform not the least important consideration should be the cap, for a man's entire presentment is affected by his headgear, and an otherwise pleasing appearance may be spoiled by an awkward looking cap. A uniform cap should be of good material and shape, should fit properly, and should always be worn squarely upon the top of the head.

One of the oldest and largest dealers in employees' caps is F. H. Newcomb, of 136 Flatbush Ave., Brooklyn. Mr. Newcomb is supplying caps for several of the leading street railways in the United States, and his line includes all the latest and most approved shapes. He is making a specialty of winter styles and has just brought out a warm winter cap that will undoubtedly meet with general approval. The design includes flaps to be drawn down over the ears, but by a new pattern the flaps, when folded up around the crown, do not cover the badge usually worn at the front of the cap by street railway employees. This point will be appreciated, as it avoids the necessity of removing the badge and replacing it if the man prefers to run with the ear caps up.

Satisfactory progress is being made on the new electric line between West Chester, Pa., and Downingtown, which the Tennis Company is building. Ties and poles have been delivered at each terminus, and grading has been finished for a distance of three miles.

## FINANCIAL.

## MANHATTAN RAILWAY CO.

The annual report of the Manhattan Railway Co., of New York, for the year ending September 30th last was presented by President Gould at the annual meeting of the stockholders held November 13th. The report is one of the most favorable ever issued by the company and contains the following statement of earnings and expenses:

	1901.	1900.	Increase.
Gross earnings, all sources...	\$ 10,455,872	\$ 9,950,735	\$ 505,137
Operating expenses .....	5,328,649	5,195,312	133,337
Net earnings .....	5,127,223	4,755,423	371,800
Interest on bonds.....	1,809,681	1,816,309	*6,628
Taxes .....	873,451	872,335	1,116
Total charges .....	2,683,132	2,688,644	*5,512
Net income .....	2,444,091	2,066,779	377,312
Dividends .....	1,920,000	1,920,000	.....
Surplus .....	524,091	146,779	377,312
Previous surplus .....	4,309,626	4,162,847	146,779
Total surplus .....	4,833,717	4,309,626	524,091
Refund by New York City on taxes .....	132,639	.....	132,639
Final surplus .....	4,966,356	4,442,265	524,091
Passengers carried .....	194,152,316	183,788,851	10,363,465
Operating per cent excluding taxes .....	50.97	52.21	*1.24
Operating per cent including taxes .....	59.32	60.98	*1.66

\*Decrease.  
The comparative statement of the company's business for the quarter ending September 30th was also submitted as follows:

	1901.	1900.	Increase.
Earnings from operation ...	\$2,093,276.96	\$1,889,600.89	\$203,676.07
Operating expenses .....	1,312,130.28	1,236,710.79	75,419.49
Net earnings .....	781,146.68	652,890.10	128,256.58
Other income .....	191,287.50	192,362.50	*1,075.00
Gross income .....	972,434.18	845,252.60	127,181.58
Interest on bonds .....	454,004.88	454,004.88	.....
Taxes .....	178,345.64	172,919.63	5,426.01
Total interest and taxes ...	632,350.52	626,924.51	5,426.01
Net income .....	340,083.66	218,328.09	121,755.57
Operating per cent .....	62.66	65.45	2.77
Passengers carried .....	42,296,998	38,199,423	4,106,575

\*Decrease.

For the year ending September 30th the total number of passengers carried was 194,152,316; the percentage of operating expense was 50.97 per cent, as against 52.21 per cent for the previous year, taxes included. In explanation of the report Mr. Gould said that while the results were very gratifying he was glad to state that the current earnings were even more so. During the past year the improvement and enlargement of the company's facilities have been steadily pushed. The extension from Tremont to Fordham was completed and put in operation about July 1st and opened a very promising field. The new terminals secured in the Bronx district have greatly improved the company's facilities on the east side lines, which have met with immediate response in increased traffic. Great progress has been made during the year in the electrical equipment of the road. The buildings for the central power station at 74th St. and East River and the substations at Allen St., 34th St. and 99th St. are completed and the machinery is being rapidly installed in all of them. The company's engineers expect to run the first of the power house units by December 1st and to operate the first of the electrical trains on Second Ave. during this month. The only change made in the board of directors was the election of Mr. E. N. Foss, of Boston, representing a large interest held in that city.

## MONTREAL STREET RAILWAY CO.

The Montreal Street Railway Co. has issued its financial and statistical statement for the year ending Sept. 30th, 1901. The business of the past year shows a net profit of \$649,251 as against \$647,246 for the previous year. Out of this amount four quarterly dividends of 2½ per cent each have been taken, amounting in all to

\$551,700, leaving a surplus of \$97,551. Of this surplus, \$50,000 has been added to the contingent account. The increase in the company's business during the year has been most satisfactory although expenses show an increase of 11.32 per cent over last year. This increase is due chiefly to the higher cost of coal and the expenditure required for the maintenance of the roadbed and rolling stock.

The company's new power house at Williams St., has been in operation since the 26th of last March. One quarter of the machinery to be installed, amounting to 1,250 h. p., is now in operation and

	1901	1900	1899	1898	1897	1896	1895	1894	1893	1892
Gross Receipts ..	\$10,455,872	\$9,950,735	\$9,300,000	\$8,700,000	\$8,100,000	\$7,500,000	\$6,900,000	\$6,300,000	\$5,700,000	\$5,100,000
Operating Expenses ..	5,328,649	5,195,312	5,000,000	4,800,000	4,600,000	4,400,000	4,200,000	4,000,000	3,800,000	3,600,000
Net Earnings ..	5,127,223	4,755,423	4,300,000	3,900,000	3,500,000	3,100,000	2,700,000	2,300,000	1,900,000	1,500,000
Interest on Bonds ..	1,809,681	1,816,309	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000
Taxes ..	873,451	872,335	850,000	850,000	850,000	850,000	850,000	850,000	850,000	850,000
Total Charges ..	2,683,132	2,688,644	2,650,000	2,650,000	2,650,000	2,650,000	2,650,000	2,650,000	2,650,000	2,650,000
Net Income ..	2,444,091	2,066,779	1,650,000	1,250,000	850,000	450,000	50,000	50,000	50,000	50,000
Dividends ..	1,920,000	1,920,000	1,900,000	1,900,000	1,900,000	1,900,000	1,900,000	1,900,000	1,900,000	1,900,000
Surplus ..	524,091	146,779	750,000	350,000	150,000	50,000	50,000	50,000	50,000	50,000
Previous Surplus ..	4,309,626	4,162,847	3,900,000	3,650,000	3,400,000	3,150,000	2,900,000	2,650,000	2,400,000	2,150,000
Total Surplus ..	4,833,717	4,309,626	4,650,000	4,000,000	3,550,000	3,200,000	2,950,000	2,700,000	2,450,000	2,200,000
Operating per cent ..	50.97	52.21	51.72	50.57	49.39	48.26	47.13	46.00	44.87	43.74
Passengers Carried ..	194,152,316	183,788,851	173,424,800	163,060,800	152,696,800	142,332,800	131,968,800	121,604,800	111,240,800	100,876,800
Operating per cent ..	50.97	52.21	51.72	50.57	49.39	48.26	47.13	46.00	44.87	43.74

the rest of the apparatus is to be put in early next year; the buildings are now under construction.

A summary of the company's financial statements from 1892 to 1901 is given in the accompanying table and it is the intention in the future to publish a monthly statement of operations showing the gross and net earnings.

The officers of the company are Hon. L. J. Forget, president; James Ross, vice-president and managing director; W. G. Ross, secretary and treasurer.

## AMHURST &amp; SUNDERLAND ELECTRIC RY.

The annual meeting of the stockholders of the Amhurst & Sunderland Electric Railway Co., of Amhurst, Mass., was held November 13th, when the annual report of the company's operations was submitted. The report showed the following figures:

Gross earnings, \$14,649; operating expenses, \$11,207; number of passengers carried, 292,735; number of car-miles run, 103,643. The capital stock of the company is \$48,000 and it has issued bonds to the amount of \$21,500. The dividends paid for the year were 4 per cent. The company operates 10½ miles of track. The year was a prosperous one for the company, and the extension of its line to Sunderland proved a good investment, greatly increasing the value of the road. The board of directors re-elected the following officers: President, W. D. Cowles; vice-president and treasurer, Mason A. Dickenson; secretary, Charles H. Edwards.

## UNION ELEVATED RAILWAY CO.

The gross receipts for the first seven months' operation of the Union Elevated Railway Co., of Chicago, have been officially stated. The gross earnings of the loop for the year will be about \$475,000 to amount to \$280,582 or an average of about \$40,000 a month. and the net earnings will be a little less than 5 per cent on the stock.

## THE PHILADELPHIA CO.

Circulars were issued to the stockholders of the Philadelphia Co. on November 18th giving the details of the consolidation of the roads in and about Pittsburg which has been concluded by this company. The companies involved in this deal are the Consolidated Traction Co. of Pittsburg, the Monongahela City Railway Co., owned by the Mellon Syndicate; the Pittsburg & Birmingham Traction Co., the Pittsburg & Charlevoix Street Railway Co., the Monongahela Light & Power Co. and the Southern Traction Co. The stock of the Consolidated Traction Co. which is capitalized at \$27,000,000 will be bought outright on the basis of one share of



Philadelphia Co. common stock for two shares of Consolidated common stock. The Monongahela City Ry. is to be leased for 999 years for \$165,000 for the first year and increasing at the rate of \$18,750 each year until the annual sum of \$315,000 is reached, which will be the fixed rental for the remainder of the lease. The Pittsburgh & Birmingham Traction Co. is also to be leased for 999 years for \$150,000 a year during that time. The Pittsburgh & Charleroi Street Railway Co. is leased for the same term for \$35,000 a year and the Monongahela Light & Power Co. for the same time for \$85,000. The Southern Transit Co. will be bought outright on the basis of one preferred and one common share for one common share of the Philadelphia Co. The Philadelphia Co. will increase its bonded debt to \$22,000,000. A meeting of the stockholders of the company was held on December 4th at which these actions of the directors were ratified.

#### BROOKLYN RAPID TRANSIT CO.

The comparative statement of operations for the months of October, 1900 and 1901, has been issued by the Brooklyn Rapid Transit Co., which includes the statistics of all the subsidiary companies of this system:

	1901	1900	Increase
Miles of track operated.....	489.3	488.9	.40
Gross receipts .....	\$1,067,106.30	\$991,454.00	\$75,652.30
Expenses including taxes.....	772,396.06	639,982.07	132,413.99
Net receipts .....	294,710.24	351,471.93	*\$56,761.69

\*Decrease.

A similar statement for the four months ending October 31st is also given as follows:

	1901	1900	Increase
Miles operated single track)	489.3	488.9	.40
Gross receipts .....	\$4,500,706.82	\$4,217,912.07	\$282,794.75
Expenses, including taxes....	3,031,519.22	2,601,524.62	429,994.60
Net receipts .....	1,469,187.60	1,616,387.45	*\$147,199.85

\*Decrease.

#### JERSEY CITY, HOBOKEN & PATTERSON STREET RAILWAY CO.

The annual report of the Jersey City, Hoboken & Patterson Street Railway Co. was presented by President David Young at the annual meeting of stockholders held Nov. 4, 1901. The report included the following figures: Receipts from passengers, \$1,535,575; receipts from other sources, \$19,095; gross receipts, \$1,554,670; operating expenses, \$803,025; net earnings, \$751,644; fixed charges, \$697,356; net proceeds, \$54,288. While the net profit is considerable less than that for 1900 the decrease is due to the heavy expenses incurred during the year, including which was the new franchise tax. Another important expense was the building of new car barns and shops in West Hoboken. New cars have also been added on nearly every line owned by the company during the past year.

#### CONSOLIDATED TRACTION CO.

The monthly report to the stockholders of the Consolidated Traction Co., of Pittsburgh, Pa., contains a comparative statement for the months ending October 31, 1900 and 1901. The figures are as follows:

	1901	1900
Gross earnings from operations.....	\$277,007.47	\$257,179.76
Operating expenses .....	126,260.68	108,137.35
Net earnings from operations.....	150,746.79	149,042.41
Total net earnings and other income....	179,491.13	177,140.27
Total deductions from income.....	63,974.05	63,212.85
Total income .....	115,517.08	113,927.42
Fixed charges .....	86,143.33	86,475.84
Surplus .....	29,373.75	27,451.58

#### TWIN CITY RAPID TRANSIT CO.

The earnings of the Twin City Rapid Transit Co. have shown a steady increase in the past year and the showing for the first nine months of the year is considered to be a remarkable one. From January to September inclusive, the gross earnings amounted to \$2,340,164, an increase of \$238,135 over that of 1900. The net

earnings for the same period amounted to \$1,271,318, which is an increase of \$150,204 over 1900. The surplus after deducting taxes, interest and 7 per cent dividends on preferred stock is \$610,544, or an increase of \$116,673 over 1900. From these figures it is estimated that the company's earnings for 1901 will approximate \$3,200,000. In view of the proposed addition to the system it has been reported that many improvements, extensions and new lines are contemplated in the near future.

#### METROPOLITAN STREET RAILWAY CO.

The Metropolitan Street Railway Co., of New York City, reports for the quarter ending September 30th as follows:

Gross income, \$3,596,545; operating expenses, \$1,563,260; total income, \$2,187,025; fixed charges, \$1,148,714; balance, \$1,038,311; dividends, \$910,000; surplus, \$128,311. This shows an increase of \$151,176 in gross earnings over the same period of 1900 and an increase in the surplus for the same period of \$114,026.

#### ROME CITY STREET RAILWAY CO.

The report of the Rome City Street Railway Co., of Rome, N. Y., for the quarter ending September 30th has been published and gives the following figures: Gross earnings, \$3,243; operating expenses, \$4,982; net loss, \$1,739; other income, \$141; gross loss, \$1,598; fixed charges, \$1,605; deficit for quarter, \$3,203.

#### AN OPPORTUNITY IN TEXAS.

Mr. George W. Lindsay, who was formerly general manager of the Gainesville (Tex.) Park Street Railway Co., advises us that that company, which operated a mule line, has ceased to exist, those interested not being in a position necessary to make the investment needed to equip the line for electricity. Mr. Lindsay regards the field as a good one for an energetic street railway man. He states that there are about 8,000 inhabitants within a distance of 6 or 7 miles of the road. The profile of the road is a gradual incline leading to the bluff above the river. The summit affords a grand view for many miles in all directions. A stream of considerable size drains a large area of the heights and a dam across this stream can be easily erected, making a fine artificial lake for park purposes. Fishing, boating and bathing with other park attractions would secure a large patronage from the Gainesville people during all seasons of the year. The road to the heights could also be run past the cemetery, a route which, while involving considerable expense, would largely increase the patronage of the line. Mr. Lindsay would be glad to furnish any information desired by interested parties.

#### CONSOLIDATION IN OHIO.

The consolidation of the Ohio and Indiana Traction Co., and the Toledo-Bryan Air Line Railway Co. was completed last month and is now in full effect. The name of the consolidated company is the Ohio & Indiana Air Line Railway Co. and its plans include an extension which will eventually make a road from Toledo, O., to Marion, Ind., a distance of 157 miles. The construction of the road will be pushed rapidly as soon as the weather permits in the spring. The franchise and right of way from Toledo to Bryan and from Bryan to Marion, through Ft. Wayne, has been secured and transferred to the new company. A prospectus which has been recently issued announces that this road has secured the exclusive right in the territory covered by its lines to use the Bonner road wagon for shipment of farm products to the terminal markets without reloading. The general design of these wagons has been described at various times in the columns of the "Review" and the railway company will provide a depot where the loaded wagons will be delivered. The farmer or merchant desiring the use of one of the wagons will signal a passing train of them and one will be left on the nearest side track to accommodate him. The railway company proposes to make collections and deliveries from store to store with its own teams and it claims that farmers and merchants will be able to have coal, lime, brick and other heavy freight, as well as ordinary merchandise, transported at a cost far below that of teaming.



### HALF FARES.

The new electric line between St. Albans, Vt., and Swanton Junction, is nearing completion.

The Oklahoma City Railway Co. has been granted a 20-year franchise. Its capital stock is \$200,000.

The Danville, Ill.) Paxton & Northern Electric Ry. has closed a contract for building a depot at Westville.

The new interurban which is being built between Grand Rapids and Jackson, Mich., has secured a franchise in Eaton Rapids.

The regular quarterly dividends of 1 per cent on the stock of the Chicago South Side Elevated road was declared December 5th.

The Fort Dodge (Ia.) Light & Power Co. has installed a new 200-h. p. engine for the operation of the local street railway system.

The Milwaukee Electric Railway & Light Co. has put a new rule in effect requiring passengers who desire transfers to ask for them at the time of paying their fare.

The Lewiston, Brunswick & Bath Street Railway Co. has sold its menagerie of wild animals at Merrymeeting Park, near Brunswick, Me., to the New York Zoological Society.

The Union Traction Co., of Indiana, has agreed to contribute 5 per cent of any sum that the business men of Muncie, Ind., may raise for the advancement of the industrial interests of that city.

The Detroit, Howell & Lansing Railway Co. has filed amended articles, changing its name to the Detroit, Howell, Lansing & Grand Rapids Railway Co., and providing for an extension to Grand Rapids.

The Kenosha Street Railway Co. has increased its capital stock from \$25,000 to \$50,000, and has issued \$150,000 in bonds, which were taken by the present stockholders. Mr. B. J. Arnold is president of the company.

The Lewiston, Brunswick (Me.) & Bath Street Railway Co. has inaugurated an express service between Lisbon Falls, Sabatis and Lewiston, which, if it prove a fortunate step, will be extended to Brunswick and Bath.

The Cincinnati & Columbus Traction Co. has been granted a 25-year franchise to operate its cars through the village of Madisonville. The company has agreed to grant a five-cent fare between Madisonville and Cincinnati.

During a snow storm on December 3d a trolley car in Poughkeepsie got beyond the motorman's control and ran down a steep grade into the Hudson River. There were five passengers on board, one of whom was drowned.

The Utica (N. Y.) & Mohawk Valley Railroad Co. has surveyed several routes for its double track road between Frankfort and Ilion and it has finally decided to build its line on a private right of way on the south side of the Erie Canal.

Negotiations are pending with a view to the consolidation of the Rapid Transit Railway Co., of Chattanooga, Tenn., and the Chattanooga Electric Railway Co. If this is effected a large amount will be spent on improvements and extensions.

All difficulties between the Aurora, (Ill.) Wheaton & Chicago Railway Co. and the city of Aurora have been adjusted, the city conceding terminal facilities and the company agreeing to pave one of the principal streets through which its line will run.

Trackson & Co., of Brisbane, Queensland, project an eight-mile street railway in Rockhampton, which will cost, including rolling stock and other equipment, about \$300,000. The overhead trolley system is recommended, and it is proposed to operate 14 cars.

The Louisville, (Ky.) Anchorage & Pewee Valley Electric Railroad Co. has opened its new 16-mile line between Louisville and Pewee Valley. Five modern passenger cars with separate compartments for whites and blacks, and an express and baggage car are operated.

The Newcastle, (Ind.) Cadiz, Markleville, Pendleton & Western Railroad Co., which was recently incorporated with a capital of \$500,000 proposes building a 20-mile electric line, which in connection with Union Traction lines at Pendleton will afford a direct route from Newcastle to Indianapolis.

The franchise granted in August, 1901, by the Elwood city council to the Central Traction Co. for an electric road from that city to Indianapolis by way of Atlanta, has been extended for another year. The company gave a bond in the sum of \$1,000 for the completion of the line to Atlanta by Jan 1, 1903.

An interurban company proposing to build a line between Madison & Janesville, Wis., has received a 50-year franchise from the Stoughton common council. It is stated that the installation of a railway and power system is assured in Madison and the surrounding cities which will cost in the neighborhood of \$1,000,000.

Work on the Oshkosh-Omro interurban line which is being built by the Columbia Construction Co. has been suspended owing to the severe cold weather and will not be continued until spring. It was expected to have gone into operation by Christmas, but delays in receiving the necessary supplies has made this impossible.

The Milwaukee & Lake Geneva Street Railway Co. has petitioned for a new franchise which will enable it to carry freight, express and mail matter in addition to passengers. The amended ordinance is practically the same as the old one with the exception of the provision concerning freight, which was at first omitted through an oversight.

The Rockford-Belvedere Electric Railway Co., of Rockford, Ill., is preparing plans for a new car barn and freight house which will be erected on South Wyman St. The building will be 66x450 ft. in area and will be built entirely of steel. The freight and express rooms will be designed for the rapid and convenient handling of this business.

The proposed electric railway connecting Dubuque, Ia., with Bloomington and several other towns in Illinois and Wisconsin will probably be under construction by early spring. Mr. Flynn, the promoter of the enterprise, states that the line will extend from Dubuque to Bloomington, a distance of 96 miles, and will pass through East Dubuque, Hazel Green, Cuba City, Platteville and Lancaster.

A circular letter was recently sent out by the Amalgamated Association to the various labor unions of Philadelphia asking them to appoint a joint committee to call upon the Union Traction Co. in regard to existing grievances. A committee representing the Philadelphia Street Railway Employees' Union and Relief Association called upon Mr. John B. Parsons, president of the Union Traction Co., repudiating the circular letter and requesting the company not to grant an interview to any such committee.

### ELECTRICITY FOR NEW YORK TERMINAL OF PENNSYLVANIA R. R.

The Pennsylvania has decided upon plans for securing an entrance into New York City and connecting with the Long Island R. R., and the Pennsylvania-New York Extension Railroad Co. has been incorporated to carry out the work. Briefly the plans include: A two-track tunnel under the North River to 33d St., Manhattan. Four tracks in deep level tunnels across Manhattan Island. Four single-track tunnels under East River. A terminal station for the joint use of the Pennsylvania and the Long Island roads will be built underground between 32d and 33d Sts. and 7th and 9th Aves., Manhattan. The underground lines will all be operated electrically.

## NEW CARS FOR UTICA.

The semi-convertible car exhibited in Madison Square Garden during the recent A. S. R. A. Convention, and which attracted a great deal of favorable attention, was one of a lot of 22 now building by the J. G. Brill Co., for the Utica Belt Line Street Railway Co., of Utica, N. Y. This car, which is of the semi-convertible type, is illustrated herewith in exterior and interior views. It is 34 ft. 4 in. long over the end panels and 8 ft. wide at the sills. It has two vestibule platforms 4 ft. 8½ in. long and the feature which makes it adaptable to all seasons and changes of weather is the arrangement of the sash. The windows are large and the whole of the double sash can be raised into pockets in the roof with only the same effort that is required to handle the common drop sash. By means of these windows the cars can be adapted to any weather conditions at a moment's notice. Except for the side entrances, it is practically an open car when the sash is raised, and for sub-



NEW CAR FOR UTICA, N. Y. J. G. BRILL CO.

urban work it is found advantageous to retain the low protecting sides and dispense with the side entrances. As the sash are not removed from the car the danger of breakage of glass is avoided as well as the expense of making the change where the sash have to be taken out and stored.

The vestibule platforms have openings only on the right hand side. The outer platform timbers are reinforced with angle irons and each platform has four large sash in addition to those in the doors. The latter are of the folding style. The front of the vestibules are sheathed with steel and at each end is a Brill angle iron bumper. The forward platform is provided with two sand boxes



INTERIOR OF CAR

operated by a foot pedal. The inside finish of the cars is of mahogany inlaid and the ceiling is decorated three-ply veneer.

The construction of the car is such that a gain of over 6 in. is made on the inside width without increasing the outside dimensions. This makes the use of car seats 36 in. long available, which still leave an aisle of good width. There are no basket racks in the car which have proved a great convenience on suburban lines. From one of the illustrations it will be seen that the body of the car is divided into two compartments, the forward one embracing the transverse seat, and the longitudinal one in the corner. The door in the partition is the full width of the aisle. Each corner of the car has one longitudinal seat, the others being transverse. Electric

heaters are placed under alternate seats. The forward dasher has an electric headlight; all the windows are fitted with metal weather strips. The trim throughout is bronze with wood grab handles, and the car is fitted with push buttons and signal bells. The trolley board is laid on rubber and is placed at the rear of the roof as the car runs in one direction only. The body is mounted on No. 27 Brill trucks and contains a four-motor equipment. It is provided with air brakes and Brill track scrapers and the entire equipment is extremely complete in all details.

## TESTS OF "COMPO" PULLEYS.

During the past summer extensive tests were made at the Worcester Polytechnic Institute, Worcester, Mass., by C. M. Allen, M. S., of Worcester, and F. C. Furlow, M. E., of the Georgia School of Technology, to compare the relative power-transmitting proper-

ties of the various standard pulleys and compare them with those of the iron and wood pulleys with cork insertions. The standard pulleys used were the smooth iron-face pulley, the ordinary wood, and the wood with leather face. The pulleys with cork inserts are known as the "Compo" and were made by the Allston Foundry Co., Boston, Mass.

The iron "Compo" pulley was about 18 in. in diameter with 6¼-in. face; four staggered rows of 1-in. holes were bored out on the rim 2½-in. apart. These holes were ½ in. deep and slightly larger at the bottom; into these pieces of cork 1¼ in. in diameter and ¾ in. thick were forced. For the wood pulley 1-in. holes were bored in the face and similarly filled with cork.

The conclusions of Messrs. Allen and Furlow are thus stated: "Results of the tests show that when the belt is in the least favorable condition for the 'Compo' or iron pulley with cork inserts, this pulley carries more load with allowable slip than any of the others, and when the belt is in the least favorable condition (i. e., dry) for the plain iron, wood, and wood with leather face, the increase in favor of the 'Compo' or iron pulley with cork inserts is more marked. From the average results of over one hundred tests, the 'Compo' or iron pulley with cork inserts at a point of 2 per cent slip (which is considered allowable in commercial practice) shows an increase in its power-transmitting capacity of 51 per cent over the plain iron pulley."

The Allston Foundry Co., of which Mr. W. W. Whitcomb is president, also makes cork inserts for friction clutches and some of the clutches so fitted were also tested by Mr. Allen with equally satisfactory results.

## FOG CAUSES ACCIDENTS IN CHICAGO.

A dense fog on the morning of November 19th caused much trouble and delay in the operation of the Chicago transportation lines, and there were seven rear-end collisions on the elevated roads; only one of these could be called serious, however. About 7:15 a. m. a crowded train on the Metropolitan Elevated was struck near West Adams St. on the Logan Sq. and Humboldt Park division. One passenger was killed and 11 other persons were reported as more or less injured.

The other collisions were at the Ann St. station and at Homan Ave. on the Lake Street Elevated; between Ogden and Mansfield stations, near Grand Ave., and at West Chicago Ave. stations of the Metropolitan; between Madison and Monroe Aves. on the 63d St. line of the South Side Elevated.



## OHIO NOTES.

The Columbus, New Albany & Johnstown Traction Co. hopes to be able to run cars as far as Gahanna, Franklin County, by December 15th. Mr. D. J. Ryan, president of the company, in order to ascertain the amount of farm products reaching Columbus from the section through which his road passes, stationed a man on one of the turnpike bridges. This man found that within the period of a few weeks there passed over this bridge 180,000 tons of baled hay. This was one item alone and other farm products reach the Columbus market in like proportions in the ordinary road wagons. This immense amount of farm products the new company expects to handle in the future. Mr. Ryan states that it has ordered a number of new cars for this purpose; these cars will be painted a bright yellow color the same as the passenger cars. It is expected to have a freight depot in the heart of the city.

The Ohio State Board of Appraisers is considering the returns of the Cincinnati & Covington Street Railway Co. In making returns to the state auditor for payment of the excise tax, the street railway deducted from receipts the sum of \$24,000, which is paid annually to the Cincinnati & Covington Bridge Co. for tolls, which the state board contends should not be done though it has been the practice for several years.

The Cincinnati Traction Co. has decided to operate during the holidays an inner belt line for the convenience of patrons. The belt will extend about five squares in each direction around the retail district, and will be operated only during the day and evening while the traffic is heaviest and transfers will be received from and given to any other line in the city.

The village council of Mason, Warren County, has granted a franchise to the Rapid Railway Co. This gives the company a clear right from Mason to Norwood, a distance of about 16 miles through the villages of Montgomery, Deer Park, Silverton, Kennedy and Pleasant Ridge. The company will next seek franchises through South Lebanon and King Mills, through which the line will pass before entering Lebanon.

A new interurban was incorporated early in December under the name of the Mt. Vernon, Mt. Gilead & Western Electric Railway Co. This line is to run west from Mt. Vernon through Fredericktown, Chester, Mt. Gilead to Marion, the western terminus. A branch is intended north from Mt. Gilead to Galion and one south from Mt. Gilead to Delaware. The incorporators are John W. Barry, U. G. Denman, C. D. Smiley, U. S. Wayne, Harry Grotz, A. E. McVety. The capital stock was at present fixed at \$10,000.

A certificate of consolidation of the Tuscarawas Railroad Co. and the Tuscarawas Electric Co. has been filed with the secretary of state. The consolidated company will be known as the Tuscarawas Traction Co. and will have a capital stock of \$350,000. The directors of the company are F. T. Pomeroy, Cleveland, president; J. A. Reuterford, Cleveland, vice-president; J. O. Wilson, Cleveland, secretary; Will Akins, New Philadelphia, treasurer; George W. Bowers, New Philadelphia, Theo. Wentz, New Philadelphia, and Will Christy, Akron.

Mr. Will Christy, president of the Southern Ohio Traction Co., has issued letters to the stockholders of that company stating that the board of directors has decided on the consolidation of that company with the Miamisburg & Germantown Traction Co., the Cincinnati & Northwestern Railroad Co. and the Hamilton & Lindenwald Electric Transit Co.

The Columbus, London & Springfield Electric Railway Co. is pushing the work both on the main line to Springfield and its southwestern branch to Morgans Station, about 16 miles from Columbus. Cars are running about 14 miles now in both directions, and work is progressing very satisfactorily, though the company is hampered with several injunction suits growing out of some petty animosities. Work on the Columbus, Buckeye Lake & Newark Traction line is also being pushed forward from both ends of the line. The numerous other lines are forging right ahead with their work also and another year will witness the Buckeye capital one of the most important traction centers in the country.

Work on the line between Lorain and Sandusky has at last been completed and the first cars passed over the line made the run on December 7th. This completes the last link between Cleveland and Toledo by way of Lorain, Sandusky, Norwalk and Fremont.

The Southern Ohio Traction company will probably enter Cin-

cinnati along the bank of the Miami and Erie canal, and has made application for a franchise over part of the line already.

## STREET RAILWAY SECURITIES AS A SPECIALTY.

Mr. J. D. Harvey, First National Bank Building, Chicago, is devoting particular attention to the placing of bonds and other securities of electric railways, and interesting capital in new street railway enterprises. This is a specialization which is the natural result of the extremely rapid development of the electrical railway industry and must, we feel sure, be of great benefit inasmuch as it enables the promoters of new roads to have fuller opportunity of presenting their plans to investors whom it is desired to interest. The development of specialists in this line is an advance in the right direction.

## PROVIDENCE FENDERS.

The Consolidated Car Fender Co., of New York, has opened a very attractive exhibition room on the second floor of the Taylor Building, 39 Cortlandt St., New York. This is the same building in which the company has its general offices, and the room is intended for the convenience of visitors who desire to obtain accurate information concerning the "Providence" fenders. In the room are full-sized samples of the various styles of the fenders shown as they appear attached to the platform of an electric car. A model of a car frame is also exhibited with the "Milton" car step lifter, and the "Campbell" snow broom, both of which specialties are handled by the Consolidated company. The exhibit is practically the same as the company had at the Madison Square Garden during the recent railway convention.

## MONARCH ENGINE-STOP.

The Monarch Manufacturing Co. has sold its interest in the well-known "Monarch" engine-stop to the Consolidated Engine-Stop Co., of Waterbury, Conn., a corporation recently formed for the purpose of uniting all the principal interests in the engine-stop business. The officers of the new company are as follows: President, George E. Terry; secretary, L. W. Sweet, former general manager of the Monarch Manufacturing Co.; treasurer, Charles M. Heminway.

The new company has recently closed a contract with B. B. & R. Knight; Providence, R. I., for supplying 27 complete "Monarch" equipments for all the engines in the Knight cotton factories, comprising 15 or more of the largest mills in the country. This order is good proof that the Monarch stop has become a necessity in all well regulated engine rooms. The Consolidated Engine-Stop Co. was awarded the highest medal at the Pan-American Exposition.

## EQUITABLE TRUST CO., CHICAGO.

The Equitable Trust Co., of Chicago, is probably the only one of the large trust companies in this country which confines itself strictly to the administration of trusts; contrary to the usual practice this company does no banking business and does not receive deposits payable upon demand. The company is organized under the laws of Illinois and acts as executor, administrator, conservator, guardian, assignee, receiver and trustee. One branch of its business is acting as agent for the registration and transfer of stocks and bonds of corporations, for the payment of coupons, interest and dividends and for the handling of sinking funds.

The capital of the company paid in is \$500,000 and the surplus and profits at this time are \$200,000. The directors of the company are: Charles H. Hulburd, George F. Jennings, Maurice Rosenfeld, George T. Smith, John M. Smyth, J. R. Walsh and L. A. Lawton. The officers are: President, J. R. Walsh; vice-president, L. A. Lawton; secretary and treasurer, C. D. Organ; assistant secretary and assistant treasurer, C. Huntoon. The company occupies the building at No. 152 Monroe St., Chicago.



## ECHOES FROM THE TRADE

THE CONSOLIDATED CAR-HEATING CO. was awarded a silver medal for car heating apparatus at the Pan-American Exposition.

H. M. SHAW & CO., 115 Broadway, New York, have taken the agency of the Banner Electric Co., of Youngstown, O., maker of incandescent electric lamps.

GRAPHITE, the monthly publication of the Joseph Dixon Crucible Co., of Jersey City, N. J., has appeared for December and contains its usual budget of news in regard to the numerous products of this company.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has issued Circular No. 1057 illustrating and describing "O. D. Transformers," and Circular No. 1055 on "Alternating Current Switchboards for Polyphase Circuits."

W. S. BROWN, of New York, representing the Chase-Shawmut Co., of Boston, is to furnish "enclosed fuses" for the entire car equipment of the Manhattan Ry., of New York. The order amounts to about 10,000 fuses and is believed to be the largest fuse order ever placed.

THE USE OF OKONITE wire for telephone work has been increasing steadily, and has now reached such proportions that in order to supply the demand the Central Electric Co. is compelled to carry in Chicago a large stock of this grade of wire as well as "Okonite" wires and cables for lighting purposes.

WILLIAM M. WAMPLER, representing the Stuart-Howland Co., of Boston, has opened offices in the Havemeyer Building, New York City, where a cordial reception always awaits the many friends and customers of the company he represents. Mr. Wampler reports some good orders for railway and lighting supplies.

HARTSHORN'S ROLLER, a monthly publication of the Stewart Hartshorn Co., of East Newark, N. J., has been published for November. This publication, while devoted very largely to descriptions of the products of this company, contains besides a large number of excellent humorous illustrations and articles.

THE BURT MANUFACTURING CO., of Akron, O., has recently received an order from the De Beers Consolidated Mining Co., Ltd., of Kimberley, South Africa, for a very large "Cross" oil filter to be used in its new power house. Only American machinery will be used in this plant and the Burt company considers this a strong endorsement for its filter.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has issued a Pan-American Exposition bulletin illustrating and describing the various applications of the chloride accumulator to lighting and power plants. The illustrations are taken from plants in actual operation, and a number of diagrams and curves show the value of this apparatus for regulating purposes and for carrying overloads.

THE SPRAGUE ELECTRIC CO., of New York, has issued a bulletin, No. 207, which describes the various uses to which the Lundell motors, made by this company, may be adapted. These motors are made in sizes of from 1-20 h. p. to 1,000 h. p. and in either the enclosed or open type. They can be belted, geared or direct connected and may be attached to the wall or the ceiling. A

number of illustrations are given of these machines in connection with various printing presses, machinery, tools, looms, fans, etc.

THE UNITED STATES ELECTRIC SIGNAL CO., formerly of Watertown, Mass., has removed to No. 20 Westwood St., West Newton, Mass., where it has a new factory with greatly enlarged and improved facilities. The company has met with great success in introducing its signal system on street railways and the indications all point to further increases in the business between now and spring.

THE GOLD CAR HEATING CO., of New York, sends us the following notice concerning T. H. Symington & Co., its Baltimore agents: "Pending the completion of many tests of their specialties in various parts of the country, the business of T. H. Symington & Co., of Baltimore, Md., will be conducted as heretofore from their Baltimore office under the direct supervision of Mr. Harvey Middleton, managing director. Mr. W. R. Bean has been appointed general inspector of the company, and will look after these tests."

THE VICTOR COOLING TOWER CO., of St. Louis, Mo., has published a new catalog, No. 11, relating to its water cooling towers for condensing engines. The catalog contains a number of illustrations of these towers showing their method of connection to the plant and other details, and also contains an interesting treatise on the subject of condensing water. These towers are made for cooling both by means of mechanical draft and by chimney draft, and are rapidly going into extensive use in electric light and street railway plants.

THE DE LAVAL STEAM TURBINE CO., of New York, has published a catalog of its steam turbines which are used in connection with dynamos, blowers, pumps, fire engines and for almost all purposes where a prime mover is required. The catalog opens with a treatise on the thermodynamic principles of the steam turbine and gives a number of curves showing the steam consumption per brake horse power per hour and a comparison of efficiencies at various loads. This is followed by a general description of the mechanical features of the steam turbine, and the book also contains reports of various tests made on these machines.

THE WESTERN ELECTRICAL SUPPLY CO., of St. Louis, reports that the electric railway department is being crowded with orders. The company is prepared to furnish, through the coming winter months, a complete line of snow plows, track cleaners, sweepers, sleet cutting trolley wheels and everything necessary to protect a road through the winter months. This company is one of the largest jobbers of electric railway supplies in the United States and carries in St. Louis stock a complete line of everything necessary for the operation and maintenance of electric railways. It issues what is believed to be the most complete electric railway catalog in the business, which is mailed on application.

THE WHEEL TRUING BRAKE SHOE CO., of Detroit, Mich., maker of wheel truing brake shoes, is mailing a card to its friends and customers giving a large list of street railways which are using these brake shoes. The wheel truing brake shoe is made with three blocks of emery inserted in the face of the shoe, one at each end and one at the center, by means of which any flat spots or inequalities on the tread or flange of the wheel are ground off by the action of the brake. The list of railroads using these shoes to which the company refers is a long one and includes a number of prominent systems such as the Boston Elevated Railroad Co., Boston, Mass.; Atlanta Rapid Transit Co., Atlanta, Ga.; Cleveland City Railway Co., Cleveland, O.; Milwaukee Electric Railway & Light Co., Mil-

waukee, Wis.; Market Street Railway Co., San Francisco, Cal.; Cincinnati Traction Co., Cincinnati, O., and a large number of other roads too numerous to mention.

THE CONSOLIDATED CAR HEATING CO. has moved its New York office from Havemeyer Building to Room 634 Park Row Building.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has installed 158 batteries of "chloride accumulators" in street railway service, for the purpose of regulation, carrying the peak during heavy traffic and for use in emergencies. These batteries representing over 103,000 kw. h. of output are installed in power houses, substations and rotary transformer stations, and cover every application of storage batteries to street railway service. Among recent installations are those for the Detroit United Railway Co., consisting of 250 cells of type 53-G; the Chicago City Railway Co., 250 cells of 39-G; the Southern Ohio Traction Co., 290 cells of 11-F; and the Fairmount & Clarksburg R. R., 250 cells of 11-E.

FISHER & SAXTON CO., of Washington, D. C., are meeting with much success with their machine for mixing and distributing concrete called the "Dromedary" mixer. This is in the form of a cylinder mounted on a pair of wheels and an axle, which is drawn by a horse and is arranged so that the work of both the mixers and wheelers is done by the horse. It takes the place of the mixing platform, the wheelbarrows, most of the plank and many of the tools of the ordinary outfit and is especially useful in building duct lines, setting poles in concrete or doing any kind of concrete work on the street. The mixer is arranged to dump automatically and does away with almost all of the manual labor of preparing and distributing concrete.

THE WESTERN ELECTRICAL SUPPLY CO., of St. Louis, is now introducing what it claims to be the best track sanding device ever shown. This is the Nichols track sander, the good points of which are thus stated: It is absolutely air and water tight in all points exposed to water and mud, which completely eliminates a most frequent source of trouble of ordinary track sanders. It has no complicated system of levers or valves. It can be located in any desired point, can be applied without cutting or changing anything on the car, and is instantaneous in operation. On roads with heavy grades it is especially adapted for equipping each end of the car, thus lessening liability to accident and very nearly doing away with flat wheels, which are often due to an indiscreet use of sand. It works instantaneously, and can be applied without any extra effort on the part of the operator. The company has issued a very attractive pamphlet, fully describing and illustrating the sander, which will be mailed on application.

THE LUDLOW SUPPLY CO., which was established about two months ago, with office at 313 Electric Bldg., Cleveland, is now representing the following well-known manufacturers: Morris Electric Co., New York, rail bonds and "Monarch" fare registers; Speer Carbon Co., St. Marys, Pa., carbon brushes; Chisholm & Moore Manufacturing Co., Cleveland, "American Standard" rail joints, rail braces, rail chairs, chain hoists and traveling cranes; Garton-Daniels Co., Keokuk, Ia., lightning arresters; Globe Electric Manufacturing Co., Cleveland, arc and incandescent headlights; The Nichols-Lintern Co., Cleveland, the "Nichols" track sander; Bierbaum & Merrick Metal Co., Buffalo, "Lumen" journal bearings and trolley wheels; Delaware Hard Fiber Co., Wilmington, Del., hard fiber; American Hard Rubber Co., New York, hard rubber; National Elastic Nut Co., Milwaukee, track bolts. The Ludlow Co. is also negotiating for other agencies; it is not the intention to handle a stock at present, but it will probably do so later. The Ludlow Supply Co. is the first general electric railway supply house in Cleveland, which is rapidly becoming one of the largest centers of electric railway construction in the country.

THE LAUFKETTER-BENDIT M. E. CO., of St. Louis, has received the following letter from the Compania de Tranvias de Lerdo á Terreon, Mexico: "We have installed an 8 by 30-ft. 'Victor' cooling tower, which has been in daily use for the past eight months and is giving entire satisfaction. It is substantially

built and easily put up, and the stamped filling is in our opinion better than the tubing as used in some towers, as the water seems to be broken up better and consequently relieved of the heat easier. We find that when not drawing water from the condenser for boiler feed, no additional water is required to maintain the service; in fact, there is always a small overflow. We have placed in the hot well of our tower a float valve connected with the cold water tank, and if we draw off hot water for the boilers it is instantly replaced by cold water from the supply tank." Also the following letter from the Consumers Ice Co., of Laredo, Tex., giving some details concerning the operation of a "Victor" tower at its plant: "During 20 days in June water was measured, the meter showing an average of 315 gallons per hour for 12 to 16 hours per day; the meter was then taken out and the water company made us a flat rate of \$15 per month for the water we used. August 16th the water was delivered to the tower at 125° and reduced to 86°, the temperature of the atmosphere being 96°."

## STREET RAILWAY PATENTS ISSUED IN NOVEMBER, 1901.

This list is furnished by T. Reed Clift, Patent Attorney, Washington, D. C., from whom copies of the patents mentioned can be secured for ten cents each.

No. 685,755, Nov. 5, Frank W. Garrett and Emmett W. Stull, Johnstown, Pa. Controller for electric railway-motors.

No. 685,781, Same.

No. 685,795, Nov. 5, Charles J. Reed, Philadelphia, Pa. Means for operating and controlling electric motors.

No. 685,796, Same.

No. 685,822, Nov. 5, John H. Cook, Brooklyn, N. Y. Switch for overhead trolleys.

No. 685,841, Nov. 5, Andrew Johnson, Concord, N. H. Dust guard for car axles.

No. 685,852, Nov. 5, Christian W. Kragh, Madison, Wis. Motor starting and controlling device.

No. 685,996, Nov. 5, Daniel B. Littlefield, Chicago, Ill. Device for anchoring railway tracks.

No. 686,017, Nov. 5, Milford J. Wilson, Painesville, O. Trolley.

No. 686,048, Nov. 5, George J. Gahring, Oil City, Pa. Emergency brake for street cars.

No. 686,110, Nov. 5, Edward A. Munson, Grand Rapids, Mich. Car mover.

No. 686,152, Nov. 5, Albert W. Smith, Washington, D. C. Motor.

No. 686,161, Nov. 5, George A. Stenson, Wilmerding, Pa. Annunciator for street cars.

No. 686,169, Nov. 5, William P. Tucker, Brooklyn, N. Y. Car fender.

No. 686,172, Nov. 5, Harlan P. Wellman, Ashland, Ky. Electric headlight lamp.

No. 686,212, Nov. 5, Anton Duppler, Jersey City, N. J. Mechanism for operating brakes.

No. 686,217, Nov. 5, Ephraim W. Fairbanks, Los Angeles, Cal. Divided axle car truck.

No. 686,241, Nov. 12, Robert E. Alexander, Forest City, Pa. Car replacer.

No. 686,341, Nov. 12, Charles Schlechtiger, Nantasket, Mass., and Robert Bingham, Philadelphia, Pa. Third rail safety system for electric railroads.

No. 686,644, Nov. 12, Lyates Woods, New York, N. Y. Electric railway.

No. 686,651, Nov. 12, George W. Gurten, Piqua, O. Trolley wire hanger.

No. 686,715, Nov. 19, Seth A. Crone, New York, N. Y. Dust guard for car axle boxes.

No. 686,768, Nov. 19, Gordon J. Scott, Philadelphia, Pa. System of electrical propulsion for railway or other cars.

No. 686,794, Nov. 19, Ransom C. Wright, Philadelphia, Pa., and Frank E. Stebbins, Washington, D. C. Car truck.

No. 686,795 and 686,796, Same.

No. 686,797, Nov. 19, Frank B. Anderson, Dayton, O. Tramway for street cars.

No. 686,969, Nov. 19, Charles H. Hofmeister, St. Louis, Mo. Car fender.

No. 686,988, Nov. 19, William P. L. Pentland, Baltimore, Md. Track sanding apparatus for cars.



No. 687,089, Nov. 19, Jacinto V. Velasco, Keywest, Fla. Safety appliance for trains.

Re-issue No. 11,945, Nov. 19, Alfred Green, Rochester, N. Y. Brake.

No. 687,318, Nov. 26, Carl Klaassen, Wandbeck, Germany. Combined fender and net for street railway cars.

No. 687,368, Nov. 26, Frank W. Chaffee, Albany, N. Y. Gas regulating equipment for railway cars.

No. 687,452, Nov. 26, George E. Chapman and George L. Ensign, Cleveland, O. Trolley.

No. 687,453, Nov. 26, Luther R. Faught, Philadelphia, Pa. Car wheel.

No. 687,493, Nov. 26, Chalmer Carpenter, Swissvale, Pa. Switch throwing device.

No. 687,507, Nov. 26, Mathew H. Van Dinter, Detroit, Mich. Car fender.

No. 687,545, Nov. 26, John Shelton, St. Louis, Mo. Car brake.

No. 687,577, Nov. 26, James W. Russell, Boston, Mass. Snow plow.

No. 687,616, Nov. 26, Anton Duppler, Jersey City, N. J. Electro-magnet and brake operating connection.

No. 687,630, Nov. 26, Chas. S. Johnson, Brownville, Me. Device for removing ice from tracks.

No. 687,651, Nov. 26, Frederick J. Radford, Trinidad, Col. Self oiling car wheel.

## YOU HAVE ALL DAY IN PITTSBURG

and can be back in Chicago next morning if you make the trip on the Pittsburg Special leaving Chicago Union Station 7:30 p. m. daily, and return on the Chicago Special leaving Pittsburg 6:30 p. m. These trains run every day with vestibule coaches and sleeping cars, including buffet sleeping car, on which lunch is served; also breakfast going and returning. Sleeping car space and tickets can be arranged for in advance by addressing H. R. Dering, A. G. P. Agt., 248 South Clark St., Chicago.

## NEWS NOTES.

**RICHMOND, IND.**—The Richmond & Greenville Traction Co., proposing an electric railway between Richmond and Greenville, O., has been incorporated with a capital stock of \$10,000, and rights of way have been secured over a greater portion of the route.

**BURLINGTON, IA.**—The People's Gas & Electric Co. of Burlington, capitalized at \$200,000, has been incorporated with R. E. Sunny, president; T. P. Bailey vice president and treasurer, and George F. Townsend, secretary, all of Chicago. One of the objects of the company is the construction of a local system of electric railways.

**SHAWANO, WIS.**—The Shawano, Green Bay & Interurban Electric Co., with a capital stock of \$300,000, has been incorporated by Herman G. Dresner, Louis Rollman and John Black, who project a line to connect Shawano, Appleton, Green Bay and Wausau.

**KENOSHA, WIS.**—The Wisconsin Interlakes Electric Railway Co. has been incorporated with a present capitalization of \$25,000 by G. R. McDowell, Jacob Kronske and W. T. Marloff, for the purpose of building a system of electric railways to connect the inland lakes of Wisconsin. The first step in the project will be the construction of a line from Kenosha to the village of Lake Geneva.

**SIOUX FALLS, S. D.**—J. E. Colton, of Colton, S. D., writes us that the Sioux Falls Suburban Traction Co. has been organized to build an electric railway from Sioux Falls to Madison, a project which was noted in the "Review" bulletin November 14th as being promoted by members of the Sioux Falls city council. The officers of the company are as follows: P. F. Sherman, president and treasurer; W. H. Chase, vice president and general manager, and G. M. Root, secretary.

**OAKLAND, CAL.**—The Oakland & San Jose Railroad Co., capitalized at \$2,500,000, has been incorporated for the purpose of operating a system of electric railways between Oakland and San Jose, with three branches extending from San Jose to Santa Clara, Saratoga and Los Gatos, a total distance of 84 miles. Fifty miles of street railways are now in operation over this route, and the remaining 34 will be built at once, the first step in the project being the extension of the Oakland, San Leandro & Hayward Ry. to connect with the local lines of San Jose. The principal stockholders in the Oakland & San Jose company are E. A. Heron, president, and W. F. Kelly, general manager, of the Oakland Transit Co., and Frank M. Smith, F. C. Havens and W. H. Martin, of Oakland.

**DETROIT, MICH.**—F. A. Smart, superintendent of right of way for the Detroit Construction Co., is quoted as stating that work will probably be begun on the proposed electric line from Detroit to Howell, in the early summer.

**BALTIMORE, MD.**—The United Railways & Electric Co. has awarded contracts for the excavating and piling of the proposed addition to its power house on the proposed electric line. The addition will be 90 by 140 ft. in dimensions. W. H. Staub, purchasing agent, may be addressed at the Continental Trust Building, Baltimore.

## PANTASOTE WINS AGAIN.

The Gold Medal Conferred by the Pan-American Exposition.

It is now nearly ten years since Pantasote began to be shown in the market, and for a number of years after its appearance so great was the prejudice against imitations of, or substitutes for, leather, owing to the wretchedly inferior character of all such goods up to that time, that the sales were very limited; nevertheless wherever Pantasote was given an opportunity to prove its merits it won favor and recognition; a signal victory being the winning of the Edward Longstreth Medal of Merit, the highest honor conferred by the Franklin Institute of Philadelphia, which is known and respected all over the world for its scientific investigations and impartial judgments.



In awarding the Medal the Franklin Institute judges said: "The products possess in high degree the qualities of flexibility and imperviousness to moisture and notable freedom from stickiness or brittleness. The appearance of these counterparts and the excellent adaptability of Pantasote leave nothing to be desired." Later in the Report the judges allude to Pantasote as "the best substitute for leather that has thus far been placed on the market." The eventual success of Pantasote induced the manufacture of many imitations, no one of which has ever succeeded in displacing it, and no one of them has ever received an award in competition.

At the Philadelphia Export Exposition of 1899 Pantasote received the highest award and diploma of special merit, and at the Pan-American Exposition just closed received the Gold Medal, the highest award given.

The business of the Pantasote Co. has developed to enormous proportions in this country and in Europe. So closely does the material represent leather, which it is made to imitate in several varieties, that it passes for the finest morocco in the luxurious buffet palace cars, the smoking-rooms of the finest ocean steamships, in the upholstery of high cost carriages, fine office and library furniture and in other uses where leather has previously been the only material adapted for the purpose.

Embossed Pantasote is also largely used for artistic chair seats and backs, wall panels, etc.—the embossing being plain or in gold, silver and bronze effects. In fact every use to which leather has been applied for such purposes as referred to is acceptably and in many cases more completely served by Pantasote.

Another use to which Pantasote has been put is worthy of mention; it is displacing every material in the manufacture of car window shades. As it is not affected by sun or rain, and does not deteriorate in strength or usefulness by age and retains the quality of flexibility, indefinitely, it has no equal as a material for this class of goods. A further recommendation is that it can be scrubbed and cleaned by means of soap and water without injury and restored to its original appearance, which can be said of no other material used for the purposes mentioned. The offices of the company are at 29 Broadway, New York City, where the goods in use may be seen.—Adv.

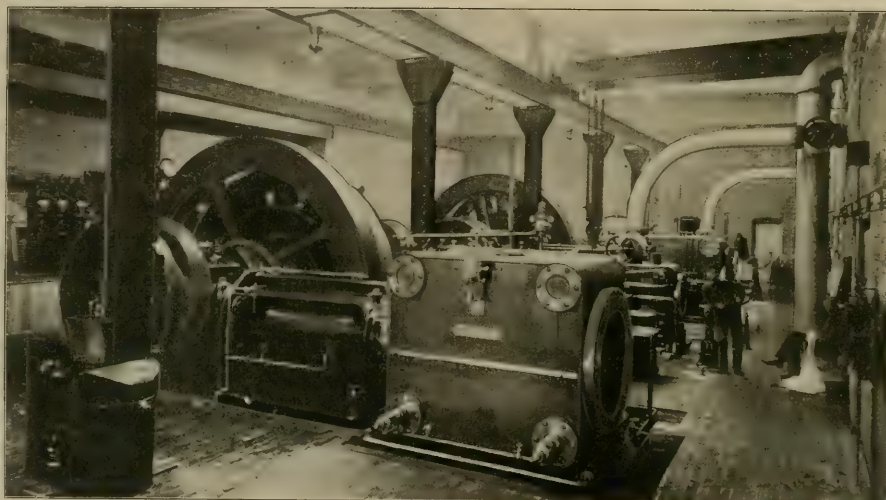
## PITTSBURG SPECIAL FOR PITTSBURG TRAVELERS.

Leaves Chicago 7:30 p. m. every day, arrives Pittsburg 7:45 next morning. In addition to vestibule coaches this train carries sleeping cars Chicago to Pittsburg. One car has buffet serving breakfast, and passengers can get off train at Pittsburg refreshed and ready for business. Its counterpart, the Chicago Special, leaves Pittsburg 6:30 p. m. and brings passengers to Chicago next morning. Arrange with H. R. Dering, A. G. P. Agt., 248 South Clark St., Chicago, for your next Pittsburg trip on this train.



# THE FILER & STOWELL CO.

MILWAUKEE : : WISCONSIN



## THESE ENGINES

Are Described on Page 885 in the  
Article on the New Power House  
of New Bedford and Onset Street  
Railway Co. at New Bedford, Mass.

Eastern Representative,  
**THEO. W. PHILLIPS,**  
4 Market Square,  
PROVIDENCE, RHODE ISLAND



Chicago Representative,  
**FRANK ENGLEHARDT**  
735 Marquette Bldg.















